

Jussi Ilari Kantola  
Tibor Barath  
Salman Nazir *Editors*

# Advances in Human Factors, Business Management and Leadership

Proceedings of the AHFE 2017  
International Conferences on  
Human Factors in Management  
and Leadership, and Business  
Management and Society, July 17–21,  
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Los Angeles, California, USA

# **Advances in Intelligent Systems and Computing**

Volume 594

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Jussi Ilari Kantola · Tibor Barath  
Salman Nazir  
Editors

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# Advances in Human Factors and Ergonomics 2017



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*8th International Conference on Applied Human Factors and Ergonomics  
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*Proceedings of the AHFE 2017 International Conferences on Human Factors in  
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# Preface

This book provides researchers and practitioners a forum to share research and best practices in the application of human factors to management and leadership. Just as human factors have been applied to hardware, software, and the built environment, there is now a growing interest in the management practices and learning experiences. Principles of behavioral and cognitive science are extremely relevant to the design of instructional content and the effective application of technology to deliver the appropriate managerial and leadership experience. These principles and best practices are important in corporate, higher education, and military environments.

This book also aims to share and transfer not just knowledge, but share best leadership and management science practices that are of real value in practical terms, value that can help leaders ensure their organizations stay ahead of the competition through continued innovation, strong competitive advantage, and inspired leadership.

A total of six sections presented in this book. Each section contains research paper that has been reviewed by members of the International Editorial Board.

- I. Business Development Applications
- II. Tools and Methods
- III. Skill Development
- IV. Safety Management
- V. Learning, Capacity Building and Social Innovation
- VI. Human Factors and Organizations

Our sincere thanks and appreciation go to the Board members listed below for their contribution to the high scientific standard maintained in developing this book.

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# **Business Development and Applications**

# Working Life Within a Hybrid World – How Digital Transformation and Agile Structures Affect Human Functions and Increase Quality of Work and Business Performance

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**Abstract.** Digitization is dramatically changing economy and society. With current developments in the field of e.g. artificial intelligence and machine learning, big data and data analytics, cloud computing, conversational systems and adaptive architectures, robotics as well as virtual and augmented reality work life is facing huge challenges. On the other side the networking over the internet, more effective handling and sharing of data and new forms of human-machine-collaboration offer a great variety of potentials for designing even more flexible business processes, agile working structures and even smarter working setups and environments. Technique, organizational aspects and humans in the future are going to be within a new triad. Instead of taking the role of a “dominator” or “captain” as in former times, humans now more and more have to fulfill tasks as a “conductor”. The role of building up and interacting within new hybrid networks and holistic systems is gaining higher importance – leading to massive changes with reference to all dimensions of work. Total new requirements concerning work objectives, working tasks, work equipment, workspace as well as new challenges for organization, qualification, employment and leadership arise. Work is becoming more and more digitally and going to look quite different than expected today. Combining the physical and virtual world is representing the key success factor for future work. The study examines how digitization is going to penetrate working life further on displaying central measures and selected solutions for resulting organizational structures, human qualification needs and optimized working conditions in a hybrid world.

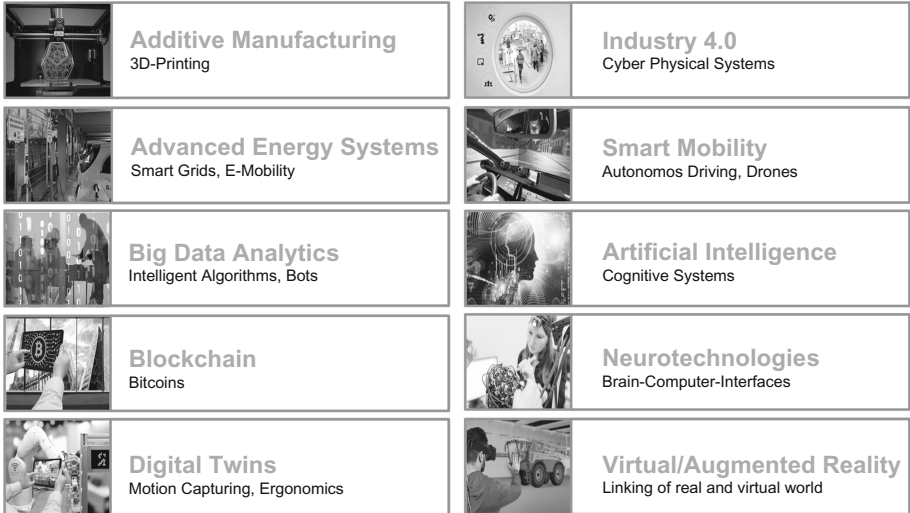
**Keywords:** Agility · Collaboration · Data · Digitization · Industry 4.0 · Organization · Performance · Qualifications · Requirements · Technology

## 1 Introduction

We are all permanently living in times of change, but actually developments are happening quicker and their consequences are of a much higher impact than in the old days. The digital transformation changes economy and society life likewise – in a



radically and sustainable way [1]. The global change towards a fully networked economy and society is in progress, in Germany, the United States, in Asia too – actually more or less all over the world. Actual buzzwords in this context are for example artificial intelligence, big data and Industry 4.0. With new technologies, ongoing disruption and new approaches for innovations serious movements in the field of business are actually taking place (Fig. 1).



**Fig. 1.** Selected key and emerging technologies

One central driving force of the digital transformation is the total connectivity leading to new ways how products and services are developed and how people and machines collaborate. Therewith working areas of people are going to organize and network themselves more and more automatically: networks form, the working world environments are getting smart and working processes as well as organizational structures are getting more and more flexible.

Another important aspect in this connection is the effective handling of and access to data. The one, who can interpret the data, draws conclusions and can take actions towards customers and systems will be successful. This way, new applications like smarter driving, smarter energy solutions, smarter homes, smarter manufacturing and smarter transactions are going to develop. Cognitive systems, intelligent algorithms and platform-based solutions are generating new business models and are enabling new forms of human-machine-collaboration.

## 2 Impacts of Digitization on Business and Jobs

The digital transformation is leading to a new style of economies, where new interaction between the physical products and the internet occurs [2]. Cyber-physical systems are combining ICT and data functions with the technical systems. They interact with each other and with humans via internet communication and other protocols. Many people are describing this phenomenon as the fourth industrial revolution (Industry 4.0) in the line of the invention of the weaving loom, the assembly line of Henry Ford and Frederic Taylor and the invention of the programmable controller.

As actual forecasts display, these developments will gradually affect nearly every industry. The industrial sector already is facing great challenges with heavy impact on business in the following years. Looking on the actual assessment of the situation most of the business leaders are very concerned about the radical changes by the digitalization of the world and their business [3].

Especially managers of the ICT companies, but also managers of energy companies are very concerned about that. On the other side, the managers in the automotive industry, in finance and insurance business are getting more and more aware of these transformation processes (Fig. 2).

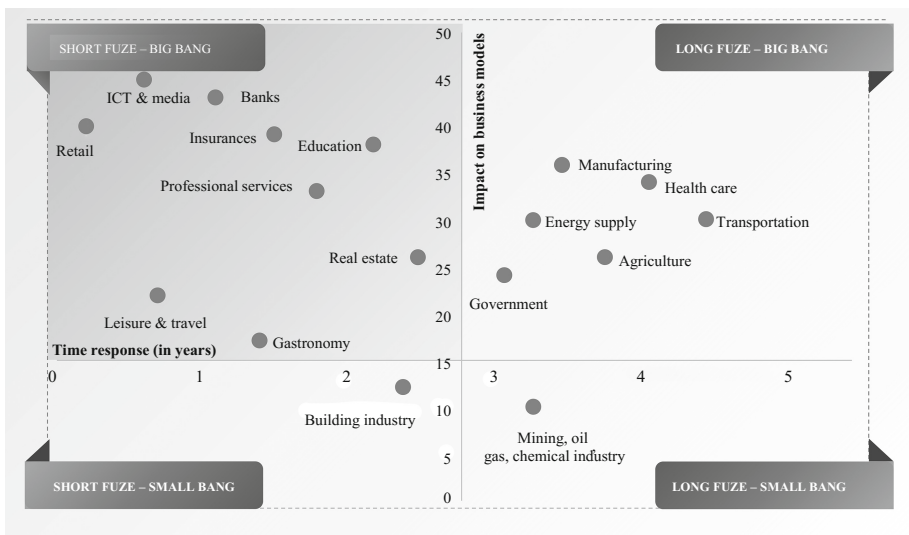
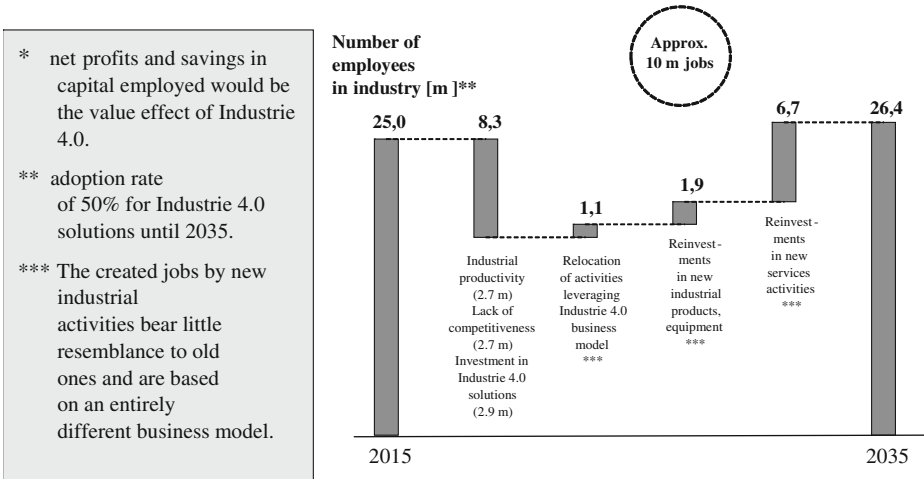


Fig. 2. Disruption map by industries [4]

A survey in the smaller and medium sized companies in Germany shows very clear, that most of them are expecting that the digitalization is influencing business and working processes significantly. As aforementioned ICT companies from are feeling themselves more digitally developed than other industrial sectors. Nearly three third of the SME leaders in Germany are expecting an expansion of innovation activities in order to fully exploit the possibilities of digitalization [5].

The potential value effect of industry 4.0 is added up to 420 billion Euros (net profits and savings in capital employed) based on the assumption, that there will be a 50% adoption rate of industry 4.0 solutions by 2035 [6]. There will be a loss in employees in activities, which will be overcompensated by new jobs bearing little resemblance to the old ones and based on an entirely different business models (Fig. 3).



**Fig. 3.** Potential value effect of Industry 4.0 for Western Europe [6]

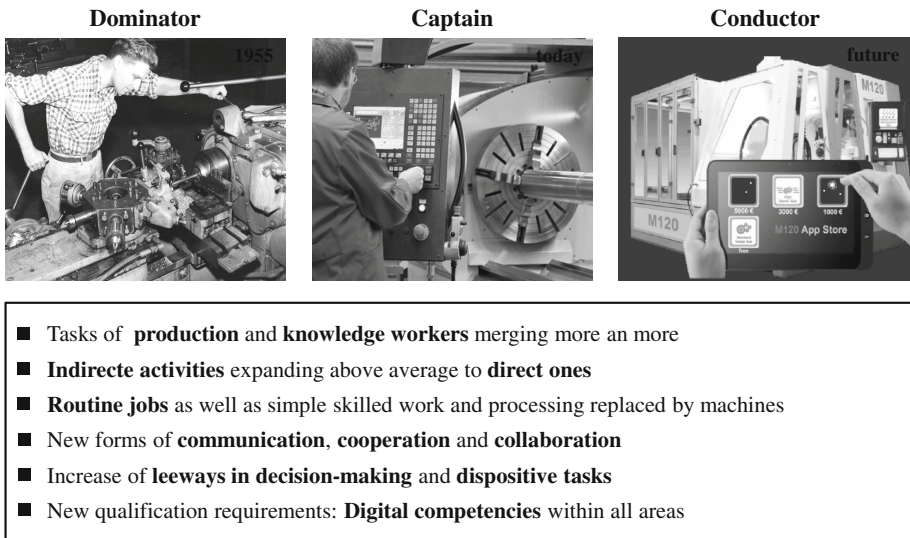
The way people are going to do their business in the future is transforming from rigid value chains to a dynamic value network structures. Collaboration is no longer a clear and stable line principle, but much more flexible, dynamic, agile and with many different and changing stakeholders. Within a study, we identified the following current barriers within the transformation process [7]:

- 64%: Lack of clarity concerning economic benefit
- 60%: Lack of experts and specialized knowledge
- 43%: Lack of technical requirements
- 40%: Lack of ability to change organizational structures
- 37%: Lack of norms and standards
- 29%: Employee representation
- 27%: Prevention of data relating to employees
- 27%: Age distribution within companies
- 25%: Prevention of data relating to companies

Digital transformation hence leads to massive changes with reference to all dimensions of work: concerning work objectives, working tasks, work equipment, workspace as well as new challenges for organization, qualification, employment and leadership.

### 3 Future Work Trends and Dimensions in Times of Digitization

It seems to be clear: in the future companies, states and the society in the whole will have to try to take advantage of the digital progress. New forms of human-machine-collaboration will develop combining the specific competencies. Technique, organizational aspects and humans therefore are going to be within a new triad. Instead of taking the role of a “dominator” or “captain” as in former times, humans now have to fulfill the tasks as a “conductor” [8] (Fig. 4).



**Fig. 4.** Changing relation between humans and working world [8]

As an example, new digital forms of networked work in logistics by the usage of data glasses will emerge. Mobile devices will open up new possibilities for effectively gathering and using data. In a survey we conducted, that nearly 75% of the participants are of the opinion that the displayed scenarios are going to be the standard soon.

Another innovation field is human-robot-collaboration, which is going to define new rules for future partnership of work. SMEs and large-scale enterprises already are experimenting on new forms of physical assistance in means of human-robot-collaboration. Prototypes already exist, but it's still a great challenge for automated and standardized working scenarios.

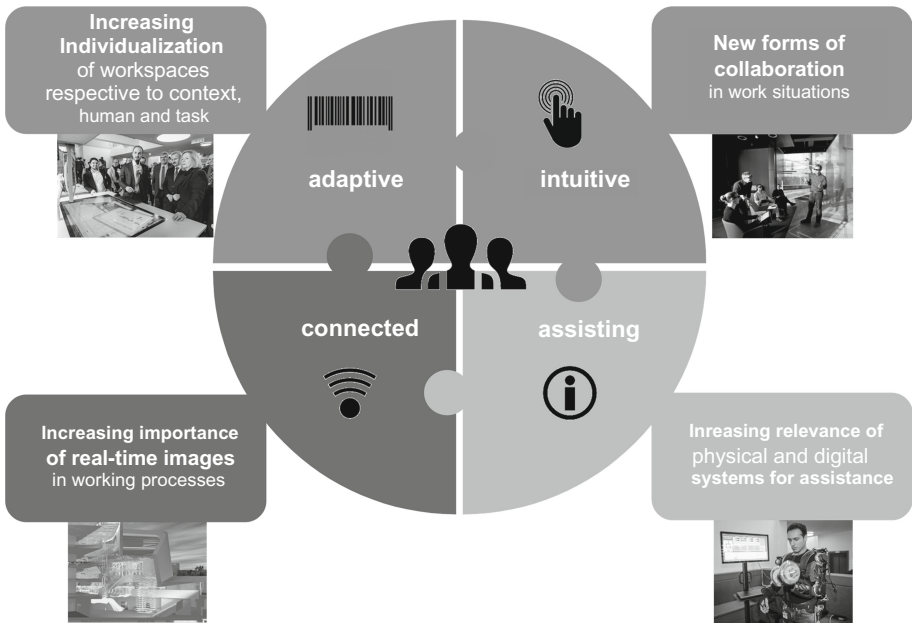
Furthermore self-organized human resource allocation, which we investigated within the project “KapaflexCy” in cooperation with selected partners from the industry, is gaining more and more importance: incoming customer orders are demanding for human capacities. A web-based platform allows pushing requests for capacities to an app used by the production workers on a mobile device. This way they are able to inform about their disposability, with an intelligent algorithm automatically

proposing suggestions for human resource allocation. Therewith a faster capacity planning is possible and the system leads to a better work-life balance of the workers by self-organization [7].

It has also to guarantee, that digital working scenarios are serving better working conditions for the production workforce. One way can be seen by integrating “activity-based lighting”. This solution consists of RFID and sensor-based components helping to illuminate the workplace right to the users profile and the needs of their working tasks.

Finally, the developments in the context of digital transformation also mean changes of work organization. It is certain, that new forms of human-machine-collaboration need new qualification of the workers, for example willingness for lifelong learning, more active participation in problem solving and process optimization, stronger interdisciplinary thinking and acting, ability to permanently interact with machines and cyber-physical systems as well as higher knowledge of systems [9].

As the presented examples illustrate, in the context of digital transformation, massive changes with reference to all dimensions of work are ongoing: concerning work objectives, working tasks, work equipment, workspace as well as new challenges for organization, qualification, employment and leadership. In order to increase quality of work and business performance by new forms of human-machine-collaboration and agile work organizations four dimensions are essential (Fig. 5).



**Fig. 5.** Dimensions changing work in the context of digital transformation

- **“Adaptive” – Increasing individualization of workspaces respective to context, human and task:**
  - Background: Diverse demands of employees actually are often not taken into account
  - Opportunities: Personalization of workspaces appropriate to personal preferences (e.g. adaption of table height, activity-based lighting, access to relevant data)
  - Organization: Definition of rules for the usage of personal information and identification of potentials for individualization
- **“Intuitive” – New Forms of collaboration in work situations:**
  - Background: Increasing complexity of ICT Systems integrated into employees’ work processes
  - Opportunities: New concepts for intuitive interactions (e.g. brain, gesture, speech, touch) in connection with mobile devices and wearables as “native” tools
  - Organization: Identification of required competences for the usage of new devices and concepts for interaction
- **“Assisting” – Increasing relevance of physical and digital systems for assistance:**
  - Background: Increasing product variation due to increasing individualization of customer demands
  - Opportunities: Adaptive systems for feedback and optimized learning to support employees in connection with new technologies (e.g. augmented and virtual reality)
  - Organization: Definition of learning scenarios in work processes based on smart systems for assistance and new rules for control disposition
- **“Connected” – Increasing importance of real-time images in work processes:**
  - Background: Existence of ICT systems without connection of relevant data to processes or products
  - Opportunities: Visualization and usability of relevant parameters (e.g. for refeeding of essential work events towards controls)
  - Organization: Evaluation of employee acceptance concerning transparency and performance monitoring as well as identification of required qualification needs for digital competence (e.g. interpretation of data)

## 4 Conclusions and Demand for Further Research

Summing up the following central conclusions concerning impact of the digital transformation on future development of business and work can be drawn:

- Digitalization of value creation is already on the way and will penetrate work life further on.
- Digital transformation is raising high expectations. The public perception of the topic has gone beyond real solutions and implementations.
- Digital transformation is penetrating enterprises top-down and bottom-up.

- There will be significant impacts on work, work organization and qualification.
- Nontransparent economic benefits and organizational obstacles prevent a widespread realization of good practices – at least today.

Digital transformation will be the future of business and work organization, but probably it will look quite differently than expected today. Existing dysfunctions and tensions can be eliminated with the help of instruments, organizational architectures and technologies enabling exploitative and explorative innovation simultaneously.

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# Airbnb in China: The Impact of Sharing Economy on Chinese Tourism

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**Abstract.** Today an increasing number of young people are likely to book homestay hotels instead of traditional hotels. We find Airbnb is one of the most popular websites in China to reserve homestays for young people traveling abroad. Since the company's headquarters is based in San Francisco, we find it is not well-known in China and little research has been done about it in China. Therefore, this paper addresses how Airbnb can influence Chinese tourism. We use mixed methods in this paper, including surveys, interviews and ethnography studies. We conduct semi-structured interviews to travelers and Airbnb employees. We carry out surveys to participants. The surveys have been posted both on the internet and in print. Ethnography studies have been conducted in order to get detailed information about customers' usage of the website. We find that 59.05% of the participants prefer to live in starred hotels, and 49.52% of the participants prefer to stay in budget hotels and 18.1% of the participants used Airbnb. We find out that interviewees believe that the emerging of sharing economy like Airbnb does influence or will impact the traditional hotel industry. Some participants expressed their preferences about the website design and the work environment of Airbnb. Our ethnography studies also investigated four Airbnb customers' travel experiences about using Airbnb website. They reported that Airbnb not only offered them diverse rooms, but also offered them good accommodation, lots of travel information and help from landlords. However, trust issue still is a big concern between customers and Airbnb.

**Keywords:** Sharing Economy · Human Factors · Website Design · Culture

## 1 Introduction

As the development and growth of Chinese economy and the increase of per capita living standards of Chinese people, the whole entertainment industry become increasingly prosperous. Travel industry is one of the most important and typically part of all the entertainment industry. Because of this, the travel industry of China attracts many foreign enterprises, which want to make profit and expand their international market in this country. This paper studies Airbnb China, one of the most famous home stay facility company in China. We aim to discuss the influence about Airbnb in Chinese tourism market. Via data from surveys, interviews, and ethnography studies



we try to analyze their website design and user experiences. We also analyze the data from two perspectives: Sharing economy and Human factors.

## 2 Related Work

Since Airbnb was launched in China, it began to influence the development of tourism market in China. The whole idea of the Airbnb business and service was based on the theory of “Sharing economy”. This theory changed the old traditional hotel industry. Researcher have studied the impact of sharing economy such as Airbnb in cities and countries. Few studies have been done to investigate how Airbnb impacts Chinese tourism.

Researchers studied the relationship between hosts’ profile and customers’ trust level [4]. They found that longer description in host’s profile can perceived more trust from customers. Also Byers et al. stated Airbnb’s business model is based on trust between host and guest, and they also encourage guest and host should communicate with each other in terms of the room’s possessions [1]. In addition, parts of participants also think house or room is a private place.

Fradkin et al. studied customers’ reviewing behaviors [2]. They found out that most reviews were informative. The data showed that reviewers were likely to have positive experiences while non-reviewers were likely to have worse experiences. They also explored how to improve the design for reviews.

Lee et al. analyzed four thousand room data, aiming at investigating which features are more important for Airbnb business [3]. They found not only price and amenities are important features, the response of hosts, the count of Wish List, the number of reviews, and the membership seniority are also important for the Airbnb business.

Zervas et al. found that Airbnb impacted the business of low price hotels and non-business hotels [5]. They also found that these affected hotels took related strategies such as lower price, which benefits all customers. They stated that sharing economy has been successfully competed with tradition hotel companies.

In summary, even though researchers have studied the impact of sharing economy such as Airbnb in different countries and cities, there are few research conducted about Airbnb in China. These research have studied the trust issues and user experiences of Airbnb customers. We aim to find out how Airbnb impacts Chinese tourism and how customers interact with the website and their trust concerns.

## 3 Methodology

We designed a mix methods of surveys, interviews, and ethnography studies to gain a deeper understanding of the impact of Airbnb on Chinese tourism. Surveys have been sent to college students. The purpose of these surveys is to investigate how the service of Airbnb has influenced participants and its popularity among young people. Our research aimed at identifying how this emerging application has improved lives and the industry. We also investigated participants’ attitudes toward this new online culture in China.

We interviewed two groups of participants: tourists, and Airbnb employees and customers. There are two advantages of these two groups. First, it's easy to organize the interviews if we decide the participants into two groups. Second, we can get different answers from different perspectives.

Our ethnography studies observed how Airbnb customers interact with the website. We recruited four participants starting last year. We observed who they use the Airbnb website and let them describe their experiences with Airbnb. The purpose of the studies is to investigate how Airbnb satisfies different customers' diverse needs.

## 4 Results and Discussion

### 4.1 Survey

Our survey data showed that 59.05% of the participants prefer to live in expensive hotels, and 49.52% of participants prefer to stay in budget hotels. Our participants report Airbnb does not have much advantages on price in China. Even so, 18.1% of the participants used Airbnb. It is likely to be the reason that young people enjoy new things. Airbnb is a new way of accommodation for them. Another reason tends to be the fact that they can get to know some local cultures and receive accurate information about tourists' routes from hosts. Local people always know the appropriate information, for instance, what is the most interesting places and what is important for travelers. Meanwhile, 48.57% of the hosts think if they have extra houses or rooms, they would like to join Airbnb. They are able to have extra income while they can make new friends with tourists. Comparing with other people's labor work, through this way they can earn money much easily. However, there is an untrusting relationship between hosts and tenants. Fifty four percent of the participants will not join Airbnb if they have extra rooms in their houses. They think tourists will damage their furniture's. Therefore, rental house resources are scarce on Airbnb in China.

### 4.2 Interview

The results of the interview study showed that the employee from hotel industry believed that the emerging of sharing economy- Airbnb has influenced or will impact the traditional hotel industry. The interviewees preferred Airbnb's website design and work environment.

Since August 2015 Airbnb announced their business in China, it has been two years. In the past people who traveled around China had no other choices but to stay in local hotels. Airbnb offers them a second choice. Interviewee One was an employee who used to work at Airbnb China. He believed that Airbnb influenced traditional hotel industry.

*In my opinion, the home stay facility service of Airbnb already have certain extent influence to Chinese traditional hotel industry. Because this is a new service, a lot of young people who don't want to follow the old step or the people used to have bad experience, Airbnb is their best choice to choose, at least they think it's a worth to try. (II)*

Interviewee Three has worked at top hotels for one year. She does not think the Airbnb service will influence the traditional industry. But she admits that she is not quite sure that in the future Airbnb and other home stay facilities will impact the hotel industry or not.

*I think the home stay facility or the service of Airbnb still cannot impact the profit of the traditional hotel industry in China. First, because in peak tourist season our hotel can not satisfied all of the tourist, Airbnb attract the tourist that we can not satisfied; Second, there are some people who don't want to stay in hotel, and they are not our customers, so Airbnb can attract this group of people are also not influence our profit. (I3)*

From the interviews of hotel business employees we found that the business expanding of Airbnb in China attracts more people's attention and curiosity to this foreign company, not only because of their new service but also due to the work environment. Interviewee Two, a student who used to study hotel management in United States, is looking for an internship right now. She does not like the way that traditional hotel doing business. Now she wants to work in Airbnb China because she believes Airbnb influences Chinese tourism.

*Even though it's still not reached the degree of "impact", and there are lot of things they need to be complete, Airbnb is still shake the system of the China hotel industry, they not only offered tourist another choice, but also offered a new thought. (I2)*

Interviewee Four, who graduated from an American university, hold special feelings to Airbnb after she did her internship at Airbnb. Many of her family members work in traditional hotels in China.

*I used to do internship in Airbnb, the first time that I went to their company, I think this is really a fancy building, everywhere and every corner in Airbnb's office building decorated luxury, the first thing you entry the door you can see the model of the fancy house all over the world. (I4)*

Interviewee Five used to work in hotel industry for five years. She used to visit the Airbnb office building and she think it is totally different with any other hotel's office building, she think Airbnb's office building is full of life.

*I think the Airbnb's work environment is quite different from other hotel company. I used to work in several different hotel in China, and the most impressed thing for me is each of their conference room have different decor themes, such as Shanghai theme, Paris theme, Washington theme... and some decor theme of the room is exactly the same as the room that been rented. (I5)*

Interviewee Six got his master's degree in Sweden, and now lived in Tokyo. He shared his experience about the different of work environments between Airbnb and Chinese hotel companies.

*When I finished my master degree in Sweden I found a job in Airbnb Japan. Because my aunt was a manager of a famous hotel in China, when I was a little boy I usually went to her office to found her. The style of her office and the Airbnb office is totally different. Airbnb is not like an office, its like a leisure cafe or indoor small parks. The designer of this office building put many scenes of ordinary life scenes in the office, create many different the scene office space, such as living room style, private mini meeting room style and corridor coffee shops style. I found the characteristics of the work environment of Airbnb is everywhere is public space, the designer of this building seems want to create a neighborhood atmosphere. (I6)*

The interviewees discovered Airbnb did a lot of research about China hotel industry. They pointed out that even though Airbnb's cultural background are totally different from the hotel industry in China, it refuses to become one of the traditional hotel companies. They have done many things on purpose to advertise their company and their service. Interviewee Seven used to work for one famous Chinese hotel company for four years, and now she works for a British hotel company.

*I think Airbnb is a company that focus on the design, this is very different from other hotel company. My friend send me the picture of the wall in Airbnb office building, it's full of the history of their new logo design history, there are many designer in Airbnb even more than the engineer. (I7)*

Interviewee Eight was a loyal customer of Airbnb before the company expanded their business in China. When Airbnb China was launched, he got the internship from Airbnb and now he is already a formal employee at Airbnb China.

*Everyone know Airbnb is a famous America company, but even no one compare Airbnb and Chinese hotel company. Since Airbnb was in China, everyone started to compare this company with the traditional hotel service, Cheaper, more friendly, fashion, those are the key words when people ask you the different between the Airbnb and other hotel company in China, and as a employee of Airbnb China, I love this kind of comparison, people in China, especially young generation, they love something different, something special, which can made them unique. We are in purpose to mention our difference with other hotel service. (I8)*

Interviewee Nine has worked in a Beijing hotel company for 12 years. He thinks the fact that Airbnb, as a new company in China, keeps mentioning their differences from China traditional hotel companies is quite a good idea. But it is not a good strategy for long run.

*I work in this business for such a long time, and there are many new hotel company joined into this industry, they have different way to advertise their service and business. Airbnb was one of the most unique one that I ever seen. Their service is totally different with any other hotel company in China, as a hotel manager, I have complex feeling about it. On the one hand I think their business will influence our profit, but on the other hand, I think this is a good thing, maybe Airbnb can be the one change the old traditional system of China hotel industry. I pay close attention to this company already for a while, I also heard some negative report about their business, I think if they keep mention their differences but stop complete their website system and service, after a period of time people will think Airbnb's differences is not represent good differences, but bad differences. (P9)*

Interviewee Ten is an economic professor working in an America university, and he is also a travel enthusiast. He said the service of Airbnb and other homestay service is a very normal thing, it will happen one day.

*As we know, the year that Airbnb was established at 2008. And that time the whole world just experienced the economic crisis. Everyone suffered from this disaster, Airbnb's idea was let people in this difficult situation, use less money to rent house to enjoy the journey. And at the same time, it can also let the people who have extra house or room to earn some profit at this difficult time. It was the main idea of the Airbnb service, and also the best example of the theory of Sharing economy. (I10)*

From customers' point of view, the most intuitionistic way to see the influence that Airbnb brings to the China hotel industry is sometimes Airbnb cannot satisfy tourists' high demand for the house renting. Interviewee Eleven is a student. She has used Airbnb to book hotels for six months since 2016. October 2016 she decided to visit DaLi, but all the hotel room on Airbnb was fully booked. She had to use other hotel application to book the hotel.

*I first time found out that Airbnb is so popular in China. To be honest, I am a little worried about it, because I am not sure that if that mean they are going to increase the price, or their service will decrease. (I11)*

The popular of Airbnb made more people want to know something more about this company, Airbnb allowed tourists to visit their office. Interviewee twelve shared his experience about this visit.

*The first thought when I came into the office is, is this really a hotel company? The room looks very fashion, and different room have different style! I kind of regret why I didn't work for this company! (I12)*

The interviewees expressed that even though Airbnb just has expanded their business in China for only two years, they try to instill their opinion, they style, and their company culture to their customers. Interviewee Thirteen lived in a family in which many of her relatives work in China traditional hotel companies. She already gets used to the old style of hotels and she does not think changing this industry is a good choice. But since Airbnb got into China, she started to change her attitude.

*Because many of my relative work into China hotel company, when I heard Airbnb expanded their business in China I felt not happy, why this America company come to China? When I travel around, I still use old way to book hotel, but since many of my friends use Airbnb, I become curious about this company. Then I try to booked the hotel from their website. To be honest, the room was just like the website showed, and the service is more friendly than other hotel company in China. Since that time, I started to use their service to book hotel, and visit their office building to know something more about this company. Now my attitude is totally different, I know it was Airbnb want me, to know more about them, but I cannot refuse, because there have a better choice, why should I refuse? (I13)*

Airbnb China not only attracts more customers' attention, but also attracts groups of people who want to rent their room to Airbnb's website. Interviewee fourteen rent his house to tourists via Airbnb's website.

*I lived in a place which is very famous in China, and every year there are many people come to visit. I have two house, I really want to rent one to make some money, but local people don't need to rent the house, and I am also not trust the tourists that much. But when I heard Airbnb this company, and find more information about this company, I thought perhaps it's worth to try to rent my house to tourists through this company. Actually, it was good. I think it's not only good for tourists and me, but also good for the Airbnb. I started to trust this company, and also started to trust tourists. (I14)*

### 4.3 Observation

Since the Airbnb announced they would expand their business in China, there has been groups of people becoming Airbnb's China customer. We observed five participants for over a year on how they interact with the website and service. These ethnography studies offer us detailed information about how the customers use Airbnb in their lives.

Participant One is a graduate student from a Beijing college. She used to use the Airbnb's website for a year from 2015 to 2016. Every time she ordered the residence on Airbnb China's website. She told us the Airbnb's website is the website that she loved most. On the top of the website it asks you to type the location, time and number of people, and the following content is through different catalog to find more information satisfied your specific demand for the residence. She said this website design can satisfy different groups of people: people who want simple process and people who want specific order. And for her personal experience every time she ordered hotel service, she would use different catalogs to know something more about the place she traveled. After one year use of the Airbnb's website, she also got more information about some famous place's reviews, including food and cultural information.

The experience she shared was in 2015 summer she planed went to London because she just graduated. She just wanted to go to London, but she had no idea if she could find the famous place or the food suitable for her taste. Then her friend told her she could find all the information from Airbnb, and that was the first time she knew this company. When she accessed the website, she found out the website design was very clear and concise. She followed the step to choose the day that she wanted to leave, and she started to pick the hotel. She said it was the first time she found out there were so many styles of hotel rooms that she could choose, more than she could imagine. The designer of the Airbnb website also showed the map on the right side, in order for her to find the most convenient place for her schedule. She expressed that for the people who have no idea about where to go and no information about anything, the website also shares other tourists' experiences, food or place recommendations. They also exhibited lots of pictures. Because of the Airbnb, her graduation trip was great. She not only visited Buckingham Palace, Tower of London, Royal Greenwich Observatory and Saint Paul's Cathedral, but also visited many restaurants which offered delicious food, such as Palm Court at The Langham, Terry's Cafe, Orrery and The Bull Steak Expert. And that great experience was the first time she started to love this company and their service.

Participant Two worked in a famous international company Beijing branch for five years. He became an Airbnb China's loyal customer since one year ago. He thought through his experience, expressing the reasons that made him become the loyal customer of Airbnb. That was because the picture that showed on the website is completely the same with the real hotel room. He used to travel around many different places and booked hotels on many different websites. But Airbnb was the first one which didn't make he disappointed.

May 2016 he prepared to go to ShenZhen China to attend a conference. But because it was the hot season for travel he cannot book the hotel that he used to stay. That time he just found the news of Airbnb China, and then he thought perhaps he should try something new. The first thought when he opened the website was there

were so many different types of rooms, but he was not so surprised because he has already experienced lots of similar situations. The picture from the websites have huge difference with the real rooms. And when he arrived at the hotel he booked, he still remembered the moment when he first came into the room. He said he was shocked by the room, because it was totally the same with the website picture. And the price was much lower than he used to pay. He said since that day, he didn't use any other hotel company's service.

Airbnb expands their business not only focusing on website design but also on their service. Participant Three was still a student studying in a college. She has used Airbnb's service for almost one year since 2016. She said every time when she traveled to somewhere new, she would use Airbnb to book residence, because landlords were always friendly, and would love to introduce the information of this place. She is familiar with many places' food, famous scenic spots and local cultures just because of enthusiastic Airbnb landlords.

She said she has used Airbnb to book hotels in three different places in China, such as LiJiang, ChengDu and NanJing. And every time she can always meet friendly landlords. When she stayed in LiJiang, the landlord introduced to her a famous restaurant for local people, which meant there were not so many tourists there. The price of the food was also cheaper than other restaurants. When she stayed in ChengDu, her landlord knew she was not familiar with the city, so offered her information about some famous places, showed her the famous Hotpot restaurant, and taught her some ChongQing local language. When she stayed in NanJing, she was sick because she could not adapt to local weather. Her landlord bought her some medicine and took her to the hospital, and when she leaved the city landlord refused to accept the medicine cost. She said, she thought the meaning of travel is know something new, feel the new culture, meet some new people, that was the reason she always chose some place that she has never been to. The experience with the Airbnb landlords made her start to love this company, because only this company's landlords bring her all of these warmth and love.

For a company just expands their business in a new market, there are also something that needs to be changed and completed. Participant Four is 32 years old and works in a bank in Beijing. She has used Airbnb for 6 months. During this period she used Airbnb to book hotel three times. However, the last time brought her a bad experience. When she ordered the room online, she already paid it. But when she arrived at the place, the manager of the hotel said he didn't receive any order, and other rooms in this hotel had been all booked.

"I felt so angry and helplessness that time," she said, "I have already paid for the rental fee and the website displayed the order was successful." Then she called the customer service of Airbnb, the customer service told her there was no history about her trade in their system. But they said they would try their best to fix this problem. "Then I wait for one hour. But after that, the customer service still did not fix my problem," Participant Four said. After that, even though she still keep traveling, she never used Airbnb to book residence.

## 5 Conclusion

Airbnb is an example of the booming sharing economy happening around the world, including China. It offered customers to book homestay hotels online. Our findings indicate that it begins to influence Chinese tourism, bringing some changes to this industry in the country. Our data also show customers' opinions about its design and trust issues. Consumer confidence is the important part for business. We will try to explore more Airbnb reviews to get broader data about the impact of it on Chinese tourism.

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# The Value Analysis in the Investment Evaluation of Innovative Productions

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**Abstract.** The work objective is a study of methodological issues for evaluating innovation industries with the value analysis based on the modification of the economic value added indicator obtained by using the method of hierarchy analysis. It is shown that for the analysis of industrial enterprises' investment appeal while calculating of their value as a measure of forecasted cash flows, from the point of view of the authors, it is expedient to use an indicator of economic value added (EVA), proposed by B. Stewart. Analyzing the structure of the expression for the value of the existing innovative enterprise with the economic value added indicator, the authors show that, in practice, it is expedient to apply its modification with the introduction into the calculated model the evaluation scaled constants that determine the significance of the economic value added components.

**Keywords:** Cost analysis · Cost estimation of innovative production · Ash flow patterns · The income approach to assess the value · Economic value added · Ranking indicators · Hierarchy analysis method

## 1 Introduction

According to the industrial Policy Concept of the Russian Federation, the main goal is to increase the efficiency and competitiveness of the Russian industry.

Achieving this goal is not possible without the creation of concepts and methodologies of management based on the perception of the industrial enterprise as a system which control logic should be subordinated to such goals as increase the cost of capital invested by the enterprise's owners and the maximum satisfaction of all economic subjects interested in the enterprise success.

Therefore, the use such an indicators as market value of the enterprise as the main criterion of industrial activity efficiency is the theoretical basis for the formation of new forms of management that will ensure the integrated management of all business processes and functional subsystems of industrial enterprises.

Otherwise, when the enterprise works in its market segment and implements a strategy to create sustainable competitive advantages, its cost increases. In this situation, for company's management it is relatively easier to attract external funding, to take an active position in the markets of goods, capital and labor and develop.

This once again confirms the close relationship between the factors determining the competitiveness of enterprises and the value of business indicators, which evaluation objects can act as an integrated component, for example, the economic value added of the enterprise, as well as local indicators, for example, different components of cost [1].

## 2 Investment Evaluation of Innovative Productions

The previously mentioned is especially important for innovative industrial enterprises that solve different problems of its technological development and develop investment projects for the future within the program of its strategic development. We analyze the characteristics and theoretical assumptions of valuation of innovative industrial enterprises, after selecting the main types and methods of calculating the value of the business, used for these enterprises in practice [1, 2].

The carrying value of the net assets  $NA$  is determined in accordance with Russian law by deducting from the amount of the assets taken for calculation, the amount of liabilities taken for calculation:

$$NA = A - D, \quad (1)$$

where  $A$  - sum of assets taken for calculation;  $D$  - liabilities (borrowing) taken for calculation.

The forecast market value of the company. For the calculation of the indicator is used the income approach [1–3], according to which the forecast market value of the enterprise is the future cash flows from its operations, discounted to the present point in time:

$$VE = \sum_{t=0}^T \frac{CF_t}{(1+r)^t}, \quad (2)$$

where  $CF_t$  - the value of the cash flow in the forecast interval  $t$ ;  $r$  - discount rate;  $T$  - the duration of the forecast period.

In practical calculations within the income approach, the represented formula is used in some extended format. In particular, it can be used in the calculation of cash flow model for the entire invested (equity and long-term loan) capital of the company (*free cash flow to firm* -  $FCFF$ ) [2]. Then the market value, determined by the accumulated discounted cash flow in the forecast and after forecast periods can be calculated by the formula:

$$VE_{FCFF} = \sum_{t=1}^T \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_{T+1}}{WACC(1+WACC)^{T+1}} - D, \quad (3)$$

where  $FCFF_t$  - the value of the cash flow on investment in the interval  $t$ ;  $WACC$  - the discount rate, which reflects the weighted average cost of an alternative debt and equity capital of the enterprise (weighted average cost of capital) [5];  $T$  - the duration of the forecast period;  $D$  - liabilities (borrowing) taken for calculation.

Cash flow  $FCFF_t$  in the above formula can be expressed in terms of the balance sheet figures and the profit and loss account:

$$FCFF_t = EBIT_t - Tax_t + Dep_t - \Delta FA_t - \Delta NWC_t, \quad (4)$$

where  $EBIT_t$  - enterprise profit before interest and taxes in the period  $t$ ;  $Tax_t$  - the value of accrued income tax in the period  $t$ ;  $Dep_t$  - depreciation in the period  $t$ ;  $\Delta FA_t$  - change in the value of non-current assets in the period  $t$ ;  $\Delta NWC_t$  - the change in the net working capital of the enterprise in the period  $t$ .

When used in the calculation model, the cash flow only on its own capital of the company (*free cash flow to equity - FCFE*) calculation of the market value of equity in the forecast and after forecast periods is carried out according to the formula [2]

$$VE_{FCFF} = \sum_{t=1}^T \frac{FCFE_t}{(1 + CE)^t} + \frac{FCFE_{T+1}}{CE(1 + CE)^{T+1}}, \quad (5)$$

where  $FCFE_t$  - the value of the cash flow to equity on a range of  $t$ ;  $CE$  - the discount rate reflecting the opportunity cost of own capital of the enterprise;  $T$  - the duration of the forecast period.

Similarly,  $FCFE_t$  cash flow can be represented as a balance sheet figures and the profit and loss account:

$$FCFE_t = NI_t + Dep_T - \Delta FA_t - \Delta NWC_t + \Delta LL_t, \quad (6)$$

where  $NI_t$  - Net profit of the company in the period  $t$ ;  $Dep_t$  - depreciation in the period  $t$ ;  $\Delta FA_t$  - change in the value of non-current assets in the period  $t$ ;  $\Delta NWC_t$  - the change in the net working capital of the enterprise in the period  $t$ ;  $\Delta LL_t$  - change in the value of long-term obligations of the enterprise in the period  $t$ .

In practice, in most cases, the second method for calculating the target value of the current innovative enterprise.

Further, we note that for the analysis of investment appeal of industrial enterprises in the calculation of their value as an estimate of projected cash flows from the point of view of the authors, it is advisable to use a more "subtle" indicator the rate of economic value added (*economic value added - EVA*), proposed B. Stuart [2]. This indicator reflects the essence of the postulate that a business that does not bring a net profit that exceeds the opportunity cost of capital owners is unprofitable. You can use the following formula for the calculation of economic value added [2]:

$$EVA_t = NI_t - r \cdot NA_{t-1}, \quad (7)$$

where  $NI_t$  - Net profit of the company during the period  $t$ ;  $r$  - rate is the opportunity cost of equity;  $NA_{t-1}$  - book value of net assets in the period  $t - 1$ .

From the analysis of the structure of formula, it implies that  $EVA_t$  indicator compares the resulting net profit of the company with an alternative income to the capital of the company. A positive value  $EVA_t$  characterizes the economic benefits derived by the owner of the capital investments in existing enterprises.

This formula can be converted using the rate of return on equity indicator

$$ROE_t = \frac{NI_t}{NA_{t-1}}. \quad (8)$$

Substituting indicator  $NI_t$  from this formula in the previous one, we will get the next version of the calculation of economic value added:

$$EVA_t = (ROE_t - r) \cdot NA_{t-1}, \quad (9)$$

where  $ROE_t$  - return on venture capital in the time period  $t$ ;  $r$  - rate is the opportunity cost of equity;  $NA_{t-1}$  - book value of net assets in the period  $t - 1$ . The last formula implies that the economic value added is created in case the profitability of the company's own capital  $ROE_t$  higher than the average value  $r$ . Note that the method of Economic Value Added before constitutes a further development of the income approach to the assessment of business value. The cost of operating enterprise with the use-vaniem indicator of economic value added can be determined by the following formula proposed by E. Edwards and P. Bellom and subsequently modified by J. Olson (Edwards-Bell-Ohlson model - EBO) [2]:

$$VE_{EBO} = NA_0 + \sum_{t=1}^T \frac{EVA_t}{(1+r)^t} + \frac{EVA_{T+1}}{r(1+r)^{T+1}}, \quad (10)$$

where  $NA_0$  - the carrying value of net assets at the current time  $t = 0$ ;  $EVA_t$  - economic value added in period  $t$ ;  $r$  - discount rate reflecting the opportunity cost of own capital of the enterprise;  $T$  - the duration of the forecast period.

Otherwise, the estimate of the cost of industrial enterprise can be presented in the form of three components

$$VE_{EBO} = NA_0 + VE_1 + VE_2, \quad (11)$$

where  $NA_0$  - carrying value at time  $t = 0$  of the net assets;  $VE_1$  - economic value added to the current course of business over the forecast period  $T$  (current implementation of investment projects);  $VE_2$  - the reduced value of the enterprise in the terminal period (future implementation of investment projects).

Taking into account the expression for calculating the value added economic bridge and return on equity last formula can be converted to the form:

$$VE_{EBO} = NA_0 + \sum_{t=1}^T \frac{(ROE_t - r)NA_{t-1}}{(1+r)^t} + \frac{(ROE_{T+1} - r)NA_T}{r(1+r)^{T+1}}, \quad (12)$$

where  $NA_0$  - the carrying value of the net assets in the current time  $t = 0$ ;  $ROE_t$  - return on venture capital in the time period  $t$ ;  $r$  - discount rate that reflects the cost of the alternative cost of the enterprise capital;  $NA_{t-1}$  - carrying value of net assets in the  $t - 1$  period;  $T$  - length Flow rate of the forecast period.

It is obvious that the resulting formula assumes that the value of the enterprise depends on such factors as: the value of carrying value of the net assets  $NA_{t-1}$ ,  $t = 1, \dots, T$ ; return on equity  $ROE_t$ ,  $t = 1, \dots, T$ ; required by investors rate of return on equity  $r$ .

At the same time  $ROE_t$  in the forecast period  $t = 1, \dots, T$  should be calculated using one or another model of forecasting through statistical processing  $ROE_{t-1}$  values,  $ROE_{t-2}$ ,  $ROE_{t-3}$ , ...,  $ROE_{t-n}$  for previous time periods. As such models produce forecast estimates  $ROE_t$  it is advisable to use autoregressive model (AR-model) of the form [4]

$$x(t) = -\bar{a}(t)^T \bar{x}_{t-1}^{t-m} + c \xi(t) = -\sum_{k=1}^m a_k(t) \cdot x(t-k) + c \xi(t), \quad (13)$$

where  $x(t) = ROE_t$ . It is assumed that at each time  $t$  it is known  $m$  values of the considered time sequence  $ROE_{t-1}$ ,  $ROE_{t-2}$ ,  $ROE_{t-3}$ , ...,  $ROE_{t-m}$ , forming vektor  $\bar{x}_{t-1}^{t-m}$ ;  $\xi_t$  - error model, considered as a random process with zero mathematic expectation and variance  $\sigma_{\xi}^2$  ("white noise");  $\bar{a}(t) = \{a_1(t), \dots, a_m(t)\}, c\}$  - unknown model parameters of the time series  $x(t)$ , which recurrently calculated together with  $x(t)$  from the known values  $\{x(t-1), \dots, x(t-m)\}$  using an appropriate adaptive algorithm [4].

This type of model has proved popular in solving the problems of the various economic processes and enables reliably receiving forecasts of time series values. Calculation of the net assets of the enterprise  $NA_{t-1}$  can be carried out in accordance with the regulations in force (Order of the Russian Finance Ministry of 28.08.2014 N 84n).

The calculation of the yield assessment of the enterprise's own capital  $r$ , needed to obtain  $VE_{EBO}$ , is not so straightforward. For its implementation is widely used *CAPM* - pricing model of return on equity [1, 3], which uses the data exchange for the securities market. However, the use of the *CAPM* - model does not always give accurate and understandable results. Therefore, the authors propose to solve the problem of estimating the actual profitability of own capital of the enterprise with the use of the developed approach based on the data of financial statements [3], which greatly improves the reliability and accuracy of the resulting estimates.

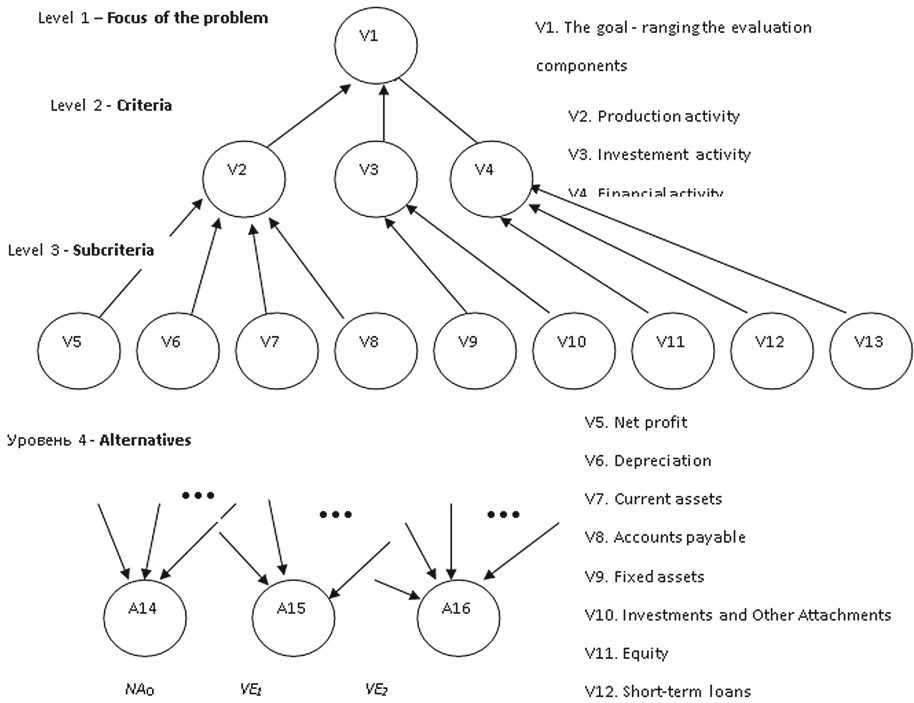
Also, analyzing the structure of the expression for the cost of the innovative enterprise with using economic value added  $VE_{EBO} = NA_0 + VE_1 + VE_2$ , it must be said that from the point of view of the authors, in practice, it is advisable to use a modification, which can be represented as

$$VE_{EBO} = \alpha_1 \times NA_0 + \alpha_2 \times VE_1 + \alpha_3 \times VE_2, \quad (14)$$

where  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$  - scaled constants that define the significance of the component indicators of economic value added  $VE_{EBO}$ .

To determine  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$  we can use the analytic hierarchy process, developed by the American mathematician T.L. Saaty [5, 6]. This method is widely used in the practice of decision support tasks and is an effective mean of structuration the problem of choosing the most preferred embodiment of the generated set of alternatives through the provision of a variety of factors that influence the choice of alternatives, and the job hierarchy of their influence over the construction of the graph that connects a target decision accordingly with the criteria of level 1, where each criterion highlighted this level is divided into sub-criteria, which in turn are divided on sub-criteria, etc.

Lower-level sub-criteria are connected by arcs of the graph with each element of the set of alternatives. In addition, for each arc of the graph above with the involvement of experts and the method of paired comparisons is determined by the weight of the arc that allows, ultimately, to rank the alternatives and accordingly choose the most preferred of them [4]. As an example, Fig. 1 shows a graph showing the structuring of problems ranging components for estimating the economic value added  $VE_{EBO}$ .



**Fig. 1** Structuration problems of ranging the evaluation components

After constructing a graph reflecting the structuring of the decision-making problem, should be constructed a matrix of pairwise comparisons for all vertices of the graph - “descendants”, relating to the appropriate top - “parent.” Tops - “parents” can be a vertex belonging to any hierarchical level, except the last one, on which there are usually alternatives. Pairwise comparisons are made in terms of the dominance of one element over another. These judgments are expressed in whole numbers and after elementary processing allow to obtain the weight of arcs connecting the peaks - “descendants” with vertices - “parents” [5].

Let us denote calculated arc graph weight  $L_{ij}$  through  $\pi(L_{ij})$ . Then to find ways to balance consisting of arcs of the first and second layers in Fig. 1, the weight is to be multiplied on the first level of arc weight adjoining edges of the second level.

Thus the weight of the path of the arcs of the first and second levels is defined as  $\pi(L_{li}, L_{ij}) = \pi(L_{li}) \times \pi(L_{ij})$ , where  $L_{li}$  - the arc of the first level,  $L_{ij}$  - the arc of the second level. In particular, the weight of ways including the second level of the arc, defined as

$$\begin{aligned}
 \pi(V_1 V_2 V_5) &= \pi(V_1 V_2)\pi(V_2 V_5); \pi(V_1 V_2 V_6) = \pi(V_1 V_2)\pi(V_2 V_6); \\
 \pi(V_1 V_2 V_7) &= \pi(V_1 V_2)\pi(V_2 V_7); \pi(V_1 V_2 V_8) = \pi(V_1 V_2)\pi(V_2 V_8); \\
 \pi(V_1 V_3 V_9) &= \pi(V_1 V_3)\pi(V_3 V_9); \pi(V_1 V_3 V_{10}) = \pi(V_1 V_3)\pi(V_3 V_{10}); \\
 \pi(V_1 V_4 V_{11}) &= \pi(V_1 V_4)\pi(V_4 V_{11}); \pi(V_1 V_4 V_{12}) = \pi(V_1 V_4)\pi(V_4 V_{12}); \\
 \pi(V_1 V_4 V_{13}) &= \pi(V_1 V_4)\pi(V_4 V_{13}).
 \end{aligned} \tag{15}$$

Estimation of weights of economic value added components is the result of the following matrix-vector multiplication

$$\begin{bmatrix} \pi(V_5 A_{14})\pi(V_6 A_{14})\pi(V_7 A_{14}) \dots \pi(V_{13} A_{14}) \\ \pi(V_5 A_{15})\pi(V_6 A_{15})\pi(V_7 A_{15}) \dots \pi(V_{13} A_{15}) \\ \pi(V_5 A_{16})\pi(V_6 A_{16})\pi(V_7 A_{16}) \dots \pi(V_{13} A_{16}) \end{bmatrix} \begin{bmatrix} \pi(V_1 V_2 V_5) \\ \pi(V_1 V_2 V_6) \\ \pi(V_1 V_2 V_7) \\ \pi(V_1 V_2 V_8) \\ \pi(V_1 V_3 V_9) \\ \pi(V_1 V_3 V_{10}) \\ \pi(V_1 V_4 V_{11}) \\ \pi(V_1 V_4 V_{12}) \\ \pi(V_1 V_4 V_{13}) \end{bmatrix} = \begin{bmatrix} \alpha_1(A_{14}) \\ \alpha_2(A_{15}) \\ \alpha_3(A_{16}) \end{bmatrix}$$

Summarizing the previously mentioned we should note that considered methodological issues of valuation of innovative industrial enterprises with using the analytic hierarchy process can be practically used to increase the efficiency of management of innovative industries, attracting external funding, etc.

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# Value Network Development in Industry 4.0 Environment

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**Abstract.** We are moving towards fourth industrial revolution through the development of digitalization. Globalization, shortage on resource, change on purchase behavior, urbanization e.g. influence on new competitive situation in every industry segment. This causes as well remarkable change pressures and opportunities for most of the industry. The development of competitiveness of the region as attractive and maintaining it continuously requires co-operation between actors and building up a Roadmap, how to do continuously and systematically small development steps towards the vision and start development activities according that. This article introduces created development process and framework for regional Roadmap-development for various industry segments in Industry 4.0 environment. It also analyses how the increase of digitalization influences on work environment. The most important is how the mindset of people and behavioral culture is possible to change. The introduced industry sectors are manufacturing industry and circular economy.

**Keywords:** Industry 4.0 · Value network · Digitalization · Transdisciplinary · Co-innovation · Co-evolution

## 1 Introduction

Many observers believe that Europe is at the beginning of a new industrial revolution, considered to be the fourth such leap forward and hence labelled Industry 4.0. The ubiquitous use of sensors, the expansion of wireless communication and networks, the deployment of increasingly intelligent robots and machines – as well as increased computing power at lower cost and the development of ‘big data’ analytics – has the potential to transform the way goods are manufactured in Europe. This new, digital industrial revolution holds the promise of increased flexibility in manufacturing, mass customization, increased speed, better quality and improved productivity. However to capture these benefits, enterprises will need to invest in equipment, information and communication technologies (ICTs) and data analysis as well as the integration of data flows throughout the global value chain [1].

The role of Finnish manufacturing industry is not often to be the main contractor (OEM) but biggest potential is in acting as subcontractor (SME) in supplier network for big international main contractors and be as part of their value network.

Succeeding in future in global supplier network requires that operations of main contractors and subcontractors are connected effectively and seamlessly together. Value networks function by flexible and cost efficient way and evolve continuously according the needs of main contractor and global competition.

The development of competitiveness of the region as attractive and maintaining it continuously requires co-operation between actors and building up a Roadmap, how to do continuously and systematically small development steps towards the vision. It is also important to benchmark industrial case studies and field labs on various other regions and find the most successful ones (e.g. Germany, Sweden, Austria).

Subcontracting network of manufacturing industry has significant influence on wellbeing, activity and employment of regions and areas. That is the reason, why regions/cities/countries has to develop and secure the competitiveness of industry and society. In future, the most essential task is to engage the companies and other stakeholders on regions as part of the development of Industry 4.0 and form a functioning ecosystem for the development work.

This article will demonstrate that 4.0 Industry is not only the goal but also the means. It introduces a strategic concept, responsible business leadership, for utilizing responsibility as a business and innovation driver to facilitate the transition of industrial business towards the new service economy. 4.0 Industry is creating significant impact and opportunities where business, technology and innovation intersect.

Digitalization is rapidly increasing and enterprises must find new ways to innovate for business advantage. Through digital transformation, the use of new technologies like cloud, mobile, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities and optimize existing operations to achieve significant business improvement. The collection of enormous amount of scattered data, clustering it for analysis, visualizing it for decision making and using the selected data in new service development and execution is most important in the concept of responsible business leadership.

Häme University of Applied Sciences (HAMK) has a Smart Service-research center as dynamic breeding environment to create and execute, together with co-operation network, well-addressed research and development activities for regional and enterprise development needs. The research unit supports cross-sectorial utilization of digital technologies and service business development. The objective is also to offer development support for municipal, industrial and commercial organizations by creating new opportunities and responding on business transition challenges. The management of responsibility in value network and entire society is becoming an important business driver. Most of companies, which are moving towards service business, need new concepts to manage life cycle business on the responsible way.

Most companies do not have a strategy or analysis on aligning business to digitalization. Being green to achieve mitigation, clean to reach up to optimization and smart to manage the transformation is the integrated, evolutionary approach. 4.0 Industry is an opportunity integrator on the path. Integrating novelty with technology brings new opportunities for more responsible business models. The transformation

towards digitalization business takes a long time and that is why it is important to fully understand the strategic concept, identify the key issues and harness the associated opportunities.

## 2 Theoretical Background

The term “Industrie 4.0” was initially coined by the German government. It describes and encapsulates a set of technological changes in manufacturing and sets out priorities of a coherent policy framework with the aim of maintaining the global competitiveness of German industry. It is *conceptual* in that it sets out a way of understanding an observed phenomenon and *institutional* in that it provides the framework for a range of policy initiatives identified and supported by government and business representatives that drive a research and development programme [2].

Industry 4.0 describes the organization of production processes based on technology and devices autonomously communicating with each other along the value chain: a model of the ‘smart’ factory of the future where computer-driven systems monitor physical processes, create a virtual copy of the physical world and make decentralised decisions based on self-organization mechanisms. The concept takes account of the increased digitalization of manufacturing industries where physical objects are seamlessly integrated into the information network, allowing for decentralized production and real-time adaptation in the future [2].

In the field of **social change** there is little awareness of Industry 4.0 outside the group of key stakeholders. Larger firms tend to be more positively disposed whereas unions remain cautious and have reservations. While a skills gap (as well as a gap in willingness) to adjust to the Digital Single Market exists, the skill requirements to adjust to Industry 4.0 are much greater [2].

The physical world is merging with the virtual world. We are increasingly used to the internet of things, or the internet of everything and increasingly the industrial internet. They all are in the throes of digital transformation. The widespread adoption of information and communication technology (ICT) is increasingly accelerating the blurring of boundaries between the real physical world and the virtual one. The linkage is becoming increasingly Smart [3].

New ITC based technologies make possible 4.0 Industry development and give opportunities to reengineer value chains and create new business models. Internet of Things (IoT) is one of the technological fundamentals for 4.0 Industry. Growth of connections brings the new possibilities and solutions for business. Other hand exponential growth brings also new challenges for education, R&D&I and regional development activities. The exponential growth of IoT connections indicates the birth of new business models and new kind of business environments.

This “smartness” requires greater connection and collaborations. This is where the ‘explosion’ of platforms and ecosystems is occurring. To attempt to connect the internets of things, services, data, and people are needing radical redesigns within industries and the participants to connect all of this up. Presently Industry 4.0 is more industrial driven but this will change and broaden out [4].

Eppinger [5] has discovered that the link between sustainability and innovation is commonly mentioned, but not commonly made. Chesbrough [6] points out there are a new logic behind open innovation, which embraces external ideas and knowledge in conjunction with internal R&D. This offers a novel way of creating value. Miller and Langdon [7] introduce how to manage disruptive innovation by managing platform, product and process innovation in continuous cycles. Nidumolu, Prahalad and Rangeswami, [8] explain widely why sustainability is now the key driver of innovation. Salminen [9] has discovered that when new value for the customer is created in the form of a product or service offering and it results in sustainable innovation, it is essential to know whether there is also a transition into a new business model of circular economy. At the same time, the business innovation must be built on the essential business structures (operational systems, contracts, network structures, competence, etc.). Tammela and Salminen [10] introduce the interoperability concept through which common innovation of sustainable products and services can be accelerated by an open semantic infrastructure. The open innovation process requires the definition of interoperability in order to achieve a critical level of network dynamics to create new products and services. Skyttner [11] introduces new systems theory with self-organization and evolution. Jamshid [12] introduces that system thinking is the art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice. Concepts are important to explain chaos. Sanchez and Heene [13] have proposed an open systems model of firms. Improving of organizational competence also requires increasing managers' own cognitive flexibilities to imagine new strategic logics for creating and realizing new kinds of value-creating product offers and new ways of managing processes for creating and realizing new and existing product offers. Markopoulos and Vanharanta [14] have created the Company Democracy Model. It can be characterized as a multidisciplinary science, as it integrates many management (strategy, leadership, etc.), engineering (process knowledge, innovation), social (human resources, ethos, etc.), financial (marketing, extroversion, etc.) and other disciplines. The uniqueness of the model is its capability to integrate them all in a transparent way, making the execution sequence these disciplines to seem absolutely normal, reasonable and effective. The co-evolutionary spiral method in the model contributes towards the identification and achievement of the capacity, capability, competence, and maturity needed to turn knowledge into innovation. The model is structured in such a way that the method reflects the Co-Evolute methodology [15] and its application in organizational democratic performance. Evolute is an intelligent web-based system for managing human competences and organizational objects and capability in the world of business. Both organizational development methodologies (Co-Evolute and the Company Democracy Spiral Method) are directed towards the creation of an organizational knowledge based culture [16].

### 3 Research Questions and Research Approach

Digitalization will bring new business opportunities, and increasing competition. Companies are forced to renew their processes and activities and same time restructure their business models. As well, regions and areas have forced to plan and redesign

again their attractiveness for new and existing business in their business environments. In order to see the development needs for attractiveness and welfare, but also to use the development recourses best possible way the key research questions are:

1. How to determine the implementation plan and roadmap for Finnish Growth Corridor to industry engagement on the approved Industry 4.0 European Growth Strategy
2. How education can updated to responds the need of new competition in exponentially growing digital environment
3. How to ensure the change and innovations in organizations.
4. How to define the roles of actors in regional development and “smart clusters”
5. How to start using the Industry 4.0 framework in continuous development

This article introduces a concept model for utilizing 4.0 Industry as a business and innovation driver to facilitate the transition towards the new Digital Single Market.

#### **4 Multidisciplinary and Co-operative Environment**

Digitalization changes everything and is a great opportunity to find out competitive advantage in business. Universities of applied science have a good opportunity and central role in supporting the growth of business on the area of circular economy.

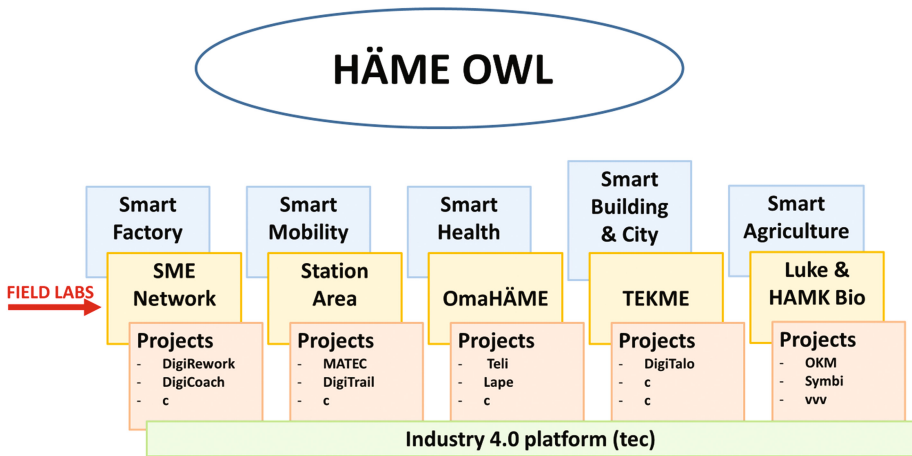
The co-operation between government, enterprise and universities is essential to succeed in co-evolution when building up cumulative competence in creation of solutions for Regional Development by benefiting digitalization in it. It is also essential to have a common vision to direct the local operation and funding. Otherwise, the activities can splinter as small pieces and do not form parts of the whole vision.

The development of business environments is understood to be the responsibility of public sector and government. Public sector is however multilayered (e.g. legislative-national- provincial- regional- municipal- areal). There are still other committees and operations, which have the duty to develop business environment. All the layers and activities should be along the same line, support each other and sustainable to get the co- operative environment to function efficiently. In rapidly changing operational environment, it requires clear and commonly understood vision.

The vision and approach are based on the need of regional clusters and the strengths of region (e.g. logistic, university, natural recourses etc.). 4.0 Industry development will be seen as a smart utilization of digitalization, which has European level comparability to European development in all key clusters.

Development roles will be designed the way that roles are tested in region where development is ahead. That approach mean that Reginal level organization (HAME OWL) is taking responsibility about the common platform and development resource allocations for the clusters (“smarts”).

Contents of education and training will be designed so that content will respond the future needs. Learning will take place in “real world” environments (field labs), which gives faster cycle time for development activities and implementation. This is the way, how to ensure the birth of new innovations and the renewing the businesses and organizations (Fig. 1).



**Fig. 1.** Häme Region Cluster/“Smarts”, field labs, future development projects and platform.

4.0 Industry and industrial internet can then be used when increasing the efficiency of processes. Industrial internet enables functional optimization of entire value network and increasing of use of material side flows (material and energy efficiency). It is possible to anticipate beforehand the disturbance situation of value network and their repair operations. Collected data from whole the value network can be used for its functional development or forecasting purposes. New entrepreneurship and new digital services can be created through digitalization activities. Industry 4.0 standard architecture can be applied for common framework, when starting business on circular economy.

In Fig. 2, there is an example of technology oriented competence and solution creation on the smart clusters. It is essential to gather data from various sources and different processes. Automation system or sensor network (IoT) is creating data, which is gathered, clustered, analyzed and compare it with the data gathered earlier and then make decisions on how the optimize activities. To support this value network process it is important to have all type of experts in virtual network optimizing material, logistic and reuse of material. There can also be final customer experts in the same network.

The substance in the network is knowledge and capability, which is activated when the customer requirements are decomposed. In order to manage economical and technical risks the new innovation should be evaluated as a value for customer and network partners. Effective method of decomposing the requirements reveals precisely. Content management competence, organizational capability and human mental capability are in strong interrelationship. It is planned to parametrize each of the entities and turn as a questionnaire's. Evolute- system is thought to gather and analyze the knowledge needed.

New ITC based technologies make possible 4.0 Industry development and give opportunities to reengineer value chains and create new business models (Fig. 3).

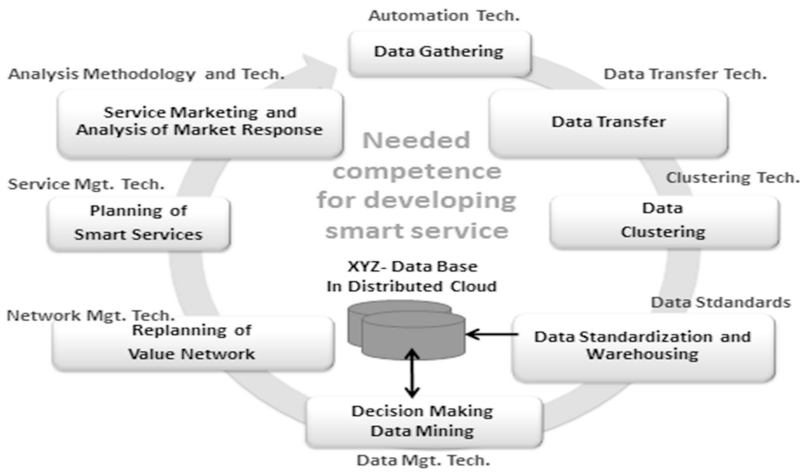


Fig. 2. Relationship of technology and competence using the data effectively

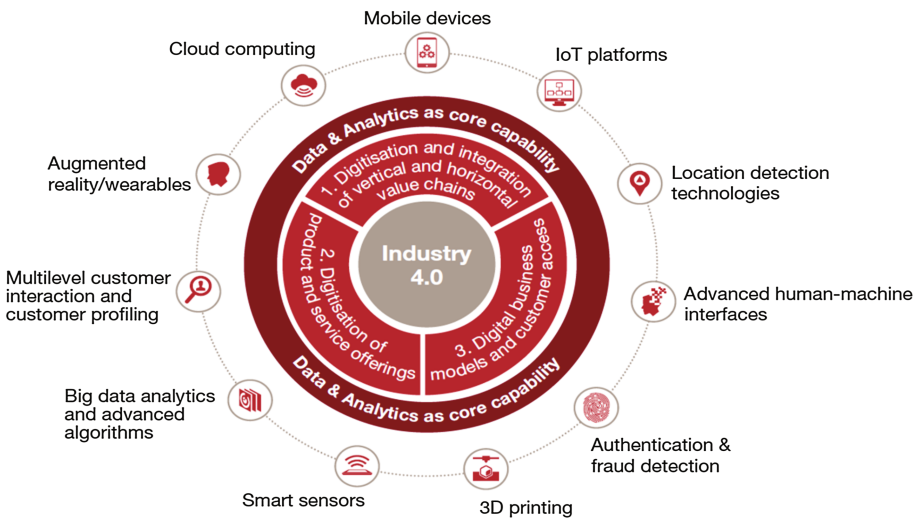
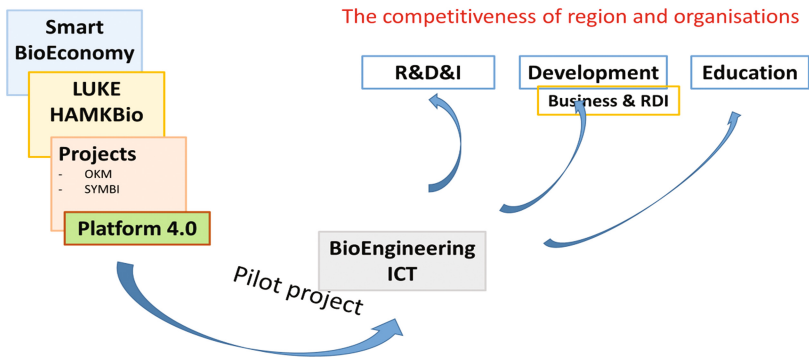


Fig. 3. Industry 4.0 framework and contributing digital technologies [4]

## 5 Pilot (Case: BioEngineering (ICT))

In order to develop its own knowledge and flexibility to response the demand of exponentially growing digitalization and transdisciplinary problems. Based on that development, HAMK has designed new program (BioEconomy Engineering ICT), with the idea, that it will be first pilot step to start implement 4.0 Industry concept in “Smart” BioEconomy Cluster and start learning process to make change toward 4.0 Industry also in other “Smart” Clusters and whole Häme Region.

## Pilot Case: BioEconomy engineer (ICT)



**Fig. 4.** The content of BioEngineering DP is planned so that it support the development of industry and region.

Content of studies and learning method with the cooperation of industry are designed 4.0 Industry compatible. (BioEngineering DP is ICT programme for BioEconomy environment.) (Fig. 4).

Education will take place in close cooperation with industry by doing projects by “resolving real life” problems. By this approach is possible to educate students to response to transdisciplinary problems, but also to speed the development in industry and region.

The every study module of degree programme is planned so that it will support regional development and R&D&I activities. This is considered to be very important to be able to find new innovations in company surface. In order to create unik organization culture many other degree programmes are involve and their cultures, not only because of their knowhow.

Partly “R&D-teams” will take care of a few study modules, in order to strengthen the content of new technologies in HAMK. R&D-teams will operate over the study programme and faculty boarders and will participate actively human resource activities.

The study modules which are ran by “R&D-teams” are like “Data Collection & Visualization”, “Data analytics and Clouds”, “Service Design” etc.

Usability of this kind of “R&D-teams are piloted in BioEngineering education” (Fig. 5).

When the “R&D- teams” have been develop and tested, the experience of teems will be utilized in other programs under redesign and other activities over the faculty boarders

Smart services research unit at Häme University of Applied Sciences supports industry, commerce and the society in digitalization and service development needs. The task of the research unit is to create and execute, together with co-operation network, well-addressed R&D activities for the region and its’ enterprises. The Smart Services research unit supports the utilization of digital technologies and service business development across sectors: similar solutions can be adapted in various lines of business.



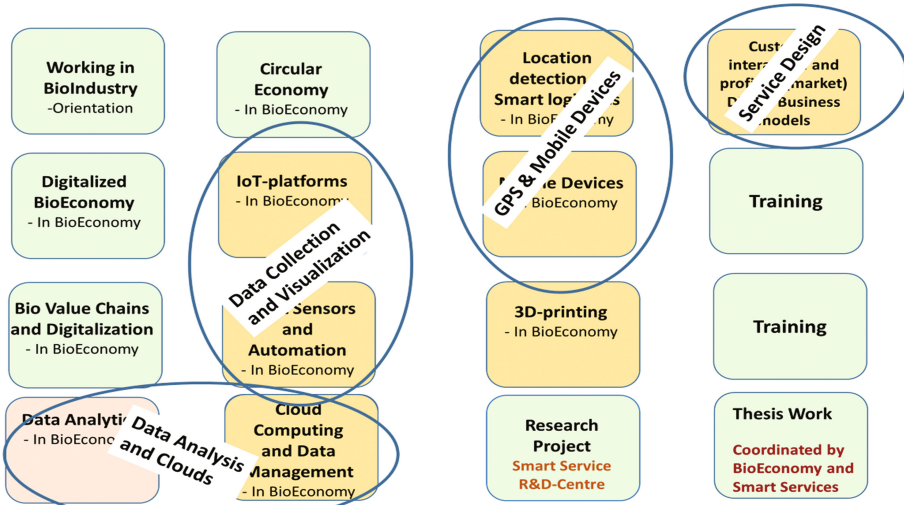


Fig. 5. The responsibility of “R&D-teams”

## 6 Benefiting Digitalization and Big Data Supporting Business Co-evolution

The amount of scattered and structured data around us is increasing dramatically. It is a great business opportunity to benefit that data in business purposes. Circular economy with interrelated bio and mechanical cycle consists of huge amount of data. The data of

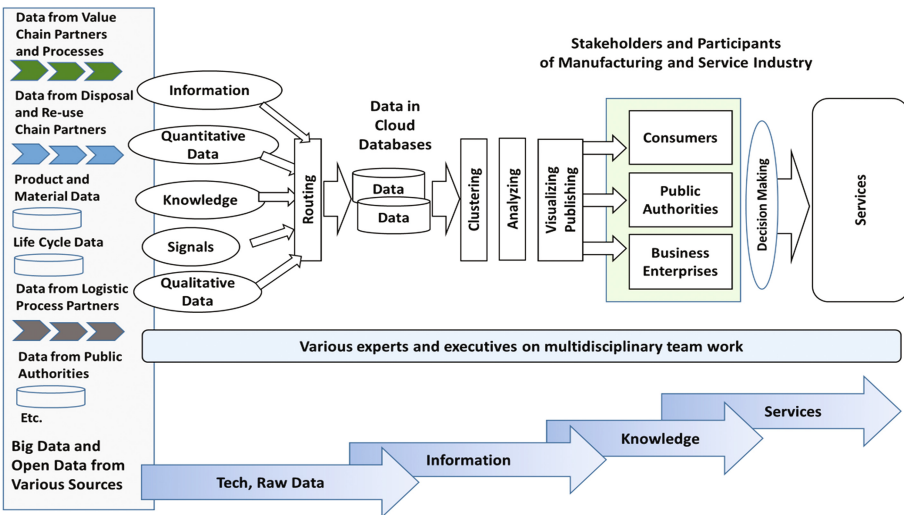


Fig. 6. From data to services process in business co-evolution

waste from one partner means material for the other partner. Understanding the value proposition in growing value networks is essential. Management and analysis of data coming from various sources is routed through data- to- service process in business co-evolution of circular economy, Fig. 6. Creation and optimization of new operational functions and responsible business co-evolution requires democratic innovation and decision culture.

## 7 Industry 4.0 - Conceptual Model for Adaptive Development

4.0 Industry and industrial internet are rather new topics and there are few experiences on driving of benefit out of them both in enterprises and universities. That is why co-operation serves developing on collaborative way. Most of the innovations are created at customer interface and co-operative development on common platform, research and learning environment, is essential basis in succeeding on business co-evolution. Good co-operation requires management engagement, trust building, information, and experience delivering. It happens on various levels of operation; e.g. forecasting and roadmap-projects, applied research and development projects, on bachelor and masters' thesis works or creation of research and learning environment for experimentation and piloting. It is ought to be continuous on various organization levels. Co-operation and learning together on research and learning environment supplied by university is basis for new innovations and continuous development. Developing of superior competitive power through principals of circular economy is built by lean and digitalized value networks. It is important to succeed in benefiting multidisciplinary competence and open information sharing.

Häme region is designing its new strategy "Smart Häme" to responds to the challenges of digitalization and to be the part of Digital Single Market (DSM). Based on that, the focus is to increase the knowhow to digitalization on Häme region.

Since 4.0 Industry is European concept and part of European platform, it is wise that best practices will be benchmarked into European approach and experiences.

The key elements to design the "roadmap" for 4.0 Industry, are:

- to recognize the potential "smart" clusters on the region/area
- create the goal and vision for region based on "Smart" clusters
- make companies and universities to work together and create "real life learning" environment (field labs) in clusters.
- renew education content so that it response the new ICT based technologies that are needed in 4.0 Industry
- create approach that knowhow will increase and it will be distributed on region
- the role of "Hämeenliitto" as coordinator and allocating assets
- make benchmarking for the regions which are like "Häme" and have already taken the steps to adapt 4.0 Industry

Succeeding on 4.0 Industry co-innovation requires data-to-service management process and creation of adaptive multidisciplinary co-operation model for solution development. For research center to be capable to collaborate with industrial companies, it is important to know the overall capability of research and development unit.

The experts making applied research with customers have to have content and process knowledge of customer site, they have to be capable to work in teams on distributed way with other experts in value network and have to certain collaborative skills to work together. In our article, we categorize the competence and capability on three layers: content management capability, organization capability and human competence and capability [17].

## 8 Discussion and Conclusions

Combining the principles of 4.0 Industry to value network thinking and digitalization of functionality of whole the network give opportunity for remarkable competitive advantage in business.

That requires combining of various theories but the main challenge is in utilization of transdisciplinary knowledge and implementation work. The use of new technologies; digitalization, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities on and optimize existing operations to achieve significant business improvement on circular economy.

According to the experiences of conceptual development work successful activity in 4.0 Industry is dependent on systematic long-term development on public sector. Essential topic is preparing of up to date platforms, which enables and controls and support the operation and creates business environment to apply new offering.

The important role for universities is to support enterprises by applied research and creation of research and learning environments for continuous piloting of new technologies and preparation of new business models on 4.0 Industry.

To be successful on new challenges of 4.0 Industry development, enterprise-university partnership has to be tight and main objective is common learning. Long-term co-operation creates background for new co-innovation and business co-evolution.

European community is preparing new legislation and directives, which are speeding up the development of Digital Single Market. Industry 4.0 as an industrial standard architecture has a remarkable role in preparing new functionalities on distributed value networks. The standard offers technical background and rules for implementation for digitalized circular economy.

Responsibility business leadership needs democratic innovation culture and co-innovation and co-evolution processes. This article introduces a concept of responsible business leadership. It also gives a concept on how to analyze co-evolution over the life cycle of business transition on “smart clusters” by using Evolute for managing human opinions and experiences and organizational objects on public- private- relationship and capability in executing responsible business leadership.

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# Ontology Based Service Environment Supports Successful Aging

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**Abstract.** The aging individuals living independently at home need new kinds of services. Digitalization of services and the wellbeing data gathered from the individual creates an opportunity for optimized and punctual services. It is important to pilot the new technology solutions at actual home and well-being environments to get certainty of usability, flexibility and accessibility of the digitalized services for citizens and nurses. The implementation of digitalization has to happen according to ethical rules and take the values and individual capabilities into account. The data gathered through digital equipment can be used in optimizing service processes. However, there is missing generic data as common ontology of service process and semantic architecture to use the gathered data for service optimization. In the article is introduced what type of ontology based semantic architecture could be used in social and health care and how geriatric data should be integrated in caring elderly people.

**Keywords:** Aging · Home care · Digitalization · Health ontology · Semantic infrastructure · Ethics leadership

## 1 Introduction

Demographic changes and the rapid aging of population are occurring throughout the world. Senior citizens are healthier and live longer. The aging individuals living independently at their own homes need new kinds of services. Digitalization of services and the wellbeing data gathered from the individuals create an opportunity for more optimized and punctual services. It is important to pilot the new technology solutions at actual home and well-being environments to get certainty of usability, flexibility and accessibility of the digitalized solutions and services for citizens and nurses. The municipal authorities, on the other hand, are closely paying attention to the cost efficiency of the services. The new solutions and gadgets have to be interesting and easy to use for senior citizens. There is lack of information behavior research involving especially the oldest group of people. The implementation of new digitalization has to happen according to ethical rules and take the values and individual capabilities of older people into account.

Services are created to support the elderly and their families in maintaining a high quality life at home. It shows that the internet has had a positive impact on the health information acquired by seniors but not all seniors. There is lack of information behavior research involving especially the oldest group of people. The objective of digitalization in home care environments is

- to support and increase the autonomy of older people and independent coping at home
- efficiency and effectiveness of nursing at health and well-being environments

Health care and well-being technology companies have started a project TELI in Finland to promote business opportunities of technology companies to implement digitalization in health care and well-being solutions. Häme University of Applied Sciences has taken digitalization of home care as focus area in the project. University has created together with municipal authorities on health care and well-being sector technology and digitalization real life piloting environments. The objective is to determine how the gathered data can be used in optimizing service processes, logistic routing and focused use of medicine and medical equipment at home visits. However, there is missing generic data to service process, common ontology and semantic architecture to use the gathered data for service optimization. However, there is missing generic data as common ontology of service process and semantic architecture to use the gathered data for service optimization.

Ontology and ontological analysis is needed fundamentally to represent knowledge about the domain and be able to share the information [1]. In specific, the shared ontologies are being proposed for representing the core knowledge that forms the foundation for semantic information on the Web. We identify broad thrust related to ontologies:

- Approaches to standardize the formal semantics of information to enable social and health care processing.
- Approaches to define real world semantics linking social and health care process content with meaning for humans based on care terminology.

The concepts in this paper are valid also within EIP AHA (European Innovation Partnership of Active and Healthy Ageing), where EIP AHA Task Forces focus on information and process modelling, upscaling and business models [2].

## 2 Theoretical Background

Key elements of the new service approach are the innovative solutions and revised healthcare and social welfare legislative reform proposal. The reform aims also to promote cooperation between municipal officers, local universities and digital equipment and service system suppliers. Services are continuously being created to support the elderly and their families in maintaining a high quality life at home [3]. Hallows [4] points out that the internet has had a positive impact on the health information acquired by seniors but not all seniors. There is lack of information behavior research involving especially the oldest group of people.

There is a dramatic gap between capabilities of current collaboration and the networked requirements of businesses. The businesses are looking for scalable, adaptive, cost-effective, collective, and pinpointed solutions [5]. Clearly, there is a need to develop a systematic and holistic approach rapidly to form Virtual Enterprises; based on ubiquitous (anywhere, anytime), and affordable (easy and cheap) collaborative environments; in maintaining securely interoperable entity infrastructure; within a multicultural-cum-multilingual perspective. Ultimate goal is to realize; the vision of turning “inside-out” enterprises, as a plug-and-play Internet business community [6]. Actual Extended or Virtual Enterprise approaches create a big dilemma because each time a new partner is entering results in increasing exponentially management and integration costs. This is mostly due to disparate visions, understandings and other interpretations, which are disabling collaboration capabilities among trading partners.

Chesbrough [7] points out that there is a new logic behind open innovation which embraces external ideas and knowledge in conjunction with internal R&D. This offers a novel way of creating value. Miller and Langdon [8] introduce how to manage innovation. Salminen [9] has discovered that when new value for the customer is created in the form of a product or service offering and it results in life cycle innovation, it is essential to know whether there is also a transition into a new business model of the wellbeing service. At the same time the business innovation must be built on the essential service business structures (processes, operational systems, contracts, network structures, competence, etc.). Tammela and Salminen [10] introduce the interoperability concept through which common innovation of sustainable products and services can be accelerated by an open infrastructure for innovation. The open innovation process requires the definition of interoperability in order to achieve a critical level of network dynamics to create new products and services. Skyttner [11] introduces new systems theory with self –organization and evolution. Jamshid [12] introduces that system thinking is the art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice. Concepts are important to explain chaos.

### 3 Research Questions and Research Approach

The role of digitalization and growing amount of data collected from home and older person himself as a business driver is growing and has to be carefully taken into account in wellbeing business transition. The opportunities of digitalization have not been understood in full context and as new service innovation. The main research questions are

- a. What does digitalization mean in home care of older persons and in wellbeing service business context?
- b. How the generic data to service process should be working
- c. How geriatric data should be integrated in caring elderly people
- d. What type of ontology based semantic architecture should be used in social and health care for aging people living at home

This article introduces a concept model for utilizing digitalization as a business and innovation driver to facilitate the transition towards the new service economy on wellbeing business. This paper introduces preliminary results and experiences of the applied research project partially already executed and ontology based semantic approach to manage various type of data and information and use it in decision making when creating services for elderly people.

### 4 Multidisciplinary and Co-operative Environment on Home Care

Health care and well-being technology companies have started a project in Finland to promote business opportunities in implementing digitalization into the health care and well-being solutions and services. Häme University of Applied Sciences is a project partner and focusing on digitalization of home care. University together with the municipal authorities established real life piloting environments for enhancing the adoption of the health care and well-being sector technology and digitalization. Figure 1 introduces home care apartment with functions executed by digital assets and equipment.

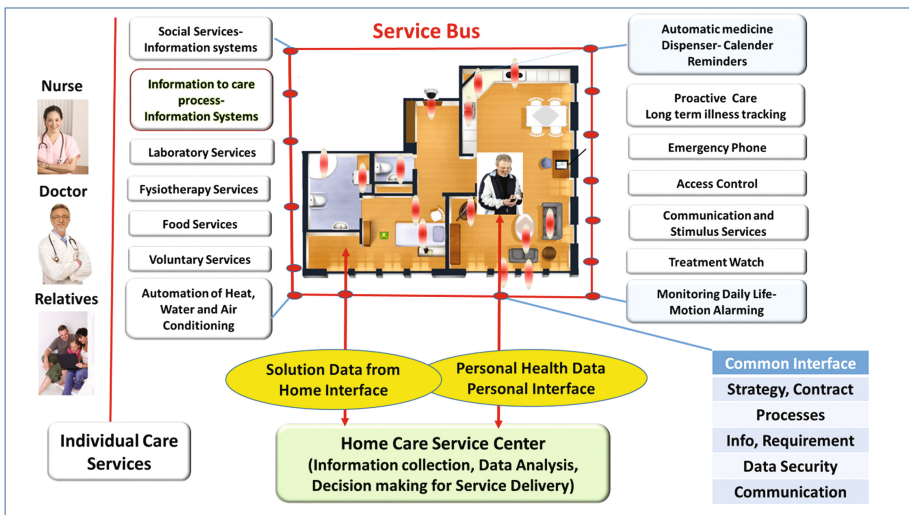


Fig. 1. Wellbeing services in home care environment

Figure 1 illustrates also the roles and partners in home care piloting environments. In the center there is a customer, who is utilizing home care services. Systems are patient data bases, there is all relevant information about customer (basic information like age, gender etc. and medication...). All relevant information is booked into the system, like changes in the medication. Maintenance of systems and equipment should be provided. It will also be utmost important to arrange answer to inquiries and alarms,



if the customer e.g. falls resulting in an injury or is not complying properly with drug treatment. Essential events have to be booked into the system, e.g. if medication has been changed. Persons to answer the alarms may be relatives, municipal service centers, nurses or even friends. Municipal officer or health care units will decide how much support will be provided by the municipality or conjoint municipalities. Medical doctors will decide changes e.g. medications and other actions in their fields.

The Finnish governmental INKA TEKES- funded applied research project Health Technology as Business-TELI has been started to create live piloting environments to test new technology solutions and new services at home care system environments. Fourteen health and well-being equipment, system and service companies participate in this project and are partially funding it. Some examples of new health and well-being solutions piloted in real environment, Wireless Smart Flower Stand system monitors the resident's daily life, Mobile remote communication tool for medical consultation, Wireless medication dispenser, Stimulus services and gaming environments, INR- measuring equipment (wireless) and Measuring EKG at home care environment.

The purpose is to gather user requirements from senior citizens, nurses, and service people of home care center in municipal areas of Forssa and Hämeenlinna cities. Students and teachers of Häme University of Applied Sciences are helping in data gathering phase. They at the same time learn to use the digital equipment and use later the knowledge in education and practice. Senior citizens learn to know the benefits of digitalization and their mindset (not being afraid of digital devices) towards utilization of digitalized gadgets in their homes becomes more open. Municipal officers and service persons at home care service centers learn to use the gathered data for improving the home care of individual customers. The data can be used in optimizing service processes, logistic routing and focused use of medicine and medical equipment at home visits. The home care nursing can achieve remarkable savings of home care visits, when new digital solutions have been adopted. The data gathered through wireless and digital equipment can be used in optimizing service processes on run, by mobile phones or tablets, on home visits. Services appearing within care processes are then part of municipal and more generally with regional integrated service pathways in the Tavastia Proper county as responsible for all health and social care including rescue services in the region.

Wireless Smart Flower Stand also enables motion identification and classification. In this context the Smart Flower Stand is a gateway sensor equipment with individual ID-address, which is collecting data from sensor network. It is actually a system itself, which is connected semi-automatically to the municipal health care system. When older persons are leaving the apartment at night (random walking), opening the fridge, has an epileptic or other seizure, problems with circadian rhythm, forgetting the stove on, alarms are raised and related information can be managed with mobile phone, optimized to summon the nearest nurse, functional abilities can be adjusted according to customer and there is an external alarm option. All rooms of an apartment can be provided with move sensors for different levels. This then relates to monitoring and assessment of geriatric data, and can also be further specified e.g. for fall risk assessment and assessment related to frailty (Fig. 2). It is also essential to have a common vision to direct the local operation and funding. Otherwise the activities can splinter into small pieces and do not form parts of the whole vision.

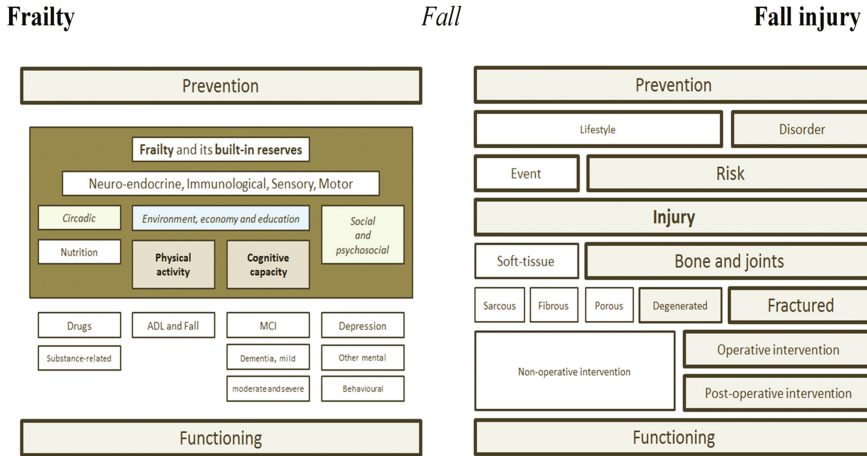


Fig. 2. Ortopedic view of monitoring and assessment of geriatric data

The digitalization changes functions and operational processes of wellbeing and home care. Deployment of new functions and operational processes often needs new type of legislation which creates rules for the co-innovation and operations generated and new business opportunities (government). It is seen rather as enabler than restrictor. Planning of social and health care areas influences remarkably on settling and placing of enterprises and prerequisites for operation (e.g. nursing and logistics).

Health care 4.0 (Industrial internet, Industry 4.0) enables functional optimization of entire value network and increasing of use of material side flows [12]. It is possible to anticipate beforehand the disturbance situation of value network and their repair operations. Collected data from whole the value network can be used for its functional development or forecasting purposes. New entrepreneurship and new digital services can be created through digitalization activities.

On legislation, national legislation in the Nordic countries also develops in direction of regulating responsibilities related to injury prevention. In Finland, the current law of the elderly people’s Social and health services (L:28.12.2012/980), municipalities have to promote the health and well-being of elderly people, also specifically as related to assuring safety (§14) and assessment of functioning with requirement of care services and levels (§15).

## 5 Exploiting Digitalization and Big Data in Service Co-evolution

The amount of scattered and structured data around us is increasing dramatically. It is a great opportunity to exploit that data for business purposes. Wellbeing and home care consists huge amount of data, e.g. the life time data from wellbeing of older persons and home where he is living. Understanding the value proposition in growing value networks is essential. Integrated services and technologies are connected on the same

platform, which is new innovation in domiciliary home care and at care homes. The definition of co-operation interfaces (Fig. 1) is nowadays missing and combining of data, gathered and life cycle data is not possible, or it is very difficult. The essential layers of common semantic interface are Strategic, Process, Information, Data Security and Communication layers. Through the definition of service environment by these layer functions the combining of services is possible and it brings categories for ontology as well.

New Internet of Thing, IoT and other distant service solutions are developed. They support combining data gathered from home digital systems (solution data from home environment and individual own wellbeing data) and information from open data in real time to home care service center, doctors, nurses, dental nurses and other experts. This information is recorded in patient information systems so that it is available to all persons participating care process. Digitalization brings new information on health and wellbeing by following way:

- Through physiological information recognition, person’s activity level can be maintained at a good level thus making it possible to contribute to living at home, and to slow the progression of diseases such as Alzheimer’s disease.
- The wellbeing process allows information management and home care and nursing homes, the collected data (personal data and big data) is processed on the basis of analysis to be used in decision-making. Digitalization can be used to create a completely new care culture, which is based on documented and analyzed data (Fig. 3).

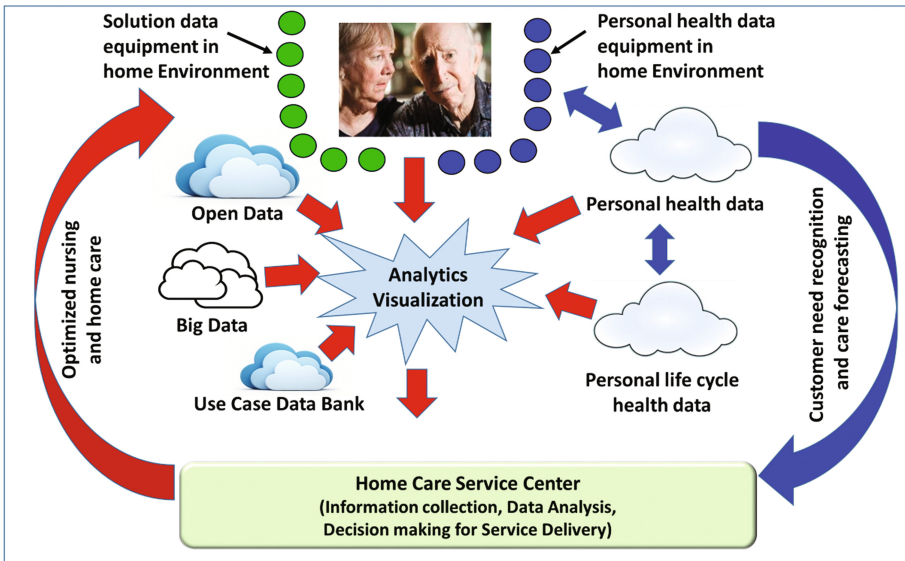
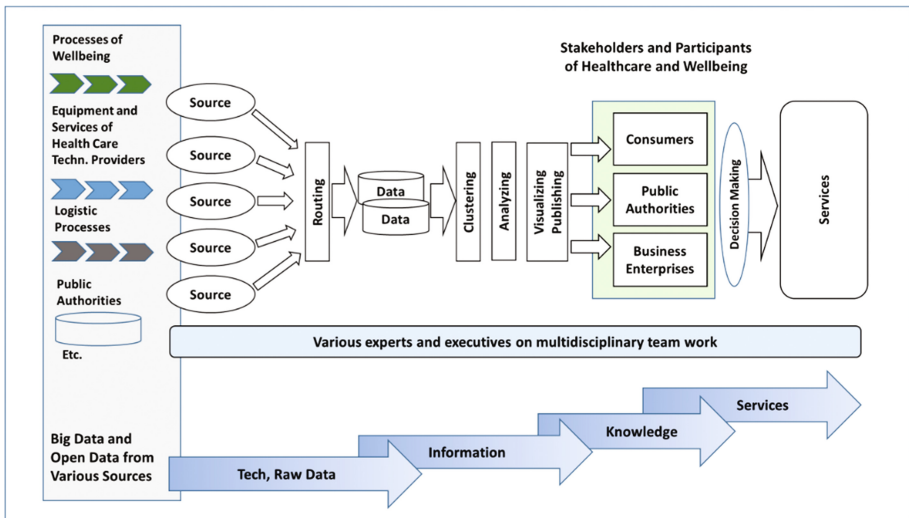


Fig. 3. Predictive care planning according data analysis

Management and analysis of data coming from various sources is routed through data- to- service process in business co-evolution of wellbeing and home care. Creation and optimization of new operational functions, ethical aspects and responsible business co-evolution requires democratic innovation and decision culture. Intelligent web-based system Evolute LLC is been planned to use at the analysis phase (Fig. 4) in the data-to-service-process over the transdisciplinary co-innovation and decision making. There will be several stakeholders of wellbeing participating on decision making and optimizing functionality of created new services.



**Fig. 4.** From data to services process in business co-evolution of wellbeing and home care

It is essential to gather data from various data sources, different processes and systems. Automation system or sensor network (IoT) at home is creating data, which is gathered, clustered, analyzed and compared it with the data gathered earlier. After that decisions are made on what nursing operations, which medication, which type of rehabilitation and what type of logistics is needed. To support this value network process it is important to have all type of experts in virtual network optimizing material, medication, logistic and nursing processes [13].

Digitalization in home care and wellbeing sector are rather new topics and there are few experiences in exploiting digitalization in municipal service functions, solution enterprises and universities. That is why co-operation serves developing on collaborative way. Most of the innovations are created at customer interface and co-operative development on common platform, research and learning environment, is essential basis in succeeding on business co- evolution.

### 5.1 Performance Model - Semantic Definition for Engineering Inserts

When a request involved in any format should answer the end-to-end performance. The Semantic definition is to be clear from the request structure [14]. There will be four structural classes, such as health, social, care pathway process and controls. A database links automatically. The model is shown in Fig. 5. Here the tag associated is to mean that it belongs to structural identification that should belong to either Health, Social, Care-Pathway Processes or Control properties and are associated to service, product and or both.

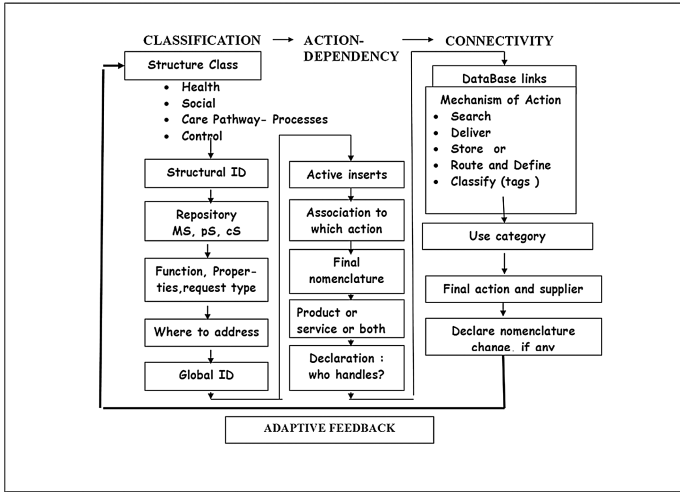


Fig. 5. Identify the tags (health, social, care pathway- processes, control).

This is a theoretical model. This can be developed to prove remarkably robust in the face of multi-disciplinary and multi-institutional inspection and sample instantiations. Its content will be to represent portions of various engineering tool kits and formula-rizes used or common application based public and private vocabularies.

### 5.2 The Process - Embracing Change and Making It Explicit

The model presented in Fig. 5 above is little more than an academic exercise without accompanying productive terminology management. As a result, there is no warehouse of engineering *tool-kit* descriptions that can be reached over time. The changes across in the terminologies used; to formalize a solution, to the common understanding through the web. The engineering tool-kit description repositories that support such “*time-travel*” no two or three do so in the same manner and none use existing or proposed standards. An explicit goal of this project is to begin to overcome this shortfall at least in the context of engineering.

The first step in making formal terminology changes into a terminology/ontology “thing” or unit is to create a unit of change that has the same general properties as any other “thing-ness” unit. For example, given the appropriate reference taxonomies, used to (in the Structural Logic sense) “classify” an engineering notion, one can create the desired reference terminology – by adding the definition of each application, one application at a time [14]. Frequently, new applications come with new mechanisms of action and new indications (implementation) and thus the corresponding “new thing” may need to update the reference taxonomies before adding the definition of the new thing.

It is not hard to imagine that most applications would be relevant of such insertion and subsequently “do the right action.” However, the problem with this simple form of the new thing transaction is that, as described by domain experts, most new things represent “changes in understanding”, and it is not at all clear how existing applications can deal with such changes in understanding automatically, or know when they need help from humans. In the context, “changes in understanding” is represented by changes in the reference taxonomies, e.g. for mechanical properties, process diversities, control citations or maintenance use.

### **5.3 Social and Health Care Ontology - Formulation Principles**

When we view a formal terminology or ontology as a corpus of “facts” or assertions, collected over time, then one can contemplate ontology of such facts, or changes. The goal is to evaluate and adapt semantic web infrastructure and implement ontologies for operational systems [14].

The difficulty is defining and implementing the semantics to be attached to each type of change unit. One step toward such semantics is the simple expedient of tagging each terminological unit – concept, term, relationship, and attribute - with a “start entity” and “end entity”. More disciplined and complete forms of such semantics are what are needed to preserve the longitudinal functionality of systems that use the ontology, and what will be needed to transfer knowledge gained from a successful test of the new thing transaction to the Semantic Web [14]. Thus, even when the user interface returns an exact equivalent for the casual term, users may choose a “better” formal term from the displayed semantic neighborhood. The simple explanation of this phenomenon is that humans are better at recognition than recall. Those developing ontologies will be familiar with the phenomenon; once domain experts can “see” a domain model they can almost always make it better. The substance in the network is knowledge and capability, which is activated when the various requirements are decomposed. In order to manage economical, ethical and technical risks the new innovation should be evaluated as a value for older persons, nursing and network partners.

## 6 Discussion and Conclusions

Combining the principles of home care service to value network thinking and digitalization of functionality of whole the network give opportunity for remarkable competitive performance on whole the wellbeing environment. That requires combining of various theories but the main challenge is in utilization of transdisciplinary knowledge and implementation work. The use of new technologies; digitalization, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities on and optimize existing operations to achieve significant business improvement on home care functionality. Recognition of older persons creating actual customer needs combined with life cycle calculation creates opportunities for life cycle services.

According the experiences of conceptual development work successful activity in wellbeing and home care is dependent on systematic long term development on public sector. Essential topic is preparing of up to date legislation, which enables and controls the operation and creates business environment to apply new offering.

The important role for universities is to support municipal officers and enterprises by applied research and creation of research and learning environments for continuous piloting of new technologies and preparation of new business models on home care in wellbeing. Häme University of Applied Sciences supports the demonstration of digitalization of home care basically at Forssa municipal facility, because it has long tradition on developing it. The other versatile piloting environment is Hämeenlinna Home Care division in Finland.

The data gathered through digital equipment can be used in optimizing service processes. In this article has been that generic data as common ontology of service process and semantic architecture is missing to use the gathered data for service optimization. In the article is introduced what type of ontology based semantic architecture could be used in social and health care and how geriatric data should be integrated in caring elderly people.

Older people like to live meaningful life at their own home. Clients of home care have self-determination about their life and care activities. Living at home has to be the person's own choice. Elderly want the right to decide whether or not to use the digital services. The study followed good scientific practice and guidelines [15] and complies with ethical ideals and ethical manners [16]. The clients and all professionals volunteered to participate to the research. Ethical questions related to the research were evaluated. Target organizations gave research permissions and decisions based on ethical evaluations. All students have signed a separate confidentiality agreement.

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# Management Style, Focus and Purpose in Development of LEAN in University Hospital

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**Abstract.** Today's rapid turmoil in economy caused by globalization and changes in world, has forced, leaders and managers in public institutions as well as private organizations to adapt and change their organizations' cultures with their own management systems and styles. Different situational management theories and approaches are scrutinized in this study. Literature review focuses on management styles. This paper investigates classic approaches, management boundary conditions and possibilities that these approaches can give to leaders and managers. The ontology for management style was created in this study, and gives the preliminary frame for university hospital leaders when inspecting possibility to move to Lean management. This article points out to future research needs.

**Keywords:** Management · Style · Focus · Purpose · Ontology · Lean

## 1 Management

Management leadership consists of three concrete responsibilities: pointing out a direction, setting goals according to mission and organizing resources in order to achieve goals [1]. Pointing out a direction can be understood as creating the purpose for the organization. This purpose could be done by setting the mission and creating the vision for organization. Leadership and management literature is hardly consistent when classifying activities clearly into leadership or management. Drucker and Maciariello [2] suggest that there seems to be consensus that providing vision, values, competence, standards, encouragement, optimism, and spirit sustaining are more clearly leadership activities and objective setting, organizing, motivating, assessing progress, and developing people are to be seen as management activities.

### 1.1 Mission

Creating the purpose is described as creating mission, with organizations' missions are stated typically in mission statements. Mission statements are thought to be powerful tools for providing value for customers and other stakeholders [3, 4]. From literature different

objectives for mission statements are found. Following objectives has been identified for mission statements. Mission statements are declarations of the firm's direction [5, 6], acts as a route in order to achieve strategic objectives [7, 8] and facilitates strategy formulation [9, 10]. Mission statements are identifying boundaries that keeps organization out from unrelated or inappropriate activities [5], creates control mechanism over the behaviour of employees and creating a balance between interests of various stakeholders [11–13]. Statements also define business domain [14–16] i.e. give an answer to fundamental question of Drucker [1] “What business we are in?” Mission statements help employees to make non-routine decisions [5], by providing framework for decision making [9]. Statements give motivation and inspiration for employees [17, 18]. Mission statements unite organization and give common purpose for organization [6, 19, 20]. They also increase organizational commitment [21]. Mission statement expresses organization's values [6, 19] and points out the competencies and unique strengths of an organization that are providing competitive success [22].

Although there are no clear scientific results that mission statements increase the financial performance of an organization, [12, 19, 23–25] an importance is found for mission statements and linkage between the performance of organization and mission statements [6, 21, 26]. They should include stakeholders [27, 28], especially employees and society [6], special components [4, 23, 29], such as values and philosophy [6], but the causality is hard to prove. Whether a successful firm emphasize value statements or value statements are resulting from a better performance is unknown [6]. Some of recent researchers have come to a conclusion when the approach to direct impact between performance and mission statement is not explaining enough, then an indirect approaches should be utilized [30, 31]. Especially indirect effect i.e. mediated effect by organizational commitment between a mission statement and organizational performance seems to be significant [21].

Considering previous research and their results, it could be said that, creating the mission for organization is very useful and it will give some advantage to leaders when leading the organization. When stating the organizations mission, it should include at least following aspects: (1) Direction and goals for organization, (2) General boundaries where and how it should perform its business (3) Framework for employees to make decisions, (4) Gives purpose to an organization and expresses it to stakeholders, (5) Statement about organization's values, (6) Expression of organizations competences and strengths, (7) Motivational part to motivate and inspire employees, (8) Increasing organizational commitment, and (9) Enhancement of organization's performance. From these aspects the first six ones should be incorporated into organizations mission by management and latter three ones are results from doing former ones well.

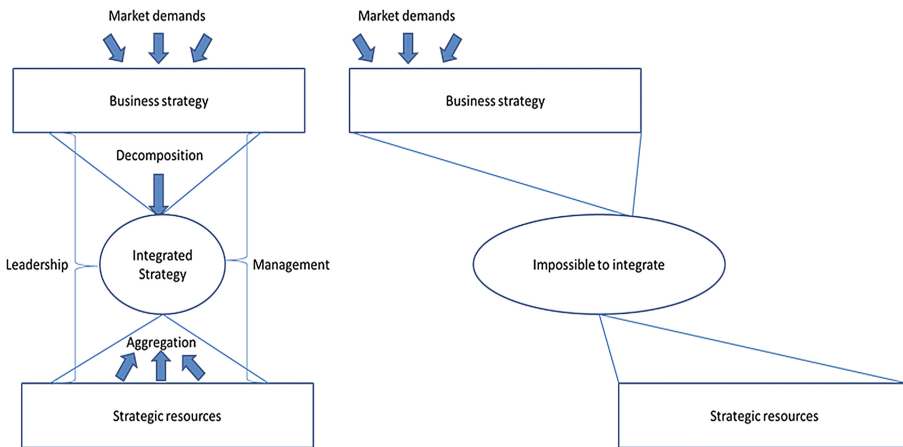
Since mission is proven to be so important for organizations, it has a self-righteous place to be set in management purpose ontology.

## 1.2 Organizing Resources

The resource based view (RBV) can be thought to be one of the points of view in management. Barney [32] stated that resources of a firm, which are rare, valuable and

hard to substitute, are a basis for competitive advantage. According to Barney, “firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness”. Resources have two forms: tangible and intangible [33, 34], where tangible ones are easier to observe than intangible. An good example of intangible resources is tacit knowledge.

Two types of knowledge have been widely recognized, explicit and tacit [35]. With explicit knowledge as a tangible resource and tacit knowledge is a characteristic example of an intangible resource. Whichever the case may be, managers should not just concentrate on tangible resources. As a prerequisite, the resources must be recognized and widely enough analyzed without certain object orientation, so that those resources could also be adjusted in time towards new products and services required [36]. Companies’ capability for change is highlighted by Prahalad and Hamel by a statement that core competence of a company is “*Management’s ability to consolidate corporate wide technologies and production skills into competencies that empower individual businesses to adapt quickly to changing opportunities*” i.e. resources should be a flexible entity. Figure 1 is illustrating this need of flexibility in resources.



**Fig. 1.** Resources in Strategy definition (Applied from Thun [37])

When resources are in line with business strategy, integration of market driven strategy and RBV is possible. When organizations resources are ill fit to market demands, i.e. market demands cannot be satisfied with them, integration is impossible. This means that management should integrate resources, results, goals and objectives as a one entity. As in many cases, organization’s goals and objectives are more easily to be adjusted or changed, after all they are in most cases defined by organization, than their resources, in management focus ontology resources is to set as first to be concentrated.

A resource management process can be divided into four distinctive steps: (1) efficient acquisition, (2) bundling/combining, (3) positioning, and (4) maintenance/protection [38].

Acquisition possesses two tasks: minimizing the cost of the resource and gaining value from the resource [39]. Bundling/combining means that single resources are bundled and combined to a set of a “higher order resources” which are more complex, harder to copy and provides more valued products and services. Positioning of resources means that resources should be provided so that customers can find them. Fast change in organizations environment causes changes in competitive conditions. This creates the requirement for managers to adjust frequently their resource management to ensure an attractive range of strategic options [28]. Otherwise company may end up to position illustrated at right in Fig. 1.

Another very crucial point of view has to be stated concerning management’s focus on resources. Resources can be internal resources, which organization possesses and external resources which organization purchases from their supply chain. Internal resources are easier to observe by the manager, but it has to be remembered that strategically managed interactions with suppliers provide competitive advantage for organizations. One of the core issues in RBV is that organizations can enhance their resource capital by co-developing capabilities with suppliers, as well as engaging in sourcing [40–43].

Considering all of these aspects resources should be set in the management’s focus ontology. When inspecting Lean point of view to organizing resource focus, Lean improvements are requiring commitment to resources, both financial and manpower [44–47].

### 1.3 Setting Goals and Objectives

Zaccaro and Klimoski [48] stated that one of the core responsibilities of a leader is to direct followers towards organizational purposes by setting goals. One purpose of managerial work was to set goals and objectives. They can be divided into eight key areas: marketing, innovation, financial resources, human resources, physical resources, productivity, social responsibility and profit [49]. These goals and objectives should be aligned to organizations mission, when setting them, i.e. trying to reach the vision and respecting the values, by proper measures and utilizing the strength, and avoiding weaknesses.

Several researchers show that setting goals has a great impact on employee performance, satisfaction, and organizational commitment. According to various researchers [50–53] “Charismatic” leaders are the ones who have confidence towards followers and communicate high expectations i.e. goals, will cause higher level acceptance and satisfaction in followers [54]. Leaders should be able to translate long-term challenges or goals into tangible contributions that followers can fulfill in goal-setting process [50, 51]. It is also seen that higher performance levels are focused by followers if challenging goals are set by leaders [55]. But on the other hand challenging goals may have negative impact on organizational citizenship behavior when followers focus on achieving these goals [56]. Later on this result has been challenged and opposite results has been found in their study [57]. Effectiveness of goals implementation is also dependent how leaders encourage an open learning environment to facilitate the successful completion of the goals [58, 60]. Leaders should encourage followers to question all assumptions, used methods and even

goals, in order to find out better ways to implement these goals by specific actions and deliverables. Open learning environment helps followers to achieve deeper understanding of the goals [58, 59].

The effectiveness of the strategic goal implementation has been shown to depend on how clear these goals are, how well they are translated to specific objectives and how well they are linked to objectives of specific units or followers [58, 60]. Avolio and Berson [61] found out that lesser consistency in articulation of strategic goals could lead to confusion and poorer alignment and also that the leaders should have a good ability to create agreement over organizational goals.

Therefore it is justified that one of the main purposes in management is to create goals from the mission and strategy and translate the goals into objectives for followers. Hence goals and objectives should also be included in management purpose ontology. Higher authority managers need to communicate well with top managers and project team members [62]. Support from managers at each level will be required [65]. Other activities are communicating a clear vision and targets of improving [46, 47, 62, 63, 65], and providing the long-term vision, and objectives, for the work from top management level [62, 66].

#### 1.4 Results and Progress Assessing

Assessing progress can be done only if the recent results is measured and compared with earlier results. Therefore measuring should be included as one activity under assessing the progress. Even that Drucker and Maciariello [2] are mentioning only people development, managers' responsibility in development of e.g. processes or working conditions can't be ignored. Therefore it would be more feasible to handle development as upper level activity which includes all development issues despite the object of development. Finding whether these development activities are successful, need for progress assessment is obvious. Organizations results are measured in different terms (profit, healed patients, served citizens etc.) and the criterion of success is extend to how these results are maximized. There is a possible pitfall of this measurement system and it is that the length of measurement is typically too short sighted, a quarter of a year or a year This fails to recognize difference between short-term profit sub-optimization and good organizational results in performance, which enable organizations success in future. A categorical example is "cost cutting manager" who neglects the organizations future in hunt for immediate results by ignoring e.g. R&D and HR development, not to mention investments to strategic assets. By cutting off these activities, cost cutting manager will lessen the fixed capital and assets and fastens the turnover of capital, which of course looks good, but s/he makes it by the expenses of future profits. In these cases managers are boosting productivity, not by enhancing actual output (actuality), but by decreasing capacity (capability) and as an end product decreases organization's performance. Beer's [67] model has three distinctive levels for organizational output: (1) Actuality, which is organization's reached results for now, (2) Capability which is organization's reachable results, as ideal situation, if they really succeed, with existing resources and constraints, and (3) Potentiality, which is organization's potential results, which can be reached by developing organization's

resources and removing constraints, in feasible ways. Combination of these three outputs produces three distinctive indices: (1) Productivity, which is the ratio of actuality and capability, (2) Latency, which is the ratio of capability and potentiality, and (3) Performance, which is the ratio of actuality and potentiality but it is also the product of latency and productivity.

Therefore management's focus on assessing results and process should be linked to performance which is indicating the ratio between potentiality and actuality i.e. results in more than productivity. Otherwise organization's progress performance can be even negative. It has to be remembered that focus on progress and results should be set to all activities and not only to economic results and progress. Beer's [67] model seems to be suitable for all progress assessment if utilized right. Focus on results and on progress assessment are therefore to be set into management focus ontology.

The process of implementing Lean can be lengthy and, the time from initial commitment to enjoying the full benefits of a Lean management system, can take up to at least 4.5 years [63].

## 1.5 Organizational Learning

In order to ensure constant progress, organization must be able to evolve, with managers focus on organizational learning. Constant change in organizations environment is evident and organization should be able to adapt itself to it, if not even change the business. This approach could be called evolutionary approach. The basis of the evolutionary analogy is on comparing it to the classic theoretical analysis of evolutionary economics where focus is – instead of basic Darwinian biological processes – on markets, the routines of firms, path dependence and bounded rationality [68]. Evolutionary theories are comprehensive and it is common for evolutionary analogies that theories have to be dynamic, they deal with irreversible processes and they cover the impact of novelty as the ultimate source of self-transformation. Theories of wholly or partially self-organizing regulatory systems have increased in number and are used in most fields of science now. Within systems theory especially, the regulatory systems have been developed, and in general, they are systems equipped as to stabilize those parameters and processes that are necessary to its existence. Self-regulating systems then, are systems that are self-correcting itself through feedback, and such a self-correcting system can be called self-organizing if the system dynamics promotes certain processes within [69]. Learning as well as economic interaction are social and dynamic processes. The individual's process of learning and creative work is often characterized by the significant degrees of cumulateness, disequilibrium situations and path dependence, but they may also be determined by the exogenous factors and therefore training projects, curricula and learning environment should be taken into account when inspecting learning as a whole [70].

Organizational learning is a primary source of competitive advantage [71–76]. Bureaucratic approach is to do things right and performance approach do the right things, learning approach in organizations is organizations create the capacity (move towards organizations potentiality cf. Beer [67]) to do both better [77–79]. Popper and Lipshitz [80] found that managers have three responsibilities in learning

organization: (1) giving organizational learning a high priority, (2) enhancing collective learning by creating the right psychological and cultural conditions to, and (3) making contextual factors to ensure transfer of individual learning to the organizational level. This means that managers should change their mind—set form “command and control” mindset, to facilitative leaders who motivate through empowerment and focus to developing followers by serving as coaches and mentors [78, 81, 82] Amy [83] found that emotionally intelligent communication was one of the most prominent feature when facilitating learning in organizations but authoritarian, defensive and non-communicative behaviors were not positively effective.

Therefore if one of the managers’ responsibilities is to keep organization as competitive as possible, organizational learning should be included in managerial focus ontology.

As Lean is targeting to continuous improvement, Lean, as whole, is very suitable philosophy for organizational learning. Tools of Lean Leadership and Management in Health Care is Gemba in which leaders go to the “shop floor” to examine the process and speak with the workers, in order to see the situation for one’s own self, empower health-care employees, reinforce Lean practices and engages the leader in experiential learning about implementation [47, 63, 64]. Taking special attention to organizational culture was pointed clearly in former research. As concrete actions, challenging the traditional and hierarchical culture, embracing the empowerment of front line health-care staff [44, 45, 63] and fostering a culture of innovation and collaboration [47] was found important. Empowering the personnel and creating the trust and engagement [44, 45, 47, 63, 64, 84], is in core of all management levels. Top level managers’ responsibility to support [62, 63], to remain engaged in Lean improvement and to be accessible for advice was highlighted [63, 66].

## 1.6 Framework for Followers Decision Making

Management styles can define which kind of frameworks followers have for their decision making approaches. The Simplest way, which is probably one of the most known, can be seen in the division that Lewin et al. [85] made to authoritarian, democratic and laissez-faire styles [86]. In the model these three distinctive styles give different levels of freedom for followers. As extreme ends of this model are mostly theoretical (full autocracy or full freedom are totalizations) most of the real world cases are to be set under democratic style. Therefore there should be done some different levels of democracy where followers possesses different levels of freedom and different boundary conditions in their decision making. Reunanen and Kaitonen [87] gathered most known leadership styles to one table in order ease to analyze and understand differences in democratic styles. One interesting approach for democratic is also from Markopoulos and Vanharanta [88, 89].

As stated in previous research [87] for the possible totalizations, there are different leadership styles in each approach and theory. These styles varies in regarding the level of freedom (to make decisions), level of followers’ capability and competences. Styles also varies whether leader should orientate to tasks or humans, and that shows how complex and demanding followers work is [87]. Despite that the research was done for

the leadership styles' ontology, in order to found out how leaders should lead, it also provides a frame for followers' decision making in management. Hence ontology for management style can be stated to include only three main categories: autocratic, democratic and freedom.

As for Leans point of view, former researches pointed out that management/leadership is a subordinate role, where the front-line workers design and improve the standards work, [44] because “everyone is an expert of his/her own work” [47] and that leaders have to lead from behind through other people and be like a pace-setter [64]. Visible management and leadership are typical for Lean [44, 47, 64]. Approach contains a strong visibility of leaders in critical activities [64], increased transparency [47] and need for leaders to operate as coaches and mentors which means that they can increase their teams' expertise two folded ways, directly in their work and in quality improvement itself [44, 47, 63, 64, 84, 90] and former research found that leaders' lead by example and acting as a role model is meaningful [47, 63].

## 2 Conclusions

This article aimed at creating scientifically solid ground for management development purposes revealing management focus, purpose and style ontologies. Researchers reports literature research and ontologies developed by integrating knowledge from former research under a management windshield entity. Article also points out issues from Lean management, especially from healthcare environment and integrates these issues into management ontologies. Therefore the approach of article is two folded, generic ontologies and first activities to utilize these.

The generic approach concluded: (1) purpose ontology, which includes mission, goals and objectives to be taken into account, (2) focus ontology which consists of

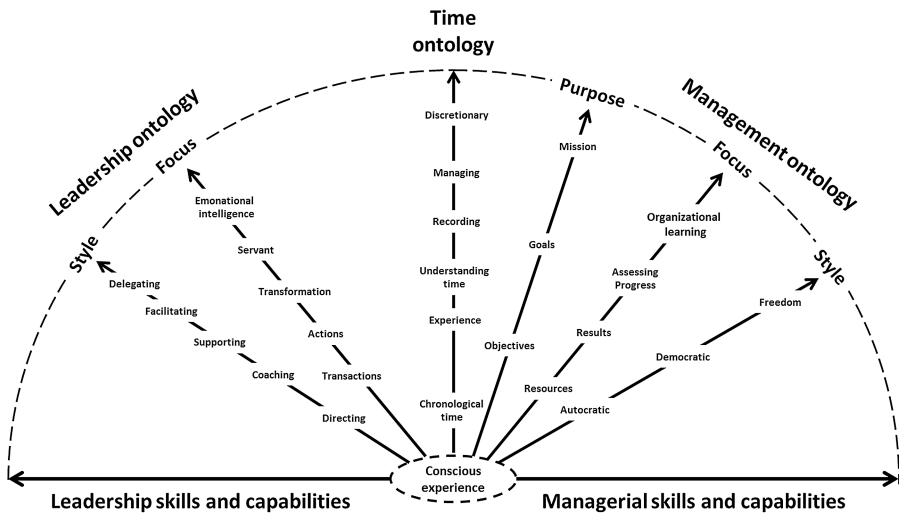


Fig. 2. Management ontology for purpose, focus and style



organizational learning, assessing progress, results and resources for managers to focus on and (3) management style ontology which gives three main styles, freedom (*laissez-faire*), democratic and autocratic for managers to utilize. It should be stated that under these main concepts there are countless different variations for managers to choose from. Figure 2 is illustrating the results of the generic part of this research.

Lean approach component is used in this article as an example of utilization and therefore it is not as thorough as generic components, but it could be used in order to widen understanding how Lean management issues are integrated into traditional and tested management theories very easily. It seems that Lean management issues are already included in traditional management theories.

Further research should be done in order to investigate detailed activities under management issues and integration to leadership research. Leadership styles' ontology is connected to management style ontology in this article, but concrete activities from both, leadership and management, sides should be researched more. Also research in Lean management and its connections to traditional leadership and management theories as detailed level should be investigated in further details.

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# Identification of Factors Predictive of Nurses' Time Pressure, Workload and Job Satisfaction in Ghanaian Public Hospitals

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**Abstract.** The purpose of this paper is to identify the factors that constitute time pressure, mental stress and job satisfaction among Ghanaian nurses working in public hospitals. Factor analysis of the collated data showed that not all the standardized factors of time pressure, mental stress and job satisfaction could be used to predict nurses' work in the Ghanaian public hospital work environment. Based on correlation analysis, it was found that by ameliorating the time pressure associated with the nursing work, nurses will experience improved relationship with both superiors and among themselves. It is concluded that by eliminating the time pressure, moderating the task pace and eliminating the emotional strain and mental stress associated with the nursing work, the mental stress associated with the nursing work will also be reduced. By implication, this understanding can be used in designing, convulsive and friendly nursing work environments in Ghanaian public hospitals.

**Keywords:** Nurses · Nursing work environment · Time pressure · Workload · Job satisfaction · Public hospitals · Ghana

## 1 Introduction

The heavy time pressure and job dissatisfaction of nurses is a major problem for most health care systems worldwide [1]. Keeping patients safe from unintended harm is an important issue and fundamental for both the patient and the delivery system providing treatment as well as the safety of the caregiver as observed by [2]. There are several notable consequences of high nursing time pressure and job dissatisfaction. Research shows that heavy nursing time pressure and job dissatisfaction adversely affect patient safety [3]. In addition to higher patient acuity, work system factors and expectations also contribute to the nurses' time pressure, nurses are expected to perform non-professional tasks such as delivering and retrieving food trays, house-keeping duties, transporting patients and ordering, coordinating or performing ancillary services [4]. Many health care professionals feel fatigued, stressed, overburdened, at risk and or in pain and are not able to provide consistent quality care [5]. Nurses are experiencing higher time pressure than ever before due to two main reasons, that is, increased demand for nurses and reduced staffing and increased overtime. Firstly, the demand for

nurses is increasing as a result of population aging and migration of health care workers. Between 2000 and 2020 for example, the united states population is expected to grow by 18% (31 million), but the over 65% population, with more health care, is expected to grow by 54% (19 million) [1]. In 2003, UK permits were approved for 5880 health and medical personnel from South Africa, 2825 from Zimbabwe, 1510 from Nigeria and 850 from Ghana [6]. Secondly, in response to increasing health care costs since 1990s, hospitals reduced their nursing staffs and implemented mandatory overtime policies to meet unexpected high demands, which significantly increased nursing workload and mental stress. Many developing countries lack the resources to implement programs to improve the health of the poor. In Swaziland, the nursing shortage is considered as the main impediment for the expansion and long term maintenance of critical antiretroviral therapy programs [7].

In Ghana, despite the advancement in the staffing of nurses in the Ghana health sector, time pressure and job satisfaction still seem to be an issue in proper and effective healthcare delivery to patients [8]. It has been indicated by [9] that, the Korle-Bu Teaching Hospital, for example, faces challenges, such as overcrowding and congestion of departments and wards by patient on daily basis, and this result in a high time pressure and job dissatisfaction for health workers, especially nurses. This study was therefore conducted with the purpose of identifying and understanding the requisite factors that are manifestations of nurses' time pressure and job satisfaction in Ghanaian public hospitals. In this respect therefore, this study was guided by the following research question; (i) what are the indicators of time pressure, mental stress and job satisfaction exhibited by nurses in Ghanaian public hospitals in the course of their task performances? (ii) Do the indicators of time pressure, mental stress and job satisfaction exhibited by executives of small firms have the same or different attributes? (iii) If the attributes are to be different, is there an influential relation among the different indicators?

## 2 Literature Review

Employees are known to experience time pressure when the time required to execute tasks is more than seventy percent of the total time available [10]. It has been suggested by [10] that employees will experience high time pressure when eighty-five percent of the available time is needed to execute the tasks. In this case, performance is often impaired with tasks not well executed. Time pressure may take different forms, such as having to do various activities within a fixed period of time leaves little time for each activity. Time pressure may also take the form of working against deadlines [11]. Time pressure has been found as an important strain factor in nursing in general. Time, according to [12], is the most critical resource in nursing to ensure a high quality of care, and [12] lack of it reduces the quality of care as well as increasing the strain on nurses and caregivers and Four out of five nurses often experience time pressure at work. According to [13], time is undoubtedly an issue in any nursing environment; a single nurse has been observed facing up to 50 significant clinical judgments in a single 8-hour shift in a medical admissions unit.

Job satisfaction has been conceptualized by [14] as comprising six components, namely, pay, autonomy, task requirements, organizational policies, interaction and professional status. According to [14], job satisfaction is derived from the congruence of workers' expectations about these six components of satisfaction and the degree to which the job fulfills those expectations (rewards). In the opposite, discrepancy between expectations and fulfillment leads to lower job satisfaction. Overlooking the job satisfaction of nurses would be unfavorable to the medical sector; as such the managers are responsible for it [15]. It has been noted by [16] that, unhappy nurses have a lot of opportunities to pass their distress down if they want. Also, assessment of the level of nurses' job satisfaction by [17] showed that most of them as having low satisfaction due to lack of team work among themselves and other members of the health team. It has therefore been noted by [18] that, nurses want decent salaries and benefits, easy schedules, stability and recognition.

According to [19], time is an important element in the work of all nurses. In their study, [19] found time as the factor that affect how nurses worked, how they go about their work and how their work affect their job satisfaction the most. A case study from Europe has shown that job satisfaction among nurses decline as work becomes intense [20]. Concerns have been raised about how nurses' fast pace, time pressures and intense work affect their commitment, job satisfaction and the overall quality of their work life [21, 22].

Mental stress has been identified as a term comprising mental arousal and/or emotional stress [23]. According to [24], most acute inpatient care requires nurses to constantly shift their attention to make clinical decisions and manage care for groups of patients in a continually changing environment. Nurses must integrate complex thinking processes with psychomotor and affective skills to deliver appropriate interventions [24]. But as [25] has noted, complex thinking by nurses in carrying out their duties is disrupted by multiple interruptions and distractions. These disruptions compete for nurses' attention and can lead to errors or omissions in care and possibly pose a patient safety risk [25].

### 3 Methodology

#### 3.1 Population and Sampling

The target population of this study were nurses in public hospitals in the Accra metropolis (i.e. the capital of Ghana), with each nurse having a known chance of being represented on the target sample. Nurses from four major public hospitals, that is, La General Hospital, Korle-Bu Teaching hospital, 37 Military hospital and Ridge hospital were selected to participate in the study due to their high of patient nurse ratio. The number of nurses that were sampled depended on the total number of nurses in each of the four selected public hospitals, as obtained from the hospitals' administrations. The nursing population for the four hospitals was 2,770. Convenience sampling method was employed to draw 350 respondents (i.e. nurses) to whom the standardized self-completion questionnaire was administered. This is because of the shift nature of the nurses' work.



### 3.2 Procedure for Data Collection

A standardized self-completion questionnaire entailing three sections was used to collect data from a total of three hundred and fifty (350) nurses. Section A of the questionnaire collected information on the nurses' demography. Section B of the questionnaire collected information on the nurses' time pressure. The effort scale [26] for measuring time pressure was adapted. The response ratings followed the five-point Likert scale from very low (1) to very high (5). Section C of the questionnaire collected information on the nurses' mental stress. The subjective workload analysis Technique scale [27, 28] was adapted. Section D of the questionnaire collected information on the nurses' job satisfaction. The Schriesheim and Tsui scale [13] consisting of six (6) items for measuring job satisfaction was adapted. The rating scale response followed the five-point Likert scale from completely dissatisfied (1) to completely satisfied (5).

In the data collection approach, introductory letters were taken from the department of Organization and Human Resource Management (OHRM) of the University of Ghana Business School to the hospital administrators of the four hospitals in Accra. The hospital administrators then gave researchers cover letter attached to the introductory letter to be given to the heads, specifically, the Deputy Director of Nursing Services (DDNS) of the various departments of the hospitals. Copies of the questionnaires were then distributed to the nurses in these departments by the researchers, after being introduced by the DDNS to the respondents (i.e. nurses) in the various wards. The researchers explained the purpose of the study to the respondents and guaranteed their anonymity and confidentiality of the information obtained. The data collection period was three months (i.e. from March, 2016 to May, 2016).

### 3.3 Procedures for Data Analysis

A stepwise approach was adapted to the analysis. The first step was to undertake a descriptive statistical analysis to establish the distribution of the demographic characteristics of the respondents. Factor analysis was conducted to identify the plausible factors with the requisite weight to predict the nurses' time pressure, mental stress and job satisfaction, and the attribution of such factors. The factor analyses, with Kaiser-Meyer-Olkin as well as Bartlett's tests, were initiated to measure the factorability of the data, using the statistical package for the social sciences (SPSS) as the analytic tool. Principal Component Analysis was then used as a data reduction technique using the Rotation Method (Varimax with Kaiser Normalization). Indicator predictiveness was interpreted using [29] recommendation that estimated factor loading must be 0.7 or higher.

## 4 Results and Discussion

### 4.1 Demographic Assessment of Study Participants

Of the 350 questionnaires administered, 310 were returned (88% response rate). Out this number, 10 questionnaires were found to be incomplete and as such rejected.

Therefore, 300 returned questionnaires had all sections fully scored and were used in the analysis. The demographic characteristics of the respondents showed that there were more female respondents (83.7%) than male respondents (16.3%). Majority of the executives are in their prime. In this regard, 53 (17.7%) of the respondents have their ages ranged between 18 and 24 years, while 169 (56.3%) of them are aged between 25 to 34 years. A significant number of them (19.7%) are also in their middle-ages (i.e. 35 to 55 years). Only a few of them (6.3%) are above 55 years of age. Regarding, the number of hours spent by the nurses in their daily work routine, a significant number of the respondents (12%) have a daily work routine of more than 10 h. A majority of them (60.0%) have work periods of between 8 and 10 h daily. Eighty two (27.3%) of the respondents have daily work periods of 5 to 7 h. Only a few of them (0.7%) have a daily work routine of less than 5 h. Generally, the respondents are adequately educated as it is reflected by the distribution of the highest level of education they have acquired. Majority of the respondents (50%) are graduates, with 122 (40.7%), of them being nursing diploma holders, and 88 (29.3%) of them holding degrees in nursing, while 8 (2.7%) of them are post graduate degree holders. Fifty eight (19.3%) of the respondents are holders of professional certificates in nursing while 24 (8.0%) of them secondary school certificate holders. Though only 4 (6%) of the respondents are neither degree nor diploma nor certificate holders, they had some level of educational training. In relation to the number of years spent in the nursing profession, majority of the respondents (62%) are quite experienced, having been in practice for periods of 4 years and above. A significant number of them (27.7%) have been in practice for a period between 1–3 years. Only a few of the respondents (10.3%) have been practicing for less than a year. The implication of the demographic distribution is that, majority of the nurses (i.e. study participants) surveyed were duly qualified and experienced to provide the needed information requested in the questionnaire administered.

**4.2 Factor Analysis of Time Pressure, Mental Stress and Job Satisfaction**

The Kaiser-Meyer-Olkin (KMO) and Bartlett’s test statistics for the nurses’ time pressure and job satisfaction indicators is shown in Table 1 below. As shown in the table, the estimated KMO value for time pressure is 0.863. That of mental stress is 0.698, while that for job satisfaction is 0.703. These values indicate that the correlation patterns for both the time pressure and job satisfaction indicators are good, as recommended by [30]. Furthermore, the estimated chi-square ( $\chi^2$ ) value from the

**Table 1.** KMO measure of sampling adequacy and Bartlett’s test result for time pressure and job satisfaction

Indicator	KMO measure	Bartlett’s test of sphericity		
		$\chi^2$	df	Sig.
Time pressure	0.863	542.391	15	0.000
Metal stress	0.698	304.895	36	0.000
Job satisfaction	0.703	333.877	15	0.000

Bartlett's test for time pressure is  $\chi^2 = 542.391$  ( $p = 0.000$ ), that for mental stress is  $\chi^2 = 304.895$  ( $p = 0.000$ ), while that for job satisfaction is  $\chi^2 = 333.877$  ( $p = 0.000$ ), both of which are highly significant ( $p < 0.001$ ).

The results from both the KMO and Bartlett's tests indicate that it is appropriate to analyze all the time pressure and job satisfaction indicators tested, using principal component analysis.

### 4.3 Principal Component Analysis of Nurses' Time Pressure

In the principal component analysis of the time pressure indicators, using the extraction method, the total variance explained yielded a one component matrix, underlined by initial eigenvalues that are greater than one. Using the rotation method, underlined by Varimax with Kaiser Normalization, the rotated component matrix with estimated regression ( $R$ ) values for the indicators is shown in Table 2 below.

**Table 2.** Rotated component matrix with regression estimates for time pressure indices

Indicators	$R$ - values
Heavy workload	0.733
Interruptions in the job	0.736
The level of responsibility in work assigned	0.701
Working overtime	0.658
Demanding nature of the job	0.768
Overwhelming pressure encountered at work	0.791

As shown in Table 2 above, an analysis of the nurses' time pressure shows that 5 indicators have factor loadings greater than 0.7, and hence are predictive of the nurses' time pressure at work. These indicators are; (i) heavy workload ( $R = 0.733$ ), (ii) interruptions in the job ( $R = 0.736$ ), (iii) the level of responsibility in work assigned ( $R = 0.701$ ), (iv) demanding nature of the job ( $R = 0.768$ ), and (v) Overwhelming pressure encountered at work ( $R = 0.791$ ). These results confirmed the finding from the work of Beevis (1999) that people experience high time pressure when 85% of the available time is required to execute the tasks. In this case, performance is often impaired in that some tasks are not well executed. As it was found by [11], four out of five nurses often experience time pressure at work. As [11] further indicated, a common and understandable reason for time pressure in nursing is an insufficient nurse-to-patient ratio in many institutions. Generally, time pressure has been identified by [11] as an important strain factor in nursing work. The implication of this finding is that nurses with excessive workload compete for time. In other words, nurses need a lot of time to accomplish their heavy task schedules, but which they mostly lack, and as such find themselves pressed with time when carrying out their daily routines.

### 4.4 Principal Component Analysis of Nurses’ Mental Stress

In the principal component analysis of the mental stress indicators, using the extraction method, the total variance explained yielded a four component matrix (i.e. C1, C2, C3 and C4), underlined by initial eigenvalues that are greater than one. Using the rotation method, underlined by Varimax with Kaiser Normalization, the rotated component matrix with estimated regression (*R*) values for the indicators is shown in Table 3 below.

**Table 3.** Rotated component matrix with regression estimates for mental stress indices

Indicators	<i>R</i> - values			
	C1	C2	C3	C4
I do not have spare time	0.183	0.844	0.006	-0.211
I occasionally have spare time	-0.105	0.589	0.418	0.354
I often have spare time	0.070	0.224	0.145	0.660
My work requires little conscious effort	0.227	0.477	-0.218	0.474
My work requires extensive conscious effort	0.179	-0.100	0.115	0.850
My work requires extensive mental effort	0.193	-0.157	0.742	-0.059
I get a bit confused, feel at risk, frustrated and anxious from my work	0.769	0.077	-0.137	0.252
I get moderately stressed due to confusion, anxiety and frustration from my work	0.670	0.138	0.197	0.162
I get highly stressed due to confusion, frustration or anxiety from my work	0.727	0.019	-0.351	-0.118

As shown in Table 3 above, an analysis of the nurses’ mental stress shows that 5 indicators have factor loadings greater than 0.7, yielding a four-component solution. The first component (i.e. C1) contains two indicators, which together reflect the frustration in nurses’ work. These indicators are; (i) I get a bit confused, feel at risk, frustrated and anxious from my work (*R* = 0.769), and (ii) I get highly stressed due to confusion, frustration and anxiety from my work (*R* = 0.727). In this respect therefore, this component (i.e. component 1) is labeled as *emotional strain of work*. The second component (i.e. C2) contains one indicator which reflects the lack of pauses in nurses’ work. These indicator is; (i) I do not have spare time (*R* = 0.844). In this respect therefore, this component (i.e. component 2) is labeled as *task continuity*. The third component (i.e. C3) contains one indicator which reflects the mental requirement in the nurses’ work. These indicator is; (i) my work requires extensive mental effort (*R* = 0.742). In this respect therefore, this component (i.e. component 2) is labeled as *mental strain*. The fourth component (i.e. C4) contains one indicator which reflects the mental requirement in the nurses’ work. These indicator is; (i) my work requires extensive conscious effort (*R* = 0.844). In this respect therefore, this component (i.e. component 2) is labeled as *mental stress*. These results are consistent with that of [13, 24] which indicated that, most acute inpatient care requires nurses to constantly shift their attention to make clinical decisions and manage care for groups of patients in a

continually changing environment. As suggested by [31], hospital administration should make sure nurses are exempt from interruptions and disturbances which compete for their attention and concentration for effective care delivery.

#### 4.5 Principal Component Analysis of Nurses' Job Satisfaction

In the principal component analysis of the job satisfaction indicators, using the extraction method, the total variance explained yielded a two component matrix (i.e. C1 and C2), underlined by initial eigenvalues that are greater than one. Using the rotation method, underlined by Varimax with Kaiser Normalization, which converged in 3 iterations, the rotated component matrix with estimated regression ( $R$ ) values for the indicators is shown in Table 4 below.

**Table 4.** Rotated component matrix with regression estimates for job satisfaction indices

Indicators	$R$ - values	
	C1	C2
Nature of the work	0.161	0.678
Relationship with supervisor	0.107	0.828
Relationship with co-workers	0.091	0.752
Amount received as salary	0.726	0.117
Opportunities for advancement and promotion	0.839	0.017
Prevailing job situation	0.753	0.287

As shown in Table 4 above, an analysis of the nurses' job satisfaction shows that 5 indicators have factor loadings greater than 0.7, yielding a two-component solution. The first component (i.e. C1) contains three indicators, which together reflect the nurses' manifestation of motivation expectation relative to their work. These indicators are; (i) Amount received as salary ( $R = 0.726$ ), (ii) Opportunities for advancement and promotion ( $R = 0.839$ ), and (iii) Prevailing job situation ( $R = 0.753$ ). In this respect therefore, this component (i.e. component 1) is labeled as *work motivational influence*. The second component (i.e. C2) contains two indicators which together reflect the nurses' relationship at the workplace. These indicators are; (i) Relationship with supervisor ( $R = 0.828$ ), and (ii) Relationship with co-workers ( $R = 0.752$ ). In this respect therefore, this component (i.e. component 2) is labeled *workplace relationship*. These results are in line with [14] association of job satisfaction with pay, autonomy, task requirements, organizational policies, interaction and professional status. By implication, the *work motivational influence, as found above is determined by organizational policies, pay received, level of autonomy, and employee status*, while the workplace relationship is influenced by the character of employee-supervisor and employee-employee contact. Thus arguing from the perspectives of [14], nurses' job satisfaction is determined by the congruence between their *work motivational influence and the quality of their workplace relationship*.

#### 4.6 Relationship Between Time Pressure, Mental Stress and Job Satisfaction

Based on the findings from the factor analyses, Pearson correlation test was conducted to find out if there is influencing relationships between the nurses' time pressure, workload and job satisfaction. The means (M), standard deviations (SD) and correlation ( $\alpha$ ) estimates are shown in Table 5 below.

**Table 5.** Correlation estimates for relationships between time pressure, mental stress and job satisfaction indices

Variables	M	SD	1	2	3	4
1. Working hours	2.86	0.70	–			
2. Mental stress	21.16	2.70	0.14*	–		
3. Time pressure	20.53	3.49	0.16*	0.54**	–	
4. Job satisfaction	17.19	3.24	–0.05	–0.19*	–0.23**	–

\*\* = very significant ( $p \leq 0.01$ );

\* = significant ( $p \leq 0.05$ );

$p$  = probability value

It is observed from Table 5 above that a negative and highly significant correlation ( $\alpha = -0.23$ ,  $p \leq 0.01$ ) exists between the nurses time pressure and their job satisfaction. By implication, increases in the nurses' five time pressure indices (i.e., heavy workload, interruptions in the job, level of responsibility in work assigned, demanding nature of the job, and overwhelming pressure encountered at work), as identified in the factor analysis will greatly lessen their satisfaction with their work (i.e., *work motivational influence* and *workplace relationship*). A positive and highly significant correlation ( $\alpha = 0.54$ ,  $p \leq 0.01$ ) exists between the nurses time pressure and their mental stress. By implication, increases in the nurses' time pressure indices will greatly increases the mental stresses they experience at work (i.e., *emotional strain of work*, *task continuity*, *mental strain*. and *mental stress*). A negative and highly significant correlation ( $\alpha = -0.19$ ,  $p \leq 0.01$ ) exists between the nurses mental stress and their job satisfaction. By implication, increases in the nurses' mental stress will greatly lessen their satisfaction with their work. These findings suggest that mental stress has a negative impact on the job satisfaction of nurses. Increase in mental stress therefore decreases job satisfaction while a decrease in mental stress increases job satisfaction of nurses in selected public hospitals in Ghana. This is in line with [32] finding that Ghanaian nurses regularly face emotionally charged situations and encounter intense interpersonal and inter-professional situations and conflicts in the workplace while trying to make appropriate and safe decisions for their patients and this reduces their job satisfaction. In essence, when nurses are mentally stressed due to factors such as overcrowding and congestion of wards and the vast number of patients they have to attend to daily, it tend to decrease their satisfaction of their jobs because the stress the stress they undergo is beyond them. This finding is also in line with that of [33] who found that nurses' job dissatisfaction increased from 40 to 60% as they become mentally stressed and burned out. This finding is also consistent with that of [34] who

observed that lack of satisfaction can be a source of mental stress, while high satisfaction can alleviate the effects of mental stress.

## 5 Conclusion

This study has shown that the nurses in Ghanaian public hospitals encounter time pressure, mental stress and job satisfaction challenges in their daily work routine. As such, mental stress is a prevailing issue among Ghanaian nurses. Factors that constitute time pressure, mental stress and job satisfaction of nurses in Ghana which can aid improve the design of the nursing work environment in Ghanaian hospital were identified. It is therefore concluded that by ameliorating the time pressure associated with the nursing work, in terms of the heavy workload, interruptions in the job, level of responsibility in work assigned, demanding nature of the job, and overwhelming pressure encountered at work, nurses will be highly motivated and experience improved relationship with both superiors and among themselves). It is also concluded that by eliminating the time pressure, the mental stress associated with the nursing work will also be reduced by moderating the task pace and eliminating the emotional strain and mental stress associated with the nursing work. All these could result in nurses positively experiencing higher level job satisfaction.

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# Service Recovery Model Based on the Fulfillment of the Value Promise

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**Abstract.** This research represents a quantitative correlational study to identify the relationship or degree of association that takes place when concepts of service recovery and degree of compliance, as related to the value proposition of an organization or company, in this case, restaurants in the city of Querétaro, México. During the study, these two variables will be measured and their links will be quantified, analyzed and established, and hypotheses derived from the theoretical framework will be proved. The main utility of correlational studies is to learn how a concept or a variable can behave in respect to behavior of other related variables. Particularly, we aim to understand the relationship between service recovery and value proposition to enable predictions and quantify the relations between both variables.

**Keywords:** Service recovery · Value promise · Service failure

## 1 Introduction

During the last decade, marketing has undergone significant changes in their conception and usage in businesses. It has moved from the operational ambit to reach the strategic direction, as a key resource for understanding the opportunities the market. Therefore, it is important that those involved in activities or projects related to marketing, understand its importance and significance to the achievement of objectives and compliance with offering value of an organization.

While there is a clear decline in the number of marketing departments and the number of people who work in them, as referred by Kumar Nirmalya [1], due to the fact that “more marketing activities are done in other areas which has given the organization has a clearer market orientation”. According to this author, “modern marketing must break the inertia of the four P and associate with initiatives that cover the entire enterprise and that they become relevant to CEOs and boards of directors.”

This reflects a paradox, because on one hand, changes in marketing forces the use of new technologies to reach the mass market, but on the other, the customer service requires a high level of customization and a unique value offer, with elements of emotional connection and social responsibility. This challenge of extending and customizing entails the requirement to prioritize care and service quality, maximizing customer life cycle with the company.

However, the chances of failing in care and service delivery are elevated to mass customization, as several members may be out of control, forcing the approach of customer recovery, if any of these failures is presented [2].

Academics and business managers have considered Service recovery as an essential operational issue. The focus has been on isolated corrective actions and their impact on the behavior of current customers [3]. However, in the last two decades, several authors have theoretically suggested the need to consider service recovery as a comprehensive set of management practices that allow companies to carry out recovery procedures in a proactive, relationally and ultimately, strategically [4].

Service recovery could be an opportunity to regain customer trust [5], increase engagement with customers [6] and build long-term relationships if the recovery is successful. The consumer experience that is undergoing a process of service recovery is considered important for long-term loyalty (satisfaction, trust and commitment).

Therefore, the overall objective of the research is to create a management model (decision-making) and market (consumer awareness), to facilitate the implementation of a comprehensive recovery strategy, which starts from the value offer and that it covers all the business model, taking as inputs the key variables of service recovery in the restaurant industry in the city of Querétaro. The scope of the research is correlational, identifying the degree of association between the variables found.

## 2 Research Conducted

### 2.1 Hypothesis Definition

To determine research hypotheses, the conceptual framework was analyzed, starting from definition of constructs, identification of variables, their definition, the scales used in the literature, and techniques to respond. The results are shown in Table 1.

**Table 1.** Hypotheses determination.

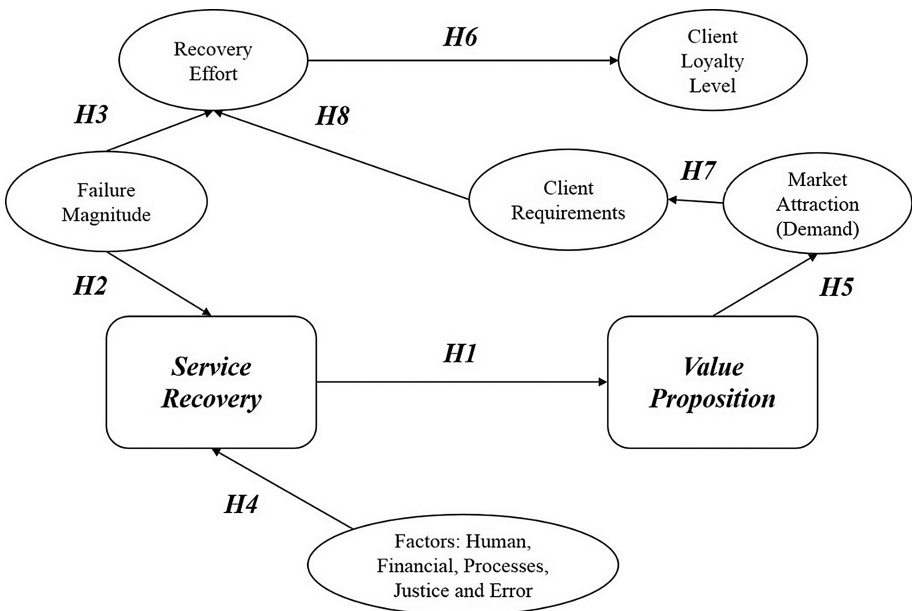
Conceptual level		Operational level		
Construct	Variables	Operation (Scales – Authors)	Response techniques	Hypothesis
Deployment of service recovery	Magnitude of service failure	From major to minor [7]	Questionnaire	The greater the magnitude of service failure, the lower the success of service recovery
	Recovery effort	From complete to incomplete [8]	Questionnaire	The greater the magnitude of service failure, the greater the recovery effort
	Client requirements (patron)	From high to low [9]	Questionnaire	The greater the client’s requirements, after a service failure, the greater the service recovery effort
	Recovery factor	Human, financial, processes, justice, error [10]	Questionnaire	Factors that make up service recovery are: (a) human + (b) financial + (c) processes + (d) justice + (e) error

(continued)

**Table 1.** (continued)

Conceptual level		Operational level		
Construct	Variables	Operation (Scales – Authors)	Response techniques	Hypothesis
Value proposition compliance	Service demand	From maximum to minimum [11]	Results analysis	The better the value proposition is displayed, the greater market demand attraction
	Value attributes	From inferior to superior value [12]	Questionnaire	Attributes highlighted in the value proposition generate a greater market demand
	Client perception		Result analysis	Service recovery is directly related to value proposition
The service recovery paradox effect	Client loyalty level	From high to low [13]	Questionnaire	The greater the recovery effort, the greater the achieved loyalty level

The literature review provides elements that allow us to identify and construct the relationships between different analyzed constructs. Based on this, we propose in Fig. 1, a conceptual model, which establishes various relationships between the research hypotheses.



**Fig. 1.** Relationship between research hypotheses. Source: Own construction.

**Research Hypotheses.** The following hypotheses were established:

- **H1:** Service recovery is directly related to value proposition.
- **H2:** The greater the magnitude of service failure, the lower the success of service recovery.
- **H3:** The greater the magnitude of service failure, the greater the recovery effort.
- **H4:** Factors that make up service recovery are: (a) human + (b) financial + (c) processes + (d) justice + (e) error
- **H5:** A greater value proposition generates a greater market attraction or demand.
- **H6:** The greater the recovery effort, the greater the achieved loyalty level.
- **H7:** The greater demand, the greater the client's requirements.
- **H8:** The greater the client's requirements, after a service failure, the greater the service recovery effort.

## 2.2 Data Collection

A non-experimental, transverse, exploratory and causal study with a quantitative research design was carried out on a single sample taken in the city of Querétaro throughout the months of May to September 2016. The sample studied is typical and intentional (non-probability sampling) as shown in Table 2.

**Table 2.** Data collection plan.

Item	Description
Objective	Analyze relationship between service recovery and value proposition in the city of Querétaro's restaurant industry
Base question	What is the relationship between recovery service and value proposition in the city of Querétaro's restaurant industry?
Sources	Frequent patrons at restaurants belonging to a business group in the city of Querétaro
Location	City of Querétaro, Querétaro (Urban area)
Collection method	Interview, using a questionnaire applied by qualified interviewers
Data preparation for analysis	Data base of interview results
Sample	From 200 to 250
Period	Four months

## 2.3 Application of the Measuring Instrument

As a measurement instrument, a 29-item questionnaire was designed, consisting of open, dichotomous and multiple-choice questions, which was applied through interviews between May and September 2016, in the city of Querétaro (urban area). This was done because interview questionnaire obtains a greater percentage of answers to the questions, between 80 and 85% [14].

In the case of this research, 250 interviews were requested from a database of customer records of the restaurant group that supported the research process, obtaining a favorable response of 227 records (90.8%); of these, 76 were face-to-face (33.48%), 41 were phone-calls (18.06%), and 110 (48.45%) were applied in an electronic format, using the SurveyMonkey® collection tool. To ensure that the reproduction of your illustrations is of a reasonable quality, we advise against the use of shading. The contrast should be as pronounced as possible. If screenshots are necessary, please make sure that you are happy with the print quality before you send the files.

### 3 Data Analysis

The generated database was integrated into the IBM SPSS® software version 24, for which variables were first defined by question, followed by entering answers in the corresponding sheet. Subsequently several analyzes were carried out to validate information, frequency reports and correlations, which will be presented in the results chapter.

The types of failure mentioned by the interviewees are shown in Table 3, from highest to lowest frequency of mention.

**Table 3.** Most common types of failure in visited restaurants.

Number	Failure
1	Time waiting for food
2	Time waiting for table assignment
3	Food quality
4	Waiter's lack of knowledge
5	Bad food presentation
6	Rude treatment
7	Personnel inefficiency, they do not know their menu
8	Pictures on menu do not reflect actual portions
9	Billing mistakes
10	Reservations loss
11	Inadequate hygiene
12	Non-standardized portions
13	Bad service from valet parking personnel
14	No children's area or access for disabled people
15	Arguments between waiters in presence of the customer
16	Customer needs unattended
17	No failure recovery, a feeling of no interest for the patron
18	Lack of hygiene in services such as restrooms and parking lot
19	Wrong dishes or unavailable menu dishes
20	Dish flavor

When there is a service failure, 84.58% of guests say that their value proposition is distorted, while 15.42% do not believe so. Table 4 shows the reasons why the restaurant’s value proposition is affected in eyes of the guest because of service failure.

**Table 4.** Reasons for affectation of value proposition due to service failure.

Reason	Percentage
Loss of credibility	31%
Contradictions	17%
Disappointment	11%
Change in perception of value proposition depends on type of failure	10.2%
Others	30.8%

In smaller percentages, more than 15 different answers were obtained on why the value proposition is affected. Regarding coming back to the restaurant after experiencing failure, guests responded as follows: 72.25% would not return and 27.75% would. Table 5 shows the factors that influence the return of people to restaurants after service failures.

**Table 5.** Factors that would encourage a guest to return to the restaurant after experiencing failure.

Determinant
If offered a sincere and honest apology from those involved in the failure
If restaurant received new certifications
If offered an apology from the manager or the owner
If offered a personalized follow-up of subsequent visits
If given a voucher to return
If proved that incompetent staff during failure have been trained
If invited to eat with the owner to share suggestions
If received both verbal and digital change recommendations
If restaurant changed management
If restaurant changed manager
If restaurant changed owner
If informed of improvements when being invited to eat
If given a refund for the failure
If given a public apology
If offered an apology from the manager or the owner
If offered a personalized follow-up of subsequent visits
If given a voucher to return
25% would not return for any reason, because the type of failure was very serious for the respondent

Validation of the hypotheses was done using the Kendall and Spearman Correlation test. The Spearman's rho and Kendall's tau (tau\_b in SPSS®) coefficients are correlation measures for variables at an ordinal measurement level. They are coefficients that are used to statistically relate Likert scales. Both coefficients vary from  $-1.0$  (perfect negative correlation) to  $+1.0$  (perfect positive correlation), 0 being absence of correlation between variables [15] (Table 6).

**Table 6.** Validation of the research hypotheses with the Kendall or Spearman Correlation coefficient.

Research hypotheses	tau_b <i>Kendall</i>	rho <i>Spearman</i>	Interpretation
<b>H1</b>	0.299**	0.326**	Average positive correlation Research hypothesis is accepted
<b>H2</b>	-0.288*	-0.308*	Average negative correlation Research hypothesis is accepted
<b>H3</b>	0.149	0.158	There is no correlation Research hypothesis is rejected
<b>H4</b>	0.270*	0.278*	Average positive correlation Research hypothesis is accepted for (a) human
	-0.297*	-0.306*	Average negative correlation Research hypothesis is accepted for (a) human
<b>H5</b>	0.267*	0.288*	Average positive correlation Research hypothesis is accepted
<b>H6</b>	-0.312*	-0.312*	Average negative correlation Research hypothesis is accepted
<b>H7</b>	-0.046	-0.048	There is no correlation Research hypothesis is rejected
<b>H8</b>	-0.144	-0.149	There is no correlation Research hypothesis is rejected

\*0.05 level

\*\*0.01 level

## 4 Service Recovery Model

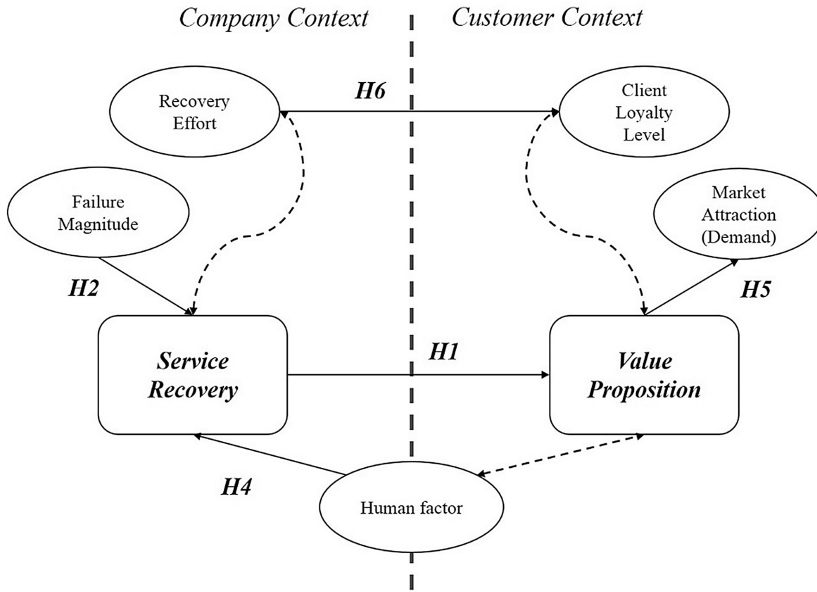
According to the results obtained in the validation of the research hypotheses, a viable model of service recovery management after failures should be centered on the following elements:

- (a) The declaration of the Value Proposition of the Company.
- (b) Measure the magnitude of the failure.
- (c) Manage the human factor above any other in the organization.
- (d) Carry out market attraction actions respecting the value proposition.
- (e) Strengthening recovery processes to achieve high levels of customer loyalty.



All these factors must be considered in two action environments: the context that corresponds to the company and the surrounding the client. So that the company can manage its recovery actions and the client can make decisions regarding the service that is provided.

Figure 2 shows this relationship of components in a management model.



**Fig. 2.** Service recovery model: a first approach to the management of service faults

## 5 Conclusions

The results obtained in the study prove the importance of the promise of value established by restaurants in service recovery and in general, we can infer that this applies to any service provider company.

Although some of the hypotheses raised in the research failed to be validated, this exercise intends to contribute and join efforts to a worldwide movement that allows professionalization of customer service and design routes for the relationship with the client, considering all decisive moments: ex-ante, ongoing and ex-post service.

Being able to implement a management model that gives the company the keys to offer an adequate level of service and processes of recovery after failures will have a commercial consequence of high impact and of greater value for the client.

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# Avoiding Wow-Gaps Through Wow-Canvas in Business Development

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**Abstract.** When talking about business development, it is important to keep in mind that the purpose of developing should drive towards differentiation of the company superiorly from rivals. The Wow-factor affects to all stakeholders of the company. Therefore, Wow-factor should be defined clearly and utilized better in all company processes. Wow approach is the approach through distinctive linkages between human, business and management aspects. Approach may emerge new, unique and motivating power to business development. This article introduces the model how to find the building blocks of Wow and how to track Wow through the company processes. The model is developed by combining the business model canvas, Wow-gap model and the theory of the Wow to a distinctive Wow-canvas. This article also deepens the knowledge of the use of the Wow-factor and the Wow-gap model in business development. Future research needs and actions are addressed in the end of the article.

**Keywords:** Human factor · Wow-effect · Wow-factor · Business development · Wow-Canvas · Wow-gap · Business model canvas · Business strategy · Value creation · Wow experience

## 1 Introduction

In today's world, where the number of competitors is only increasing the pace of doing business is clearly becoming faster. Competition for customers' attention is something that cannot be neglected [1–3]. Company should catch the customers' interest and then provide something memorable in shortening timelines. Within the marketplace where the companies do their business, they have to come more responsive and more adaptive to changes [1]. To strengthen the positions in markets, ensure continuance of business and being ready for future challenges, the companies need to be ready to enhance the capability to innovate and bring those innovations in to the markets. Because of constant and rapid change of business environments, the companies need to develop business models towards easier and faster use of innovations and simplify how the

awesome things that the company does, will be brought to markets [2]. Continuously changing economical, social, technological and political environments have changed the nature of competition, relationships and markets of traditional business [3].

These needs are affecting to every company, no matter what the business or industry is. Companies need to give customers more and more something positively different from what they expect. Otherwise, company is on a route towards competition by pricing and for many company it is not the most sustainable route. The knowledge and understanding from the Wow experience is needed through whole business model, starting from the very beginning, the point where there isn't even a customer in the sight, via the point when the customer is doing the business with company to the point when s/he will return to next deal.

## 2 Using Wow in the Business Model Development

Wow itself is an outcome of the Wow-effect, which is caused by the Wow-Factor. Using those in companies' business needs an understanding of the whole concept of Wow. The Wow is something what the customer feels when s/he is dealing with a product, service or company that have a unique affect to customer with positive way. Wow-effect is a result of something that creates a wave of sensation for what the customer was not prepared. E.g. customer's expectations were exceeded with magnificent way. Product, service or company was something that customer has never experienced before. Wow-factor is not a feeling, but it is some unique attribute(s) that the company, service or product have, which causes the positive or negative initial reaction in a user or costumer [4].

Products, services, companies and their deliverables are all somehow different, but they all can be scrutinized as production and business processes. Therefore, all personnel taking part to processes should pursue the same Wow and all people from different stakeholders of company should experience that they are part of making the Wow. Wow-factors are like good quality, we can recognize them when we experience and see those, but just like quality, those can be very difficult to define unambiguously [4].

To get the best out of the Wow-concept, the Wow needs to be connected to the company's strategy. It is important to understand the positivity of the Wow and that every company have their unique Wow-factor. Everything, what the company do, has to have an explanation. Deciding to find out what the Wow-factor of the company is, and how the Wow flows through company, is something that affect to everyone in company.

Practically from all business areas, there is a lot of knowledge and information available in every company [5]. Getting that hidden potential to enhance company's business development is one thing how the Wow concept can help the company to reach the next level and strengthen their positions in markets, ensure continuance of business and being ready for future challenges. Every company and every culture have different ways to do and think business. Whatever it is, the top management need to see and find out, which the ways are, enhance those and value the information [5].

## 2.1 How Wow-Factors Can Support Business Strategy

Thompson and Strickland suggested approaching business strategy through fundamental business questions, for example, which of the customer groups are under company's focus or whether to narrow, carry on or raise the company's product lines. According to them, formulating strategy is an exercise in selecting the best possible alternatives on every situation and making the needed choices. They also suggested that strategy is a kind of a company's commitment to particular customers, markets, products, methods and competitive approaches of business areas and operations [6]. To enhance things handled above, company should find the true Wow-factors and systematically develop those so that customers can really get what was the company's idea from the beginning.

The Kotler and Keller define strategic planning to a management activity with certain aimed topics. Those topics are strengthening operations, focusing energy and resources, ensuring that employees and other stakeholders are working toward common goals, setting and establishing clear set of priorities. Strategic planning also involves setting future directions for the company and monitoring internal and external environment [7]. When every company has its own unique Wow-factors, it is very important to realize that contribution of every employee is necessary to achieve the wanted Wow-effect for the end user. Because of the complex and fast changing business environment, customers' and users' point-of-view has become more and more important. What is offered to them, need to be something more and extraordinary that will differ you from others. Differentiation can be achieved when the customer or user feel or think, "Wow, this is more than I even imagined".

One of the three different point of views to business strategy, which are brought up in this article, comes from Michael Porter. He defines strategy to be a unique mix of different values and delivering those by pursuing different kind of sets of activities than what the competitors deliver. Company's strategy positions these values to play a key role. Porter also shows that positioning and repositioning in the business environment and area is key attract new and old customers by established positions. There is a variety of factors which company can use in positioning, for example customer accessibility or customer needs. In addition, the position of the company can be based on the unique service or product what the company is offering [8]. Separating the company from its competitors superiorly is one of the main purposes of the Wow-concept. By utilizing company's unique Wow-factors better and systematical ways, the potential for developing business and results can be huge. Bringing the whole concept of Wow to business and to its strategic development raises the customer to be even more important. Open-minded thinking and positive attributes of the Wow-concept are the key factors behind the potential of understanding the possibilities what the Wow-factors offer for giving the customers more than they expected.

Because strategy should appear at all different levels of company and all levels have different scope and holds different purposes, goals and objectives, there is no clear answer to the question "what strategy is?". Key purpose of strategy at business level is to provide business with competitive advantage over competitors. At this level strategy winds around mission and vision of the business. With identification of the opportunities

and threats in the external environment and carefully analyzing the internal weaknesses and strengths, it is possible to obtain competitive advantage [7].

## 2.2 Enhancing Business Models with Wow-Factors

In today's constantly changing competitive business environment [3, 9] with increasing uncertainties, strategies become much more essential than before [9, 10]. Rapidly changing political, social, technological and economical macro environments [3] raises an important question that companies need to realize and answer. The question is not, are the strategies relevant, but does the company have a relevant strategy [10].

Tasks for companies to be true pioneers in business development are development and enhancement of everyday business, trying new things quickly, learning from the mistakes, creating new ideas and models and providing genuine added value for the constantly changing needs of the customers. Because the ultimate aim of business strategies, to provide competitive advantage to companies over their rivals, [11] it is more than suitable to connect Wow-factors and the concept of Wow to business models. Finding the unique Wow-factors of the company and systematically develop them is the key to provide customers more than they expected. It will make the company, its products or services seen in the eyes of the customer or consumer, superior and more desirable.

## 2.3 Creating Value with Wow-Effects and Wow-Factors

There is a transformation of the value creation going on in business. Global megatrends are shaping the future of business and having impact on companies' ways to create innovate business. The ongoing transformation will change the ways companies do business and how the companies are creating value. New kind of value chains, changes in people's behavior and networks challenges every business field [12–14].

One of the most important thing for a customer, is that s/he will get the feeling that the product or service will provide something that s/he needs. Because value depends on results, the place where value should always defined is around the customer [15]. Fulfilling that basic need still doesn't make it sure, that the customer feel the Wow-effect and experience of the Wow. To ensure the experience of Wow for the customer, it is important to realize that there has to be something more than what the customer expects. Focusing to finding the unique Wow of the company, will give a new kind of perspective for the company to add value to the product or service in the eyes of the customers.

Central process and core purpose in all economic exchange is the creation of value [16]. Porter and Kramer defines value to be benefits relative to costs, not the benefits alone. Value creation has recognized in business for a long time, in businesses where profit is revenues earned from the customers minus the incurred costs [17]. Still, there are arguments about if the value should be created or shared. Even the relation of competitive advantage and adding value is not clear, the problem for companies is how they understand their market positions. However, when company can create enough

value through its products or services, emerges the possibility for company to feel confident to share the value also for the surroundings where it operates [5].

For the customer to get the Wow experience there should be something that exceeds their expectations. Because of that, the Wow-effect and the Wow-factors are important in creating experiences or pleasant surprises for consumers. Open-minded attitude and the positive nature of the Wow concept enables to address the needs of consumers thoughtfully and in innovative ways. Including emotional connections with gratitude, empathy and generosity. For the outstandingly positive user experience, the Wow experience, has said to be important also in industrial product development [18, 19].

### 3 The Wow-Gap Model

Good Wow-factors can be compared to good quality regarding how these should be measured. How to measure quality or even define perceived quality is still a constant matter of debate [20–25]. Reunanen, Penttinen and Borgmeier [4] introduced the Wow-gap model to provide framework for companies for the Wow-effect identification. It is based on SERVQUAL quality management framework as developed by Zeithaml, Parasuraman and Berry [20–22]. Wow gap model should be used as a tool to build larger understanding for how, why and where, the Wow-effects are (or are not) created.

Wow-gap model is illustrated in Fig. 1. The Figure shows a simplified system dynamic model from how Wow-effect can be examined.

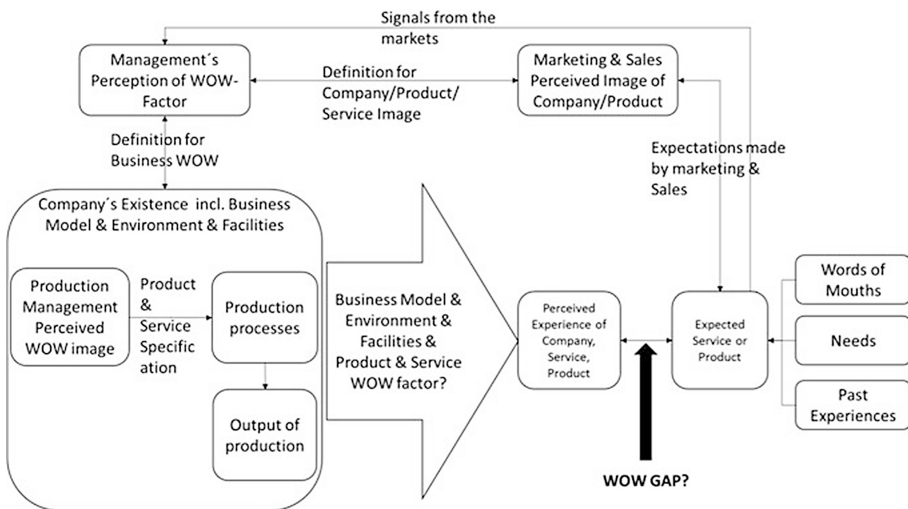


Fig. 1. Wow-gap model

As seen from the Fig. 1 there are 7 distinctive gaps between different stakeholders.

1. Gap between Markets and Management,
2. Gap between Management and Marketing and Sales,
3. Gap between business definition and Company Existence,
4. Gap between Existence and Specification,
5. Gap between Production output (includes product/service delivery),
6. Gap between Production output and Perceived Experience, and
7. Gap between Customer's Expectations and Perceived Experience.

When the Wow-effect is defined to be surprise and extraordinary or unique [4] the most interesting gap is then gap number 7 "the Wow gap". If a customer is experiencing Wow-effect, this means that customer's expectations are exceeded more than expected. Even when a customer is not having a Wow-effect, product or service may be overwhelmingly good, but for some reason this particular customer was not affected that much by Wow-factors the company produced.

## 4 From Business Model Canvas to Wow-Canvas

Osterwalder and Pigneur developed business model canvas for a descriptor and a tool to divide companies' business model into nine different components. Those nine are key activities, customer relationships, customer value proposition, channels, costs, segments, revenues, partners and key resources [26]. Business model canvas can support companies to more sustainable oriented value creation by putting alignment in to purpose and profit [27]. The business model canvas can be used as an approach to represent and make the planned business model visible. It is suitable especially for start-ups and innovative companies [2].

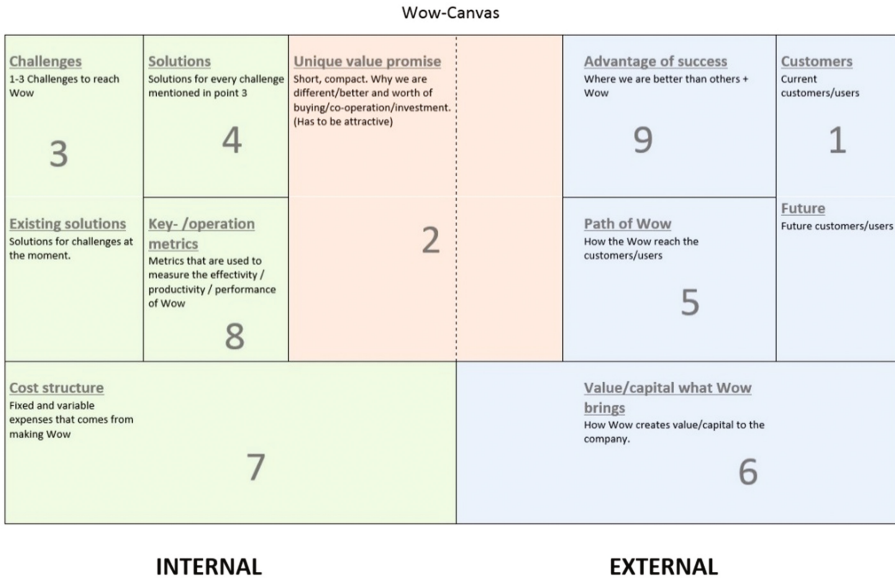
In strategic management circles, the idea about business model is solid. Still it is commonly used as a describer rather than an implement for leading the operational concerns of a business. Among many entrepreneurship, the modeling of business is a rapidly growing area [2].

### 4.1 Wow-Canvas and Its Purpose

Wow-Canvas is developed on the base of business model canvas. The purpose of the Wow-Canvas is to be the method to track how the companies' Wow-factors flow through company. Also there was a need for surveying how the Wow-factors are reached, what kind of challenges there are and where does the benefits come from. In addition, the Wow-Canvas is a tool for examination of the understanding of the Wow-factor in company personnel. The understanding and pursue for the Wow-factors should be common, just like in case of company strategy.

As seen from the Fig. 2 there are nine different components in Wow-Canvas, divided to two categories, internal and external.





**Fig. 2.** Wow-Canvas

#### 4.2 Finding Out with Wow-Canvas How the Wow Flows Through Company

Purpose of the Wow-Canvas is to get the company’s management concretely make clear how the Wow-factor flows through company from every aspect. In addition, when figuring out how the company’s Wow-factor flows through the company, people also automatically starts to think if there is new kind of Wow-factors in the company which are still to be discovered. When using the Wow-Canvas, the company should have information and knowledge which are the unique Wow-factors of the company. The Wow-gap model together with e.g. company strategy, product or service promises, information from production and marketing and other information related to the Wow-gaps are used to finding this information. Nine different components of the Wow-Canvas are explained below.

1. **Current and future customers:** Who are the customers and the customer groups the company has now. To this component also includes what are the future customers and customer groups that the company is focusing.
2. **Unique value promise:** Why is the company and its products better/different from others and that why they are worth of buying/co-operating/investing? This area has to be short, compact, simple and attractive and feed “hearts and minds”.
3. **Challenges and existing solutions:** What are the 1–3 challenges that the company is facing trying to reach the concept of Wow? Also this component includes figuring out which kind of solutions the company already have for those challenges.
4. **New solutions for challenges:** This component is the place where to think new kind of solutions for all of the challenges founded in point 3.

5. **Path of Wow:** How the Wow reach the company's customers and the end users of the product or service?
6. **Value/Capital what Wow brings:** How and how much the Wow brings value/capital to the company. It is also important to figure out the vicinity of the value/capital increase what the Wow brings. It is important when deciding which new solutions from point 4 are feasible.
7. **Cost structure:** Calculate the fixed and variable costs that are generated from pursuing and making the Wow.
8. **Key-/Operation metrics:** Define the metrics that are used to measure the effectivity/productivity/performance of Wow.
9. **Advantage of success:** In this point, target is to found out the outcome from combining the Wow with those facts where the company is better than its competitors.

## 5 Conclusions

The results of this research deepens the realization for the future of the modern business development. Rapidly changing business environments, increasing numbers of competitors and transformation in value creation are forcing the companies to find new ways of develop business faster and more innovative ways. Customers are more and more enlightened of different possibilities and they have more information to use when deciding the product or service provider. For these reasons, it will be even more important to realize and take into account the customers' feelings. The product or service what the company is providing need to give kind of a memorable moment, i.e. Wow experience for the customer. Extremely satisfied customer is a returning customer and a recommending customer.

In this article, we have shown the importance of the Wow-effect, Wow-factor and the Wow concept from the business development and strategy point of view and shown a method, the Wow-Canvas, how to track how the Wow-factor flows through company. Tools eases the pursue for the Wow-factors and enables to find possibly biases and blind spots, the places that reduce or stop the flow of Wow.

Future research should be done to the results that the Wow-factor and Wow-effect really influence on companies turnover and profitability. One important question for the future is how significant the influence on turnover and profitability is, if any, and could the Wow-factor also be harmful in some cases? Research should also be done from management and leadership point of views. How the understanding and use for Wow is affecting to management and leadership processes and results.

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# Finding the Wow-Factor to Enhance Business

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**Abstract.** In every company's business, there should be something really unique that differentiates the company from others, superiorly. In order to enhance company's business and profits, the Wow-factor needs to be found consciously, defined clearly and utilized better. To enhance business by using Wow-factors and its potential, the concept of Wow need to be understood. This article presents the importance of the Wow and how it is connected to company's everyday business. This article also presents one method to find the company's Wow-factor by a case study. Method shows how to give personnel the opportunity to tell their feelings and point-of-views of what is that great, unique and positive thing what the company is doing. Article also deepens the knowledge behind the Wow-factor and why business development should take the Wow-factor into account. Future research needs and actions are handled at the end of the article.

**Keywords:** Human factor · Wow-effect · Wow-factor · Business development · Business strategy · Wow experience · Branding · Company identity

## 1 Introduction

The field of businesses is changing quickly and the competition and rivalry, whether it is the traditional Red Ocean rivalry or quest to find Blue Ocean, is getting harder [1–3]. Customers are becoming more selective and more aware of different alternatives. When number of competitors is only expected to increase and the pace of doing business is becoming faster [3], neglect of the Wow-factor might have quick affect to company's profitability. This is the case no matter what your business is. Only the speed of collapse is difference in different businesses [3].

Competitive advantage is something that should be in the interest of every company in every business field. By finding the Wow-factor, it is possible to touch the customers' intrinsic motivation. That's because Wow-factor touches human factors and feelings.

Probably every company tries to build up a unique identity around them. Focusing to finding the unique Wow-factor of the company and enhancing it, can give to the identity building a boost. Creating the company's business towards a situation where the customers want to use your company's products or services is a path towards unique identity. Focusing to find what kind of Wow-effect the customers want, and using the company's unique Wow-factor to achieve it, makes the plans more prone to result where the customer want to return to you.

From strategic point of view, in the core of everything, the Wow is key to raise of the long-term sight towards loyal relationship with customers. Extremely satisfied customer is a returning customer, and from returning customer forms a recommending customer, which leads to new customers automatically. For companies, it is insufficient to hold on and treat well just their old customers. Quest to find new customers all the time is evenly important. Wow-factor and the concept of Wow is showing signs for becoming a very important topic for making you and your company to come valued enough, so that it deserves the confidence of the customers.

Besides the research made for this paper will also open a case study where the inquiry form to find out company's Wow-factor was tested. The case study was executed as an interview, based personal questioning using inquiry form. Paper also raises topics that emerged during the interviews, how people reacted and acted. In addition, how the interviews and inquiry forms worked to find the companies Wow-factors is described.

## 2 What Is Wow

Wow is a result from the Wow-effect, which can be created by Wow-factors. Understanding the Wow concept is needed in order to use Wow-factors in business development. The Wow is connected to customers' positive feelings when they are dealing with a service, product or company which has a unique affect. Wow-effect is a result of something extraordinary wonderful that the customer was not prepared for. The product or service exceeded customer's expectations in positive way or they were something so exclusive that the customer had never experienced before. Wow-factor on the other hand is not a feeling, it is more like a unique attribute what the product, service or company have. With Wow-factors, it is possible to cause negative or positive initial reaction in a customer or a user [4]. It is even possible to talk about experiencing Wow or anti-Wow, which is an opposite of Wow.

All services, products, companies and their deliverables are different, but all of them can be understood as a business and production processes. Therefore, all of the personnel that are taking part in the processes should have what is the Wow and what the company is doing clear in mind. Personnel should pursue the same Wow and all of the different stakeholders of the company should feel that they are part of the Wow. Everyone can recognize the Wow-effects when they experience those, but the cause of the Wow effects, the Wow-factors, are like good quality, and just like quality, the Wow-factors can be very difficult to define unambiguously [4].

## 2.1 Importance of Wow-Factor in Business Development and Strategy

One of the main purposes of the Wow concept is to differentiate the company from its competitors, superiorly. Potential for developing business and results by utilizing company's unique Wow-factors can be huge. Bringing Wow to business and its strategic development raises the customer point of view to be more important. Key factors behind understanding the potential and possibilities of the Wow-factors are positive attributes of the Wow concept and the open-minded thinking. It is possible to give customers more than they expected, by understanding the potential and possibilities of the Wow-factors.

There is no clear answer to a question "what is strategy", because strategy has differing scope, it appears at all levels of organization and it holds different purposes, goals and objectives. At business level, key purpose of strategy is to provide business with competitive advantage over competitors. It is possible to obtain competitive advantage by carefully analyzing internal strengths and weaknesses and identifying the threats and opportunities of the external environment [5]. Strategies becomes more important than before [6, 7], because business environments are constantly changing [3, 6]. Social, technological, economic and political macro environments are changing rapidly [3] and because of that, the companies need to raise the important question, does the company have a relevant strategy [7].

Because customers' needs are changing constantly, companies need to be able to provide genuine value for the customers, enhance and develop ways to try new things fast, create new ideas and models and learn from mistakes [8]. To provide competitive advantage to companies, it is suitable to connect the concept of Wow to improvement of the business models. Company might be able to improve its services or products to be seen superior and more desirable in the eyes of the customer, when company focus to find the unique Wow-factors and systematically develops them.

In order to get the Wow experience, there should be something for the customers that exceeds their expectations. The Wow-factors and Wow-effects are important when creating pleasant surprise or experience for customer. Positive nature of the Wow concept and open-minded attitude are the key elements to indicate the needs of customer thoughtfully and unexpected ways. Including connection with emotion to generosity, empathy and gratitude. Also in industrial product and business development, the Wow experience is said to be important for creating the excellent positive user experience [9, 10].

## 3 Finding the Wow-Factor

Businesses typically are like snowflakes to average consumers. They all look similar in the eyes of a consumer even they all are unique. As mentioned before, it is important to attract the customers and raise the interest towards business so that they see your business positively different from others. The Wow-factors are for aid in this, it won't only separate you from your competitors, but separate you superiorly [4]. That something unique already exist in your company, it just need to be found, defined clearly and after that, shared to everyone.

It is probable that every company wants to create certain kind of brand and a reputation, where the product or service what the company provides, exceed every other ones in the market. Overall, company already have the Wow-factor, employees and customers have already heard from it and they like what they have heard. Developing the Wow concept just needs to be done systematically. When all of the topics mentioned before are figured out, it is possible to turn business to a path where everyone of the customers feels that they are fortunated to be able operate with company.

The Wow-factor offers opportunities for every company that experiences challenges on a certain market area. Opportunities comes from a possibility to differentiate the company from others on the competition of those customers, which seek other than just a price [4]. Even a one positive experience can lead to situation that the customer comes back to you. Over time, these positive and contiguous experiences lead towards to customer loyalty, which is the strongest connection with customer that can be. For company, the first thing to do is to examine what kind of the Wow-effect the company is supposed to create for a customer. As a base for founding this, company's vision and mission are good places to start. After there is a clear picture what the Wow-effect is, it is possible to start to focus on the Wow-factors what can create the desired Wow-effect. If there is contradiction between the Wow-effects and Wow-factors, then the result of what company do, is not exactly what is wanted.

### **3.1 Wow Comes from Inside of the Company**

Identity of a person or a company is the brand of the company. So changing trends among competitors shouldn't dictate the identity of them. What is promised to customer should be delivered to customers, is brand promise [11]. The Wow-factor comes from inside of company's culture [4]. Culture reflects company's history, philosophy, shared values and beliefs, and leadership. Company's culture drives the behavior of the employees, it inevitably affects whether they hinder or support desired change [11]. There has been signs that solidity and authenticity are those attributes that enables professional and businesslike Wow-factor. True Wow isn't just hype, it's much more, because the customers see through even the best marketing strategy, if actuality is not aligned to marketing. The Wow-factors comes inside company and everyone in the company are affecting to it [4]. It is important to remember that everyone in the company contributes something to the results, even thou they wouldn't be in direct contact with the customer [11].

Wow-factor could have huge positive impact to the productivity of the company. Which are the feelings of the target group, and plan the Wow-factor to serve those, is the key. To reach the full potential of the Wow, not all of the efforts should be focusing to affection to feelings of the customers. The Wow-factor can't be reached if the employees aren't motivated and respected. Because from marketing to sales, from product development to production, every single one of your employees represents your brand [11, 12]. Hence the Wow should be transmitted to employees by using internal marketing of the Wow-factors. Even if there is a connection between the marketing Wow-factors to well-being of employees, it should be kept in mind that internal marketing is an investment for a long-term strategy and for creating a genuine



and deep connection with employees [11]. The employees play a key role in building relationships between all the stakeholders of the company [13].

### 3.2 Back to Basics

Some of the best brands are usually most simple. Average consumer expose to a great amount of hustle that they won't need that much. They need something that has that kind a familiar feeling, something they can count for. Companies should remember that they can't offer everything for everyone. This is the point where to start to create the company brand [11]. Branding is about creating attractive and positive images that sells, i.e. influencing consumers [14]. Everything starts from recognizing and learning more from what the company do and why. When developing the companies' Wow-factors onwards, it is good to keep clear in mind, what makes the company unique and how the Wow-factors are reflecting the company's vision and mission. Answers to those questions should be "pure" and in line with the reputation and values that the company has created. It also should kept in mind that the purpose of brand is not to represent the company statically. The value of a brand reflects involvement or ownership in a service or product by the owner [15]. Brand is a coherent way to remind the customers about values that are important to company.

Customers who love the brand are more willing to talk good about company, these customers are more loyal and they resist better negative information about company. Topics mentioned above makes brand lovers a critical target for companies [16]. Ensuring good balance between the costs asked and product offered the companies could avoid negative customer experience. Company should consider costs, not only from financial point of view, but also from psychological and social view [17].

### 3.3 You Are Your Own Brand

It is important to remember that when customers decide to buy from your company, they decide to buy from you. Now, when the technological, social, economic and political environments are changing faster than ever, the remembering the provider comes even more important [3]. Now a days, customers probably don't have any high expects that the company which products or services they are using, will still do business after. let's say, ten years. Customers will not seek long time relationships to companies they seek long time relationship with character. Brand is something what comes to minds of the customers, when they hear the name of the product or the company [11].

There is a difference between retail and service brands. While retail brand offers both, products and service extent, the service brand sells intangibles [18, 19]. Still, the brand is not a straight way to provide profit, but it is an important matter to provide intangible value for the company. Building a brand through the Wow-factors raises the chance to reflect the reputation of you and the company for customers. It also reflects that your customers are one of the most important asset to your company. Topics above are those that leads to confidence among the customers. When customers have

answered to your brand by choosing your company, they reward you by using your services or products repeatedly, and by recommending you to others. The Wow-factors can be linked to company's brand. If brand is used rationally the customer experience can be personified and the product or service can provide a point for customer where s/he can feel to be involved i.e. to be part of the products or services entirety [20].

Where the brand represents you and your company, it is still good to remember to direct the brand towards customers. In today's connected society the engaged customers are strategically positioned to extend the good knowledge from you and your company [21]. By giving the customers more than they expected, by using the concept of Wow, it is possible to have an influence to their feelings. One of the key for companies is to know how to find out the customers behavior that goes past the using, purchase and satisfaction with the product or service [21]. Customers that have a strong relationship for you and your company's brand will defend and counter-argue the upcoming negative information towards your brand, and maintain positive attitudes and intentions to buy and use your products or services [22]. The positive brand relationship of the customers is important to maintain, especially with the Wow-factors and the concept of Wow. Negative information about your or your company's brand can be seriously harmful to company's brand by changing customers' emotions and attitudes against your products or services [22, 23].

The Wow-effect caused by Wow-factors can be linked to a something positively unexpected emotional based feeling [4]. There are three components that form the emotion, a physiological response, subjective experience and expressive or behavioral response [24]. Brakus et al. approached brand experience by dividing it to four different dimension; sensory (as in multisensory), emotional (passion), intellectual (cognitive) and physical (action) [25]. Therefore, brand's connection to the Wow-effects and to the concept of Wow is obvious.

## 4 Case Study

Six companies, from different kind of business fields, participated to case study. Organizations were event organizing company, machine technology company, regional research and development organization, working premises provider (real estate), language technology company and regional museum center. The case study completed as an interview based personal questioning by using inquiry form. The interviews were done for 1–4 different person in the company, depending the company's size. Interviews were done with two interviewer. Persons from every company was selected to the interview so that top management, production, sales and marketing, and regionals viewpoints were covered. Timeframe for the interviews was 45–60 min per interview per person. The purpose was that the person answering to questions, don't have too much time to think the answers but answers to the questions intuitively using those what first comes in to mind. In the interview situation interviewers highlighted to the answerers that there isn't any wrong answers and that the purpose of the questions is not to try to find any flaws, but to find those genuine good things from the company's point of view.

During the interviews, the important matters considering company's Wow-factor, were picked up and wrote-down for the later analysis, done on the base of the inquiry form. Company specific form was combined from individual answerers' results for each company.

#### **4.1 Inquiry Form, Analyzing the Answers and Benefits for the Companies**

The inquiry form consisted five different questions: (1) What is Wow in general operation of the company, (2) What is Wow in business/earning method of the company, (3) What is Wow in the technology/systems/methods that the company is using, (4) What is Wow considering the company's customers, and (5) What is Wow considering the regional effectivity of the company.

Analysis of the answers were made by combining each of the company's persons answers together. Then company specific answers were categorized with numbers from one to four, how well those were aligned to the theory of Wow. If the huge differences emerged between the different answerers in views of the Wow-factors, compared to the result what the company should be doing, the conclusion was that entirety of company's mission, vision and the Wow factors was not clear. Resolving these differences in the views of the Wow-factors and unifying the views for personnel, the company has a better chance to improve further its operations. In addition, the interview clarified to the answerers the viewpoints of the company and what the company should really be doing and why. This had an impact also possibilities to find new opportunities and innovations.

#### **4.2 Interviews**

With the inquiry form and the different answers around the Wow topics found in the interviews the company based Wows were able to create. Because the Wow touches people's feelings, it was important in the interviews, that the answerers could tell their own feelings regarding what are those great, unique and positive things what company is doing. During the interviews, it was every time the same situation, in the beginning of the interview the answerers were a little bit introverted. This is understandable because the question was related to their own feelings. After the answerers noticed that interviewers were actually asking those great unique and positive things from them, answerers kind of changed to extroverted stance and started to feel enthusiasm for the Wow concept. Some of the answerers even forgot the elapse of time and were surprised after the time for the interview was up. Created company based Wow analysis was sent to companies afterwards.

## 5 Discussion

The discussion around the Wow concept is complex and multilayered. In branding, sales, marketing, and even in production the staging and organizing the Wow concept and attributes affecting to it, can be thought as a new research area. Overrunning the individual expectations of the company's customers seems to be relevant to the experienced satisfaction [26]. This makes the Wow concept probably one of the most important correlates for many research-oriented aspects of branding, marketing and sales. The proportional dissemination of the customer experiences through the ways of social networks is becoming more challenging. [27] Many of the newest marketing, service and branding issues and terms e.g. [28] the “customer journey” [29] “words of mouth”, or even the “customer satisfaction” can be examined as effects. This way these topics can be connected to Wow concept. Understanding the positive and unique nature of the Wow concept, and its enormous potential to branding, marketing and selling seems to be remarkable. Due to the immaterial side of products and services, the Wow-effects and the Wow-factors could be one of the most important, if not the only differentiation criteria when influencing or even creating the unique selling proposition to customers. Companies' knowledge of their positions in relation to markets, suppliers, competitors, gives them a chance to be proactive [30]. The Wow concept allows utilization of many powerful and modern concepts, and it provides forceful and holistic insights into business and to its development. In future, the level of information intensiveness is only raising and the partner network in business and managing the networks becomes more challenging [31]. With the Wow concept, it is possible to touch the humans' intrinsic motivation, because the Wow touches human factors and feelings. Since every company have its unique Wow factors, and companies' internal and external processes and customer relationships consist humans, and every human has own personal features and feelings, linked to the Wow, the importance for taking the Wow into account to all levels and operations, is obvious. To understand and reach the full potential of the Wow concept, it needs to be approached with open-minded and positive attitude.

### 5.1 Future Research Issues

The results of this research and case study gave insight for how to find the unique Wow-factor from company and how important the customers' feelings are in the future. The very promising connections between the Wow concept and business, management and human aspects still have to be researched more deeply. In addition, one of the future research topics should be how can the Wow be connected to the profitability of the company, how remarkable the impact of Wow-factors and Wow-effects are to the companies' profitability, and can the Wow-factors be negative in some cases i.e. are there also anti-Wow?

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# Relationships Matter: Directors and Revenue Performance in the Fortune 500 Network

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**Abstract.** Conventional wisdom states that relationships matter, thus interlocking directorships among corporations has spawned a vast amount of studies. Built on our previous research that discovered director interlocks are correlated with Fortune 500 ranking, this paper further explores the relationship of director interlocks and corporate revenue performance. Controlling for standard firm financial performance measures of GPM, S&P returns and number of employees, we look at various social network metrics from director interlocks, including degree, betweenness and closeness from the Fortune 500 network from 1996–2007. Here we employ a fixed effects, panel OLS model to analyze both if and how director relationships impact firm revenues. Our results indicate that director relationships are as important as traditional corporate measures and can almost double the explanatory power of Fortune 500 corporations' revenue performance.

**Keywords:** Network analysis · Fortune 500 · Board membership · Director interlocks · Corporate performance · Revenue performance

## 1 Introduction

“Business is not just doing deals; business is having great products, doing great engineering, and providing tremendous service to customers. Finally, business is a cobweb of human relationships.” – H. Ross Perot

Although casual colleague conversation and conventional business wisdom states that director relationships matter, exactly how do they matter is a scientific endeavor. Board memberships are critical to large cap success, providing corporate governance and oversight as well as access to sectoral knowledge, management expertise and capital. Boards of directors also assist firms to operate efficiently and deal with changing market conditions. As past research has asked, is it revenues or relationships; what you know or who you know that matters?

Interlocking directorships among firms has spawned a vast amount of both theory and research. These range from firm operation, to the effectiveness of corporate governance and oversight, as well as how and why one individual sits on another company's board. Directors can help shape corporate organizational behavior as well as impact fiscal outcomes and market performance. Several scholars highlight the

importance of directors in the roles of creating strategic alliances [1, 2], supply chain management [3, 4], access to capital resources [5–7], and performing independent oversight functions to protect shareholder interests [8–11].

Network analysis measures relationships and ties with other actors within a network by focusing on how the structure of ties affects individuals and their relationships. Here it quantifies flows between people, groups, organizations or other information/knowledge processing entities. Network analysis connotes complex sets of relationship between members of social systems at all scales, from interpersonal to international. Compared to traditional statistical analysis, unit attributes are not the main focal point. It is the intertwining of relationships with other units within a network that tells an additional compelling story. The structure of a social network determines an individual's position and status within the network. Subsequently one can derive contextual information such as individual power, relative power, social status, strength of relationships and their influence on individual units in question. Thus network analysis is a seemingly natural methodological companion to understanding director interlocks and subsequent firm performance.

In this paper we focus on how firm level financial indicators, board compositions and connectivity impacts revenues directly. As traditional financial indicators are key corporate performance indicators, we seek to understand the additional impact that Fortune 500 interlocks provide from a network analysis perspective. We econometrically benchmark key business drivers such as number of employees, GPM, and S&P returns that influence revenue performance, and then employ several network analysis metrics of centrality to show how interlocking directorships impact revenues over time. We then subsequently employ a fixed effects, panel OLS regression technique to estimate the various impacts of business and Fortune 500 network metrics on firm revenues.

## 2 Past Work on Directorship Linkages

A wealth of studies on director interlocks exists across management, organizational behavior, economics and sociology since the 1970s. Most of the literature falls into explaining why interlocks form or their impact on corporate behavior and outcomes. Boards are seen as an instrument for a firm to deal with its environment [12], as corporate governance bodies that provide access to information or capital resources. Directors possess expert knowledge and build up both formal and informal connections between firms. Despite different rationales and effects for interlocking directorates, most research agrees indicating that interlocks are associated with diverse corporate behavior.

Some director interlock research starts from the premise that access to resources simulates interlock formation. Here the focus is on both positive and negative factors of collusion, co-option, legitimacy and cohesion for interlock formation. Among others, both Mills [13] and Davis, Yoo and Baker [9] focus on the sociology of corporate actors and point out social cohesion among 'power elites' as a key factor in board formation. Continuing with the positive impact that director interlocks could potentially have, Palmer [14] suggests that diversified boards are more likely than others to facilitate formal coordination, such as profitable strategic alliances or joint ventures.



Hillman and Dalziel [11] view interlocking corporate directorates as a gateway to accessing more and higher quality of information that flows through entire Fortune 500 network. Both of these studies help support the relationship between director interlocks and better firm level outcomes, viewed through increased information quality, reduced uncertainty and ultimately profitability.

Useem [15] as well as Mintz and Schwartz [16] first employed quantitative approaches based on networks of overlapping directorships to explore the decision making power of such networks. Tracing the development of corporate networks, Mizruchi [17] provides an overview of interlocks research, focusing on director memberships from monitoring, legitimacy and career advancement perspectives. He also finds that US interlock networks consistently connected in under five steps, less than the conventional ‘six degrees of separation’ notion. Additionally, there is evidence of director interlocks as causal mechanisms for corporate control, M&A and investment activity or poison pill tactics.

One key question that remains is both if and how relationships, interlocks and directorships can actually translate into revenue performance. Thus profitability of interlocks is another large area, although there is little consensus on the results [1, 18, 19]. Past work by Baysinger and Butler [19] find a positive effect of interlocks on profitability. Richardson [20] finds the opposite showing that unprofitable firms are more likely to form interlocks. In a sample of 452 large U.S. industrial corporations between 1984 and 1991, Yermack [21] finds that small boards with less connectivity and interlocks are more effective. As a larger board implies the existence of greater opportunity for a firm but albeit at a significant cost that does outweigh the benefit. Below we provide a brief introduction to understanding board memberships in different relational contexts with network analysis measure that can help explain revenue performance before we empirically test the results of director interlocks on revenue performance.

### 3 Network Metrics and Hypotheses

To fully understand revenue performance, we argue it is necessary to explore individual firm attributes, such as S&P returns or GPM, combined within the structure of director interlocks. The structure of the social network determines an individual’s position and status within a network. Centrality measurements in network analysis quantify graph theoretic notions about actor’s prominence within a complete network by summarizing the structural relations among all units. Here we employ three particular measures, defined by degree, betweenness and closeness metrics. In our study, nodes are Fortune 500 companies while the links show the strength of director interlocks due to sharing of the same board member(s). As traditional financial indicators are obvious key corporate performance measures for the Fortune 500, we seek to understand the additional impact of interlocks from a network perspective. The power of the network paradigm is that resulting control over outcomes is relational. Firms are connected to each other according to different types of dependency such as trade, information, conflict, exchange, etc. Thus, we posit both if and how these relationships can matter.

**Hypothesis 1:** Director interlocks as measured by various SNA metrics can impact corporate revenues.

Degree centrality measures the number of ties to other actors in the network. In our context, degree counts both the number as well as strength of interlocks via board memberships between companies. If company A has five directors but those directors do not sit on any other Fortune 500 boards, that company would have a degree value of zero. This would indicate isolation in the Fortune 500 network. If company A has five directors and four of them sit on other fortune 500 boards, then Company A would have a degree value of four if those other directors did not sit on any other additional Fortune 500 boards.

Companies with directors that have more connectivity to other Fortune 500 companies (high degree) should possess more firm specific options and opportunities, while being less dependent on other companies for access, which might lead to better revenue performance.

**Hypothesis 2:** The number of director interlocks (measured by degree) leads to better revenue performance.

Increasing degree should have a positive impact on revenues due to better firm specific information and knowledge acquisition relative to other competitors.

Our second network measure is betweenness centrality, which intuitively captures the extent in which a firm is in between other firms via director interlocks. Betweenness is measured by the number of shortest paths from all firms to all others that pass through a firm via interlocks. Companies with high betweenness values might possess better information, resources or access due to their connectivity amongst other firms. More exchange and bargaining power can lead to a broker type role.

**Hypothesis 3:** Firms that are in between others (measured by betweenness) should have better revenue performance due to being a broker or hub in the Fortune 500 network.

Our third network measure is closeness centrality. This measures the extent to which a firm is near other firms in the network via director memberships. The logic here is that firms that are able to reach others via shorter director interlocking paths should have better access to resources and knowledge than firms that do not. Closeness measures the extent to which a company is near other firms in a network, meaning how fast a company can interact with others via its interlocks. Firms with higher closeness scores should have faster rapid access to others within the Fortune 500, possibly impacting revenue opportunities and performance. We also suspect that changes in closeness could also have an impact on revenue performance, as becoming more central in the Fortune 500 network could possible improve revenue performance.

**Hypothesis 4a:** Firms that are closer to others in the Fortune 500 (measured by closeness) should have better revenue performance due to quicker directorate access to other firms.

**Hypothesis 4b:** Firms that improve their central location in the Fortune 500 (measured by differenced closeness) should have better revenue performance.

## 4 Research Design

We collected Fortune 500 company level business data from 1996 to 2007. These are U.S. incorporated companies including private companies and cooperatives that file 10-Ks, as well as mutual insurance companies that file with state regulators. The data spans nine business sectors: agriculture, mining, construction, transportation & utilities, wholesale, retail, finance and finally services. Since companies can enter or leave the list, our final sample includes 758 firms over 12 years, for a total  $N = 5648$  observations due to missing data. Financial variables are included in order to benchmark corporate performance- revenues, employees, Pretax GPM, and S&P Return- from various sources, including Mergent Online, Hoover's and Wharton Research Data Services.

To capture director interlocks, we first obtained the director names for each company. We then coded a  $500 \times 500$  adjacency matrix for 12 years that looked at how many common directors sat on other firm's boards. For example, firm A and firm B do not share any director interlocks, so the value in the adjacency matrix is zero. However, for firm C and firm D, since they share 4 common directors, we coded a value of 4 for the adjacency matrix. Director interlocks indicate not only the presence, but also the strength of ties across companies if multiple members of one company sit on the board(s) of others. We then calculate our four social network metrics of degree, betweenness, closeness and differenced closeness. Our sample decreases to  $n = 2386$  due to companies that are isolated with no direct connections to others in the Fortune 500 would not generate any useful network metrics.

For example, degree shows that on average, companies have seven board members ties to other Fortune 500 members. The maximum degree value is 38 for Chase Manhattan in 1998, which of course is larger than the size the board, as this indicates that directors can sit on multiple boards and those who do bring multiple connections to a company. On average, companies in the Fortune 500 are close to 133 director paths. For example, Sara Lee has the maximum closeness 183 in 1996, but in 2007 the maximum value is 3 M with the score 168.

We employ a fixed effects OLS estimation approach as our data is for Fortune 500 companies over 12 years. The fixed effects approach allows us to capture company variations over time. We perform three econometric models, first benchmarking our business variables on revenue performance, then regressing our network metrics on revenues and finally looking at the combined effects, comparing and contrasting the explained variance and coefficients.

## 5 Data and Results

We use company-year as unit of analysis, as it is the most granular data suitable for this type of approach. Table 1 shows the summary of descriptive statistics for our dependent variable and independent variables, including key business drivers and social network variables for the Fortune 500 from 1996 to 2007. There are more than 5600 observations in the dataset, although with missing data and normalization transformations our final  $N$  will drop significantly.

**Table 1.** Descriptive statistics

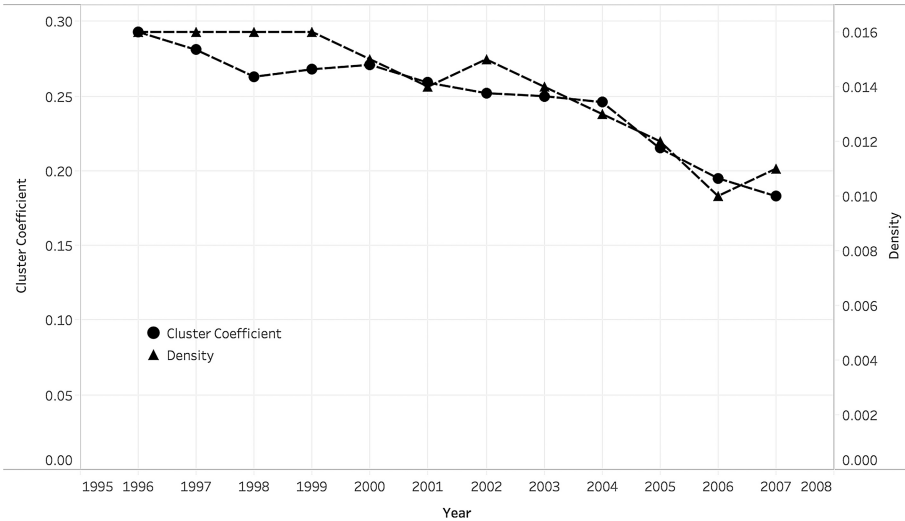
Variable	Obs	Mean	S. Dev.	Min	Max
Revenue	5,647	2.220	0.867	-1.171	5.861
Employees	5,207	3.312	1.110	-2.040	7.650
GPM	4,647	8.510	12.687	-146.1	99.93
Return	5,662	0.000	0.001	-0.001	0.001
Degree	5,662	6.728	5.553	0	38
Betweenness	4,432	1.201	1.327	-4.605	4.048
Closeness	4,779	3.385	0.822	-4.566	11.597
d.Closeness	2,647	1.508	1.205	-5.990	10.059

Besides network level attributes that we will discuss below, some node level attributes show a significant decline in levels over the course of our sample period. For example, degree, which measures the number of direct connections, has an average decrease of more than 30%. Boeing lost almost half of its direct connections within 4 years and both Ford Motor and Verizon Communication also shared a similar experience. It took Procter & Gamble 9 years to have the same rate of drop, but they started at a relative higher level.

Betweenness is the only network attribute that increases from 1996 to 2007. This phenomena is also correlated with the decrease in degree connectivity. Since companies are less connected and the whole Fortune 500 network seems to becoming less dense over time, each existing connection naturally plays a more important role. When previously connected firms are no longer connected, the firm that has direct ties between companies start to serve as a bridge, which increases their resulting level of betweenness. Both 3 M and Sara Lee are two specific examples that had peak betweenness in early 2000s when the overall density of the network is only about 75% the level it started with. On the other hand, companies such as Chase Manhattan and Verizon Communication that possessed high levels of betweenness in late 1990s declined significantly due to their large number of direct ties lost in later years.

Closeness, which measures how fast a company can reach other companies in the network, shows a different pattern. Interestingly, there is no significant change in the level of closeness over the 12 year period of our sample.

Figure 1 shows the trend of overall network level metrics in the Fortune 500 director interlocks from 1996 to 2007. We choose to use density and clustering coefficient, as those two network metrics help indicate the overall pattern of connectivity. Density is the overall measure of how dense the Fortune 500 is connected via director interlocks each year. It is calculated as the actual number of connections divided by all possible connections. The level of density has been consistently low over our sample period, and keeps decreasing over time, from 1.6% to 1.1%. Clustering coefficient measures to what extent nodes in a network tend to cluster together, so it can be seen as a good indicator of how concentrated the neighborhood is. The level of clustering coefficient shows 30% of the connections are connected at the beginning of the period but it decreases to less than 19% by the end of the period.



**Fig. 1.** Fortune 500 interlock density and clustering coefficient trends, 1996–2007

As we found previously [22], one possible explanation for decreasing connectivity in the Fortune 500 director interlock network could be the consequence of mergers and acquisitions in the late 1990s. In addition, with the development of globalization, it is also likely that those Fortune 500 firms are connecting more to international companies not included in this partial US-centric network.

Table 2 reports our fixed effects estimation results on revenue, with variables rescaled and transformed to correct for heteroskedasticity, nonlinearities and outliers. Model 1 contains financial control variables only, including number of employees, pre-tax GPM and S&P market returns on increasing or decreasing annual revenue. All the independent variables are significant at 99.9% confidence level.

First we can observe that size of the company has a positive impact on revenue. Similarly, pre-tax GPM also improves revenues, though the magnitude is much smaller. Unsurprisingly, S&P return has the largest effect among all financial variables in the model, significantly impacting the companies’ revenue generation. The within  $R^2$  from the mean-deviated regression on the transformed data indicates 31.85% of the variance is explained by Model 1 using financial variables only.

In Model 2, only the network variables are included to see the impact of director interlocks on revenue alone. We focus on centrality measures including degree, betweenness, closeness, and change of closeness. Those network variables are appropriate indicators on measuring how well directors are positioned in the network in terms of interacting with other firms.

First we can see that all our network variables are significant in Model 2 are highly significant, indicating that director interlocks, as measured through social network metrics, do impact revenue as postulated in Hypothesis 1. Interestingly, our network variables regarding director interlocks alone explains 32.78% of the revenues, which is slightly more powerful than traditional firm level financial variables alone. More

**Table 2.** Fixed effects estimation results on fortune 500 revenue

Revenue	Model 1	Model 2	Model 3
Employee	0.6030 <sup>***</sup> (0.0150)		0.5287 <sup>***</sup> (0.0246)
GPM	0.0035 <sup>***</sup> (0.0005)		0.0003 (0.0009)
Return	-59.6663 <sup>***</sup> (7.4640)		-61.3964 <sup>***</sup> (10.6777)
Degree		-0.0232 <sup>***</sup> (0.0029)	-0.0252 <sup>***</sup> (0.0028)
Betweenness		0.0869 <sup>***</sup> (0.0095)	0.0656 <sup>***</sup> (0.0092)
Closeness		0.4732 <sup>***</sup> (0.0186)	0.3478 <sup>***</sup> (0.0193)
d.Closeness		-0.0412 <sup>***</sup> (0.0065)	-0.0243 <sup>***</sup> (0.0061)
_cons	0.230 <sup>***</sup> (0.0513)	0.9043 <sup>***</sup> (0.0678)	-0.4566 <sup>***</sup> (0.0917)
<i>N</i>	4471	2386	2010
Within R <sup>2</sup>	0.3185	0.3278	0.5096
Between R <sup>2</sup>	0.3163	0.0111	0.3365
Overall R <sup>2</sup>	0.3801	0.0282	0.3541
F	595.3718	226.4344	232.3501

Standard errors in parentheses.  $p < 0.05$ ,  $** p < 0.01$ ,  
 $*** p < 0.001$

specifically, degree and change in closeness negatively affect revenue, while betweenness and closeness give positive impacts. This indicates that the quantity of connections does not necessarily increase revenue, which may be resulting from the cost of developing relationships. However, the quality of connections helps increase revenues, as the effectiveness of director's reaching resources is critical to a firm's productivity and financial outcomes.

Model 3 in the last column shows our regression result with both financial variables and social network variables. Most importantly, model fit is superior compared to the first two models, with 50.96% of variance explained by all variables together. This result confirms that financial variables still significant impact Fortune 500 performance even when director interlock taken into consideration. In addition, relationship between board members also matters, as more connections are likely to result in higher ranking. The impact of GPM washes out, but all other variables are highly significant and all coefficients remain the same direction and similar magnitude as each set of the variables run separately in the first two models. Size of company, measured by employee number unsurprisingly has a large positive relationship with revenue, while S&P return gives the largest negative impact.

All social network measures hold their affects, confirming that even with all financial variables taken into consideration, the impact of relationship is unique and substantively significant. Specifically, Hypothesis 2 relating firm degree with revenue performance is actually negative while betweenness centrality of Hypothesis 3 is confirmed as having a positive impact. Hypothesis 4a is supported as closeness is positive yet Hypothesis 4b is interestingly not supported as the change in closeness is actually negatively related to revenues. These results lead us to surmise that firms with directors that are efficient in reaching resources are likely to be associated with higher revenue firms, yet there is a cost for enlarging their network, which may hurt revenue generation.

## 6 Conclusion

To help ascertain both if and how board memberships matter for firm revenue performance, we explored the both traditional firm financial controls as well as firm connectivity. At the network level, we find that overall Fortune 500 connectivity declined during our 12 year sample period. The network seems to becoming more sparse over time, with firms less efficient in terms of connectivity. On average, the number of direct connections measured by firm degree also is decreasing over time.

At the firm level, our empirical results show that both conventional financial variables and relational variables affect a company's performance, and their impact is approximately equal. More importantly, their combined influence almost doubles the explained variation in firm revenue outcomes. Specifically as our degree and differenced closeness results show, the quantity of connections does not necessarily increase revenue, and shows the potential cost of developing such relationships. However, our results on betweenness and closeness strongly support the positive relationship between interlocks and firm revenues. This helps increase firm revenue performance and might be critical for an organization's successful development.

Director relationships can and do make a difference, yet this work is just a start to increasing the explanatory power of contemporary directorate interlocks. Possible next steps in this research include focusing on the interactive effects of firm fiscal performance with network connectivity measures to tease out the marginal effects of each. Additional work should also extend the firm level analysis here combined with both macro-economic indicators as well as network level analysis. This could help shed light on possible market trends, merger and acquisition activity and corporate governance performance. Clearly our work and that of other researchers indicates the fruitful exploration of the interplay between business performance and board memberships. Thus to answer our initial glib question, is it what you know or who you know, it seems both are important.

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# Universities of the Future: Universities in Transition Under the Influence of Stakeholders' Changing Requirements

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**Abstract.** Along with the changing expectations of the environment, higher education institutions are subject to modifications of management strategies. They have shifted from simply satisfying customers to a much higher goal – to creating value for stakeholders. Constant analysis of the changing needs of stakeholders can provide knowledge on how to modify the offer of the university as well as its pro-social activities. But in order to fully analyse the environment, institutions of this kind should also examine the changing group of their stakeholders. With the prevalence of social media and the increasing geographical range of prospective students, the groups of stakeholders who come from completely new environments are expanding. The degree of reaction of universities to these demands seems worth examining. The article is about how universities were being forced to reconsider their role in society and redefine their relations with stakeholders. The article was based on an analysis of the literature.

**Keywords:** Stakeholders · Strategy of a university · Management · Social responsibility

## 1 Introduction

Universities, for many decades, were in fact, isolated from their socio-economic and political environments. With vast changes in societal needs and globalization, nowadays, institutions of higher education have to demonstrate their relevance to society. This action may be seen in the attempts to integrate universities with stakeholders through involving them in participation in the life and development of the institution [1].

As the groups of university stakeholders differ from each other, the institution itself should not only identify their stakeholders, but also recognize their respective different needs and demands. It should be mentioned that universities, traditionally, have focused their attention on some specific stakeholders like academic teachers, donors, university managers, accreditation institutions, and, last but not least, students. But the thing is that this list of stakeholders, long as it is, is not exhaustive [2, 3].

Along with the changing expectations of their environments, higher education institutions are subject to modifications of management strategies. Limited budgetary resources in the vast majority of countries do not allow the current model of the

institution to last. Constant contact with the market, listening to the needs of the environment are the basic models of market economy. The complexity of funding sources of the university require that ongoing research and teaching activities are in demand on the open market. At the same time growing awareness of the power of social expectations and the universality of social media result in greatly increased and rapid exchange of information with the public. Constant and thorough analysis of the needs of stakeholders' concerns should also take into account whether and to what extent this group is homogeneous, and how much the 'new' stakeholders declare other new needs. The degree of reaction of universities to these demands seems worth examining.

## **2 Monitoring of Changes in the University Under the Influence of the Environment**

The stakeholder theory, after its appearance in the 1980s and its further development during the next two decades led it to be spread among academics as well as business practitioners. The new model of treating shareholders, employees and clients as crucial parties for the company core activities let them become one of the most valuable company assets [4].

This theory became highly useful for organizations with dispersed power, where universities fit perfectly. The management of stakeholders is crucial in the educational industry for the empowerment and influence of the leading stakeholders – students. It may also be helpful to understand the needs of varying communities in the university's surroundings and the complexity of relations between organizations and communities [5, 6].

It is a widely known truth that institutions of higher education have to focus their efforts on integrating the emerging trends and attempt to adapt their educational offer to support new generations of students by persistent updating of goals and resources to meet the changing challenges [7].

In order to make a step forward and improve their activities, universities are prone to use the stakeholders' analysis tool. An example from Croatia showed that this kind of analysis allows for significant improvement in the education system. Following the changing environment, universities should also recognize the need for improvement of their entrepreneurial style of leadership. The presence of professional management as well as social responsibility would be a good reaction to changes [8].

Organizations in different parts of the globe are being exposed to the notion of social responsibility and are under pressure to adopt 'society friendly' practices. These practices differ depending on national cultures and/or institutional and market realities. Managers, as the research shows, clearly observe changes in social needs. Social contracts are being changed due to globalization and stronger orientation on the role of business in a society with increasing expectations [9].

The inflow of changes in the higher education industry is driven by new technologies, a complete shift in the labor market, rising costs of education and a narrowing range of specialization of universities. With the globalization of the education market, new players have entered the business, which shifted the competition level in this industry from low to high [10].

The way the deans' leadership has had to change due to market requirements could be presented as an example of globalization. Some of the activities had to be decreased, mostly those less effective ones, followed by a complete modernization of the educational offer with focus on creativity and entrepreneurship [11].

A 2010 research conducted in one of the public universities from Portugal, listed in the middle of the ranking-list of universities from this country, showed that, among many other interesting findings, there was a spread of the stakeholder concept to areas other than management. Another finding stated that the students were the most valuable university stakeholders. The latter finding was already widely known by the university managers, but not shared by surveyed staff representatives [12].

Another research done on students from eleven (out of fifteen) Portuguese state universities showed that universities are often at fault in the level of attention paid to students as traditional stakeholders. The results showed that for students it is fundamental to establish a strong relationship with the university. The university's connections with the job market are of equal importance for them [13].

Generally speaking, students should have the feeling of belonging to the university community. The opportunities for students to engage in different activities, ranging from work commitments, through placements, to the planning of courses, might increase that feeling. It is important to successfully balance students' expectations and curriculum planning, taking into account the students' understanding of what is good for them [14].

In his paper K. Leja proposes strong binding to organizational culture and values as well as to social responsibility. Those two actions will mean that the university is becoming a flexible organization [15].

CSR reporting is useful in providing a set of information. Compared to other forms of reporting, like financial reports, CSR is in its infancy. The existence of different standards also limits its comparability [16]. There is a huge potential for growth and development in the way organizations express their actions to stakeholders. It only lets us underline the meaning of information and reporting itself for society and stakeholders.

As Piotr Wachowiak writes, 'identification and selection of issues which are most significant from the stakeholders' point of view is one of the most important tasks to be carried out by the team preparing the report' [17]. The report itself presents the relation between the results of an organization in the area of social responsibility and its strategy.

One of the main reasons why reports are prepared is to provide a wide and complete set of information for stakeholders presenting the wide range of actions predicted by an organization. It makes it possible to evaluate the current situation of an organization or even a whole sector of economy [18].

To fulfil the needs of stakeholders of a particular organization is one of the most important goals of an institution. The main problem is how to manage the stakeholders as a whole group in a way which reconciles their divergent interests [19].

Society pays attention to organizational behaviour not only through observation or media releases. The most useful form is reporting. From the point of view of the organization, it is also known that social reporting is used as a corporate communication instrument [20]. Using this source for building people's perception is a reaction

to the flood from the electronic media and its role in communication between people and organizations.

The results of research made by Rojek-Nowosielska have shown that organizations usually declare a wide array of socially responsible actions in comparison to their actual actions. What is also interesting is the discrepancy in positive answers when asked about socially responsible actions. Entities with mixed or public only ownership were more likely to declare higher level of realisation of CSR ideas in everyday business practice [21].

The management strategy of all organizations has shifted from satisfying customers, as it was in recent years, to a much higher goal – to creating value for stakeholders. What is more, educational institutions have the deep conviction that they cannot act and fulfil their strategies alone [22]. The strong and active support of the community and parents is highly required and the final results are positively affecting students of a particular institution.

According to the results of an Australian research on persons responsible for liaising with external stakeholders to their schools, universities need to operate in a ‘corporate-like manner and are interesting sites in which to consider issues of communication and organisational studies’ [23].

Universities have been forced to reconsider their role in society. Building new relations with various constitutions, stakeholders and communities was a result of this pressure. The stakeholder perspective requires an organization to find the best way to achieve goals and manage opportunities with full recognition of all participants included in the process of organizational activities. That is why recognition of stakeholder groups of a university is required. The first step would be to recognize their expectations and then, the next one, to fulfil their goals in line with the university’s mission [8].

The current situation in Poland seems to force the universities not only to re-orient their strategies of development, but also to base their decision-making process on proper relations with stakeholders. This may be helpful in more efficient use of university resources, as every change is usually associated with additional expenses. On the other hand, it might be possible to expect some kind of financial contribution from one of the commercial stakeholders of the university [24].

### **3 Stakeholders - Primary or Secondary? New or Old?**

In an ‘information age’ it is known that information is the most valuable asset. Some studies perversely prove that standardized and commodified information cannot be an instrument for empowering social actions due to its lack of visionary power to mobilize social actions [25].

In a wider perspective, it means that organizations that may ignore their communities or social interests are exposed to a higher risk of losing customer support, which may, under some circumstances, affect the organization’s reputation and performance [26]. It is not only an obligation but also an opportunity and responsibility to work with stakeholders to achieve goals important for a community [27].

The estimate value of factors contributing towards the choice of one particular institution over others is the reflection of a university's image from student's point of view. According to studies by Terkla and Pagano [28], over 25 indicators are responsible for the creation of a university's image.

A survey among 4300 students enrolled in Australian undergraduate programs, both domestic and international ones, showed that nowadays students are expecting educational institutions to be more flexible and to adapt faster to their lives, rather than students adjusting their lives for tertiary education. The failure in fulfilling students' needs and expectations may result in dissatisfaction leading to the risk of students' drop-out [29].

The results of a research project from Turkey showed that university programs are overloaded with the theoretical knowledge, which occupies approximately 70% of the curriculum space. Academics consider that proportion of practice courses, now at the level of 30% is sufficient. This stays in clear opposition to stakeholders' needs. Students commonly opt for the revision of curricula in the direction of professional life [30].

The expectations of the society would lead to the change from theory-focused programs to placing a higher responsibility on the practical use of students' skills. The programs should also be regularly revised due to their commitment to fulfil the needs and expectations of the society and business. The responsiveness to the stakeholders' voice might play a crucial role in this matter [31].

Another research was conducted among employers, students and academic mentors to explore and help them to articulate their expectations and perceptions of other stakeholders' expectations. They were chosen as a representative stakeholder group of Industry Based Learning Program at Swinburne University of Technology [32].

One of those expectations is readiness to generate work-ready graduates and meet the professionalized workforce requirements, where work integrated learning (WIL) might be a good example [33]. Going even further, they formulate their need for partnership between the university and employers with a view of the student as a customer and the dynamic nature of relationship between all the partners of the process. It only means that the stakeholder theory needs to be enriched with partnership that takes into account three positions - university, students and employer [34].

It is not easy to discuss whether stakeholders are old or new. Definitely, the relation has changed within the years of cooperation. For example, both, the University of Oslo and Telemark University College have, for many years, cooperated with external stakeholders, ranging from local and regional governments to private businesses and industries. What is important, that not the cooperation itself is new, but the strong and increasing emphasis on the revenue which might be gained from such activity is a new one [35].

In one of the recommendation by Ernst & Young, for Australian universities, it is advised to build significantly deeper relations with industry in the coming decade, as a condition of survival and thriving. The scale of this cooperation will become critical as the industry plays multiple roles: as customer and partner of higher education institutions, and, in some cases, as competitor [36].

Traditionally recognised groups of stakeholders are divided into primary and secondary stakeholders. The first group is typically comprised of shareholders, investors, employees, suppliers, governments, and communities. The second group, called 'not

essential for (...) survival' [37], are the media and special interest groups, can, under some circumstances, cause damage to an organization. The organization and the primary stakeholders are highly dependent on one another [38]. The meaning of that group was underlined by Webster, who expressed that customer relationships are one of the most valuable organization's assets [39].

The secondary stakeholders play a greater role in the development of CSR policies [40]. Opinions formulated by representatives of that group are very influential and have to be treated by organizations with respect. As those groups have no authority with the organization, they can cause significant disruption to the organization [37]. To make the situation even more blurred, secondary stakeholders have varying interests and support multiple roles [41]. It means that they can behave differently, mostly depending on the particular situation or certain conditions.

Interesting results were presented after research on an executive management team from South Africa. The results showed that the most important attribute to be granted through a stakeholder status is legitimacy. You do not have to possess power, but as long as you possess legitimacy, you will still be considered as stakeholders. On the other hand, when someone possesses legitimacy, the power cannot be completely lost [38].

Some authors recognize students as external stakeholders and lecturers as internal ones. Interesting conclusions were reached after research among Indonesian university stakeholders. Students tend to have lower satisfaction levels compared to lecturers [42]. The difference in perception was also proved in results by Kitchroen, who analysed students as primary stakeholders and staff members as internal stakeholders, proving that the former group has lower mean data of all service attributes. Measuring the satisfaction levels of internal and external stakeholders helped to obtain a comprehensive view to measure the gap between both groups [43].

For about two decades, many universities have been making effective attempts to build lasting relationships with their environments. Codified rules of conduct serve this purpose, such as inviting representatives from various stakeholder groups in an advisory capacity to the collective bodies of universities, or even the obligation to consult strategic decisions with internal and external stakeholders.

The importance of the proper involvement of stakeholders in university practice is obvious. Creating a studies curriculum always requires the diminishing of prospective discrepancies in perception of the program among such stakeholders as interns, alumni and companies.

## 4 Conclusion

Universities, as well as other organizations, are in an extreme difficulty to predict the future shape of the market in which they operate. Despite their intellectual potential, educational institutions are in no way privileged in their position in relation to other entities.

Constant analysis of the changing needs of stakeholders can provide knowledge on how to modify the offer of the university as well as its pro-social activities. But in order to fully analyse the environment, institutions of this kind should also examine the changing group of their stakeholders. With the prevalence of social media and the

increasing geographical range of prospective students, the groups of stakeholders from completely new environments with new and different expectations in relation to institutions are expanding.

Internationalization of higher education, as well as the increased mobility of students among all the countries of the world, is to be conducive to the expansion of existing stakeholder groups from the immediate environment to even from another continent or representing other nationalities.

This is confirmed by the fact that only listening to the needs of both existing and new stakeholders can promote the harmonious development of the university. The need of the market to predict the future is extremely difficult to satisfy. Knowledge of the needs of stakeholders and of themselves, however, can help in the proper demarcation of the trends of development and emerging needs of the environment. The answer of the universities to the question of what these potential future needs may be, therefore, is an extremely important factor in development. For both the institution and its stakeholders. And for those who are 'old' and the 'new', as well as, primary or secondary stakeholders of the university.

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# A Co-evolute Approach to Analyze the Competencies of Sales Personnel of Banking Sector of Pakistan

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**Abstract.** The banking sector of Pakistan is playing a pivotal role in the economy of country. Over the last two decades, private banks have progressed rapidly. It resulted into highly competitive environment in the sector that raised the need of highly competitive human resources, especially sales personnel who play a very important role in the development of banks. The purpose of this research is to use The Evolute system as a tool to analyze competencies and devising training and developing of employees. The current competency levels and creative tension levels of the sample group were analyzed and individual and group level pictures of their competencies was provided. In this paper, Astroid 1.0 tool is chosen from The Evolute platform for the analysis of competencies of sales personnel. This study resulted into practical framework to enhance the competencies of sales personnel. It makes valuable contribution into applying HRM practices that will lead banking sector to develop the competencies of their sales personnel.

**Keywords:** Competencies · Sales personnel · Banking sector of Pakistan · Evolute · Astroid · Training and development · HRM · Creative tension

## 1 Introduction

A growing and dynamic banking sector is essential for revenue generation in any country because growth in the banking sector and the real economy mutually boost each other. Similarly, sales personnel are key people for any bank who deal directly with the daily customers, brings new customer, maintains bank accounts and look after the banking operations that result into more profitability and enhance goodwill of banks. Therefore, this research will analyze the competencies of sales personnel of banking sector of Pakistan by using the Evolute system.

Evolute system is web-based platform [1] that provides different tools to analyze the competencies of different professions. In this paper, a tool Astroid 1.0 [2] is chosen, which analyses the competencies of sales personnel, determines their creative tension and provides with holistic view of competency levels of sample size. The aim of this paper is not only to analyze the competencies of sales personnel but also to introduce a new way of use of the Evolute system i.e. to categorize the sample size based on competency levels and develop training and development programs accordingly.

## 2 Theoretical Framework

Competency is one's ability to do something successfully or efficiently. Spencer and Spencer (1993) explained competency as a basic characteristic of an individual that is original related to effective and superior performance in a job or situation [3]. Spencer et al. further explained that there are five characteristics of competencies i.e. motives, traits, self-concept, knowledge and skill [3]. Trait and motives are associated with core personality of individuals that are very hard to change or develop, while skills and

**Table 1.** Competence model of astroid [2]

Competence group	Competencies
Self-knowledge	Emotional awareness
	Self-confidence
Self-control	Self-discipline
	Trustworthiness
	Flexibility
	Maintaining order
	Innovativeness
	Responsibility
	Seeking information
Cognitive capability	Analytical thinking
	Conceptual thinking
	Language proficiency
	Professional and technical knowledge
Motivating oneself	Achievement orientation
	Commitment to the organization
	Initiative
	Optimism
Empathy	Understanding others
	Cultural understanding
	Organizational understanding
	Developing others
	Service orientation
Social Skills	Influence
	Communication
	Conflict management
	Management
	Leadership
	Relationship building
	Collaboration
Teamwork and cooperation	

knowledge belongs to surface level that can easily be established in individuals by training and development programs [3]. The focus of this research paper is to develop the surface knowledge and skills of sales personnel by analyzing their existing competencies.

The Evolute system is based on the emerging Co-Evolute methodology and brain-based metaphors which enable one to visualize in the form of different graphs and examine the current reality and personal vision of individuals/employees and business processes [1]. It is a platform that supports building and using co-evolutionary applications on the Internet [4, 5]. The Evolute methodology utilizes fuzzy logic [6] to capture the abstract and vague nature of individual's current occupational competencies. The use of fuzzy sets allows for using linguistic meanings directly without conversion to numerical scale. It facilitates approximate reasoning for analyzing and modelling different levels of creative tension according to the occupational competencies and based on individual's perception of their current reality and vision [1].

In this paper, a competence model "Astroid 1.0" is chosen. It is a self-evaluation tool that determines the sales personnel's creative tension by analyzing the gap between their personal vision and current reality at work [1]. Astroid 1.0 determines the creative tension of individuals by assessing their skills at three levels which are competencies, competence groups and competence main group. The results of Astroid can be divided into two main categories. First category focuses on overall competence and creative tension levels of whole evaluated group, while second category provides individual results of each participant. So companies can see that overall, in which competencies their employees are weak and they can evaluate competencies of each individual (Table 1).

### 3 Methodology

In order to assess the value or contribution of the competencies of sales personnel, a tool Astroid 1.0 is used. The aim of the Astroid (Competencies of Sales Personnel) is to provide a generic model for the purpose of evaluating sales competence, or in this case the self-evaluation of sales competence. The results of this model reflect the individual's perception (or opinion) of his or her current and targeted sales competence. The difference between the current and targeted innovation competence creates creative tension, a force to draw the two together [7]. In this research the competence model was tested with a group of sales personnel from banking sector of Pakistan (20 respondents) who are directly dealing with daily customers, chosen because of their availability to the researcher. A total of 120 pre-formulated statements were there to evaluate these competences under the Astroid tool. When taking the self-evaluation, every respondent had the choice of "only I can see my results" to ensure individual privacy. Typically, the group level results are the ones that are most interesting for the organization, because from those results it is easy to get a holistic picture of the organization.

However, in this paper, the main analysis focuses on the individual results. The individuals responded to the statements by giving the current and targeted level of the issue addressed. Four statements evaluated each competence. Next section of this paper will present the group level and individual level results.

## 4 Results

The results of this research are presented in two main categories, which are (i) group level results and (ii) individual level results.

### 4.1 Group Level Results

The group level results are presented in the graphical form in Figs. 1 and 2. Histogram in Fig. 1 presents the current and target level of competencies on the scale of 1.0 while 1.0 is the ideal value for each competency. Blue bar is representing current value of competencies of overall sample size while red bar shows their target level for each competency. This histogram is sorted in the way that, high values for current and target competencies are presented in the top of the chart while lowest value at the bottom. The line chart in Fig. 2 is not only presenting the current and target state for each competency but also presented the creative tension between both in the form of green area, while orange line at the right side represents the maximum value of the chart.

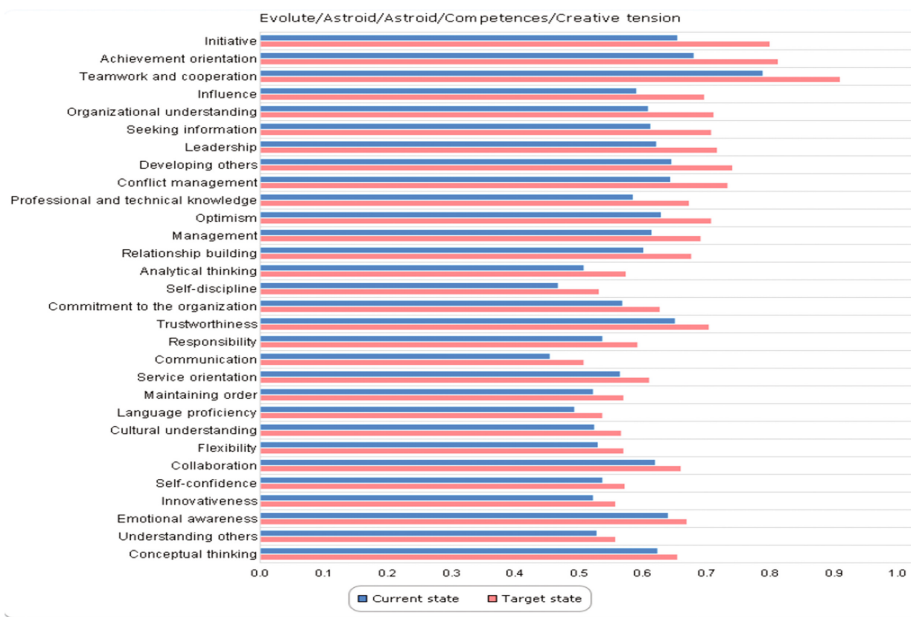
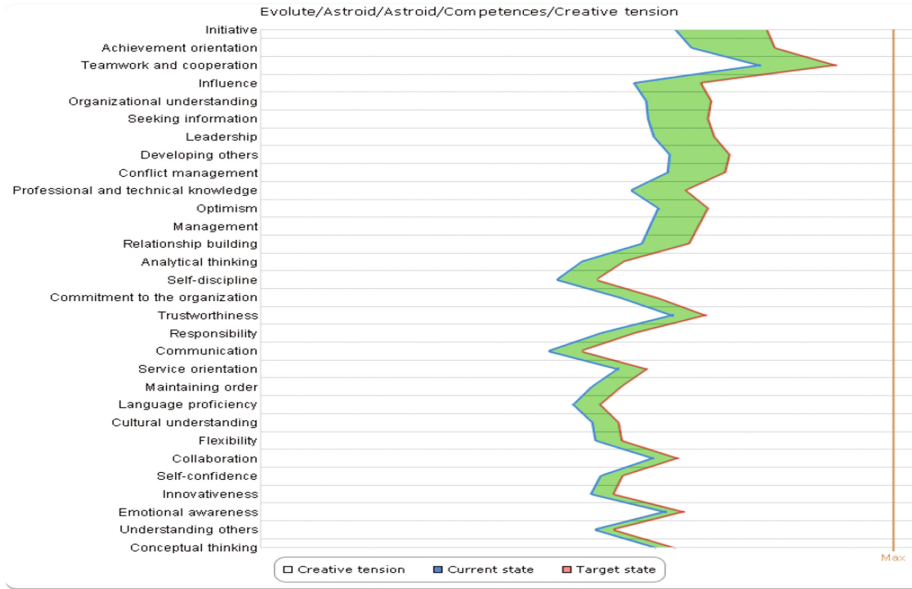


Fig. 1. Histogram: current and target competencies



**Fig. 2.** Line: creative tension of competencies

From results of both figures, we can conclude that creative tension is quite high in the first 13 competencies. On the other hand, competencies with lower creative tension have average level of current and target state.

**4.2 Individual Level Results**

Table 2 shows the detailed results of every participant against each competency. Green tabs are showing high competency level of individuals, pink tabs are showing low level of competencies and white tabs are representing average level score of individuals for each competency. The detailed analysis of Table 2 shows that seven participants have outstanding scores. They have high scores in more than 18 competencies areas with no bad scores at all in any other competency. On the other hand, there are only two participants with very low scores in 17 competencies with 0 and 2 good score in any other competency. While rest of 11 participants have mixed results consists of average score in more than 18 competencies. So according to this analysis, three main groups can be found which will consist of high scoring, low scoring and average scoring employees. Next section will shed detailed light on each group and propose a framework for improvements.

The following section will provide training and development programs based on the individual results presented in Table 2.





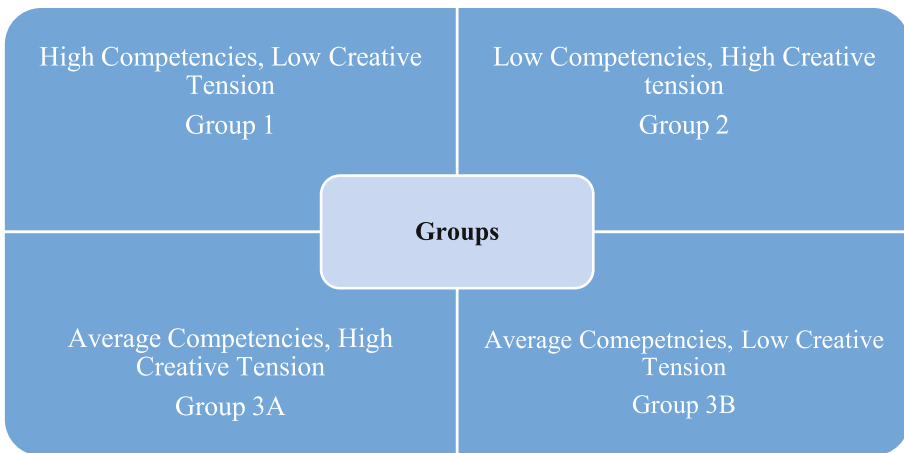


## 5 Framework for Improvements

As the main purpose of this paper was not only to analyze the competencies of sales personnel but also was to devise training and development programs accordingly. So this section is based on the analysis of individual results.

As discussed in previous section, three groups can be organized based on individual scores. Group 1 will consist of outstanding participants; group 2 will consists of Low scoring participants while group 3 will contain average scoring participants. Group 3 is further subdivided into two groups based on individual’s high and low creative tension scores. In following, detailed programs are discussed to achieve the best competency level for the sales personnel of banking sector (Table 3).

**Table 3.** Competencies based groups.



### 5.1 Group 1 (High Competencies: Low Creative Tension)

As per individual results, there are seven participants i.e. participant number 5, 6, 8, 11, 12, 13 and 14, who are best in more than 18 competencies and have no low scores at all in any other competency. Therefore, a group can be created for the advanced level training and development program. Moving towards detailed results of these outstanding participants, these all participants have seven common high scoring competencies and there are 11 competencies where only one participant has average score while all others have above than average scores. So based on these facts, the training and development of this group should focus on self-confidence, self-discipline, maintaining orders, flexibility, innovativeness, analytical thinking, language proficiency, organizational commitment, understanding others, cultural understanding, communication and leadership competencies.

On the other hand, if we analyze the creative tension of this group at individual level, apparently they have low creative tension that shows that they are satisfied with their current level of competencies and skills. It can be further analyzed in two ways: firstly, they are very confident and satisfied with their current role and performance at work, due to which their creative tension is very low. Secondly, they are not planning for their future roles for any higher position in the organization, which can be more challenging than their current roles.

On the bases of these results, it can be concluded that these employees are good at what they are doing already and possess those key competencies to perform their job. Therefore, it is recommended that organization should organize a detailed performance management program for this group to groom their competencies. "Performance management is the continuous process of identifying, measuring and developing the performance of individuals and teams and aligning their performance with the organizational goals" [8]. By implementing the concept of performance management for this group, will not only develop and groom their competencies but also it will put their efforts in the right direction according to the overall organizational goals. This program will include following steps [9, 11, 12]:

- (a) **Direction Sharing:** In the start, a workshop will be organized to better introduce the organizational higher-level goals, which will be translated into small department or team level goals. This will help employees in better understanding that, what organization expects from them [13].
- (b) **Goal alignment:** Manager or group in charge will make sure that employee's goals are meeting with the goals of its department and they are progressing in the right direction [13].
- (c) **Ongoing performance monitoring:** Usually it is computer based systems that measures progress of employee and make reports regarding to it toward meeting his performance goals. These reports also can be made by the manager who is monitoring and mentoring these employees directly [14].
- (d) **Ongoing feedback:** Manager or group in-charge will analyze the performance of employees based on the performance reports and provide them with feedback to ensure that they keep working in the right direction [12].
- (e) **Coaching:** Based on the feedbacks, training will be provided to the employees to develop their competencies in their weak areas.
- (f) **Rewards and recognitions:** To keep the employees on the right track, rewards and recognitions programs can be introduced. This will keep them motivated in not only attaining their own goals but also organization goals [15].

## 5.2 Group 2 (Low Competencies: High Creative Tension)

This group is consist of only two participants, who have low scores. Their scores are very low in 17 competencies while have average scores in remaining 13 competencies. However, if we analyze their creative tension scores, they possess high creative tension on average. Participant # 7 possesses high creative tension for 11 competencies in which he scored low which shows his positive approach towards learning these

competencies. Similarly, participant # 10 has high creative tension for 10 competencies in which he rated himself low. Therefore, these results shows that both of these participants are willing to learn to improve their competencies to perform well in their roles.

Therefore, the 1<sup>st</sup> step for their competencies improvement program will be that, these employees will be asked to write daily diaries which will include their daily activities on the job [9]. Sales manager will be observing their behaviors towards different tasks like dealing with customers, maintaining existing customers, opening new accounts, their interaction with other colleagues, problem solving skills etc. This will help the managers to understand the reasons behind those weak competencies of these employees. On the bases of results from daily dairy and manager observations, a special basic training and development program of one month can be organized to train them. This program will include intensive lectures on how to attain these competencies following with real work scenarios [10].

After the completion of training program, these participants will enter into second stage of improvement program that is on the job training method [16]. In this step, these employees will be asked to apply their learning by actually doing it under the observation of senior sales personnel or managers. Job rotation method can also be used in this stage to learn different kind of competencies. Regularly feedback from the mentors can play important role in developing competencies at this stage. In result, by following this framework, employees with very low competency level can improve their selves.

### **5.3 Group 3 (Average Competencies)**

Group 3 is consisting of average employees (participant # 1, 2, 3, 4, 9, 15, 16, 17, 18, 19 & 20) who have mixed scores. In some competencies, they have high scores and in some they have low scores but mostly they rated their competencies as average. According to Spencer, average sales personnel lacks in achievement orientation more than they lack in influence competency [3]. If we look at the individual results table, we can clearly identify that group 3 personnel have average scores in both of these competencies. Therefore, methodology for their improvement must focus on these two competencies especially on the achievement orientation. On the other hand, analyzing the creative tension difference (Target - current), results can be drawn that some of these average employees have high creative tension and some have low. So based on creative tension results, this group can be sub divided into further two groups i.e. Group 3A and Group 3B.

### **5.4 Group 3A (Average Competencies: High Creative Tension)**

This group is consisting of participants who rated their competencies as average while they have high creative tension. It shows that these employees are willing to enhance their competencies for their better future in the organization. On-the-job training methods will best suit such employees to attain high level competencies [16]. These employees are

willing to learn, so by providing on the job training by assigning mentors will be the best way to develop their competencies [17]. During this process, they will not only observe and imitate their mentors in the real work environment but also they will be provided by regular feedback regarding their different approaches in different kind of situations. Apart from on the job training, special weekly workshops can be organized in order to enhance their existing competencies [9].

### **5.5 Group 3B (Average Competencies: Low Creative Tension)**

This group is consisting of employees who have rated their competencies as average but have very low creative tension. It shows that they feel ok at their current positions and capable of doing their job right. However, the problem is they have low or zero motivation to enhance their abilities for future roles. So in order to generate their interest and motivation in their current role, a special 2 weeks training and development program can be organized. This program will address on career development aspect to generate interest regarding their job and organization in these employees [18]. It will not only focus on how to enhance their average competencies but it will also realize the employees that, what kind of opportunities are awaiting for them in the long run. In addition, it will not only motivate them to perform well in their current role but also generate a sense of achievement. After the successful completion of this program, these employees can also follow group 3A on the job training program.

## **6 Conclusion**

The analysis of this paper has concluded that the Evolute system can be very useful tool in not only determining the existing competencies and creative tension of sales personnel but also it can help in clustering the employees into different groups based on their self-evaluation. It will help banking organizations in developing different training and development programs according to needs of each group. This paper has presented sales personnel of banking sector of Pakistan as an example that how the Evolute system helps in determining the competencies and devising the training and development programs to enhance their competencies. This study is first step towards enhancing the competencies of sales personnel in banking sector of Pakistan by using Evolute systems. Although for more reliability of Evolute systems, a longitudinal and action research is required. Future researches can focus on action research to determine the actual practicality and effectiveness of this system. In addition, the sample size for the analysis of sales personnel is small in this study, so future researches can include large number of participants for more reliable results, especially for the analysis of holistic view of competencies in particular organization.

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# Encompassing the Work-Life Balance into Early Career Decision-Making of Future Employees Through the Analytic Hierarchy Process

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**Abstract.** The paper presents the results of ranking of the significance of quality of life determinants by University students that are starting professional activities. Research methodology: literature review; elaboration of an AHP decision-making model; two-stage expert selection; significance rankings by experts and a graphical and descriptive presentation of obtained results. Research sample: 14 experts out of almost 200 University students. Research outcome: a decision-making model that aims at maximizing the life satisfaction of future employees as a function of their individual assessments of significance of particular determinants of quality of life. Research implications: a more accurate adaptation to trends on the labor market and creation of new business models. Research limitation: narrowing the group of experts to University students. Value added of the research: better-motivated employees with a satisfactory level of work-life balance will contribute to an increase of societal satisfaction level.

**Keywords:** Analytic hierarchy process · Determinants of quality of life · Work-Life balance · Human resources · Decision-Making

## 1 Introduction

The objective of this paper is to open the field for applying the method of Analytic Hierarchy Process (AHP) for modelling socio-economic phenomena – from more accurate adaptation of business decisions to economic trends, through providing better-motivated employees, towards creating new business models. Recent research shows that the modelling of early career decision-making processes of future employees, which encompasses their work-life balance preferences, can enhance their choice of most appropriate professional development strategy. This paper focuses on rankings of significance of quality of life determinants obtained in a research task targeted at University students that are on the verge of starting their professional activities.

The main research method is the Analytic Hierarchy Process (AHP), but the methodology encompasses also a literature review and conceptual, methodological, exploratory and explanatory research.

The sections of the article will contain a brief review of recent scientific literature on the matter (Sect. 2), an introduction to research methodology and sample (Sect. 3), a presentation and discussion of obtained results (Sect. 4) and a conclusion (Sect. 5).

## 2 Literature Review

### 2.1 Quality of Life Studies and Work-Life Balance

Quality of life (QoL) and wellbeing studies appeared in the science of Economics rather early, beginning with Smith [1], who mentioned such QoL determinants as health, wealth and conscience. Learmonth et al. [2] describe QoL as a global psychological construct that takes into account the weighting or importance individuals place on particular areas of life (after [3, 4]). Lau et al. [5] state that QoL is how well people are able to perform daily activities and how they feel about their lives in physical, social, and psychological functioning (based on [6]).

Work-life balance is a part of QoL studies that refers to work-to-leisure time ratio. Balance here means such a configuration of time use that maximizes positive emotional and developmental outcomes. It depends on an array of normative, situational, demographic, and psychological factors, which defy ‘linear’ interpretation and complicate traditional statistical analyses [7]. Nevertheless, this ratio is crucial for QoL perception by the individuals, as stated by Hansen [8].

QoL research in Economics has gained momentum in past decades with works of such researchers as Maslow [9], Graafland and Compen [10] (life satisfaction), Abel-Smith and Townsend [11] (distribution of welfare), Atkinson [12, 13] (social inequality), Sen [14–18] (welfare, wellbeing and socio-economic capabilities), Schuessler and Fisher [19] (QoL theory), Layard [20] (happiness), Stiglitz, Sen and Fitoussi [21] (socio-economic development), Alkire and Foster [22] and Ulman and Šoltés [23], (poverty measurement), Șerban-Oprescu [24] and Simkins and Peterson [25] (QoL sustainability), Chang, Travaglione, and O’Neill [26] (gender studies), Tang and Hornung [27], Adame, Capliure and Miquel [28], Ren and Caudle [29], Russo, Shteigman and Carmeli [30], Zheng et al. [31], Gawlik and Jacobsen [32] (work-life balance), Žur [33], Neumark and Muz [34] (entrepreneurship and social inequality) Somarriba Arechavala, Zarzosa Espina and Pena Trapero [35] (QoL measurement) and others.

### 2.2 Multicriteria Decision-Making

Multicriteria decision-making (MCDM) is one of the branches of the decision-making theory. The main purpose of MCDM is to support decision-makers (DMs) in facing multi-criteria problems [36]. The theoretical framework on aiding MCDM processes has been presented in [37].

Rezaei [38] states that MCDM problems are generally divided into two classes, with respect to the solution space of the problem: continuous and discrete. To handle continuous problems, multiobjective decision-making (MODM) methods are used. Discrete problems are being solved using multi-attribute decision-making (MADM) methods, although in scientific literature they are commonly referred to as MCDM.

Ivlev, Vacek and Kneppo [39] point at such features of MCDM as complexity of decision-making criteria, high degree of DM's responsibility and uncertainty at every stage of decision-making process. The last one is due to often interfering aims of involved or affected parties, their various policies, different economic, social, technical and organizational environment and consequences of taken decisions. This internal and external uncertainty becomes the crucial determinant of MCDM [40] and results in low predictability of final effects of the decision-making.

Teixeira de Almeida et al. [41] observe that the crucial issue in using MCDM models is the evaluation of weights of criteria (or attributes) in the aggregation procedure. Ben Amor, Jabeur and Martel [42] support them by stating that conciliating the results of the pair comparisons according to the criteria could be difficult due to the heterogeneity of the measurement scales and the natures of the evaluations. Another problem appears when the differences between the alternatives are inherently close together or when the number of alternatives increases [43]. Cabello et al. [44] observe that from a strictly mathematical point of view, all efficient solutions of a MCDM problem are equally optimal. Therefore, the preferences of the DM are crucial to determine which decision alternative is the most preferred solution. This feature gains more importance in multiobjective optimization tasks of MCDM problems.

Taking into account all of the above, the choice of an appropriate MCDM method is of crucial importance in order to assure the highest possible effect of decision-making. Varmazyar, Dehghanbaghi and Afkhami [45] propose to apply a combination of various MCDM methods as a way to enhance the precision of the final decision. In such cases, the most common aggregation procedure is a simple averaging function, although Pomerol and Barba-Romero [43] suggest employing Borda and Copeland rules. Whereas Borda selects highest valued alternatives, Copeland ranks them as the result of the number of pairwise victories minus the number of pairwise defeats between the alternatives [45]. Nevertheless, a strict application of the Consistency Check within AHP method seems to provide an acceptable quality of final decision as well. Various methods of enhancing MCDM have been discussed in [36, 46]. Section 3 below will focus on the choice of applied research methodology and its justification.

### 3 Materials and Methods

The widely understood research target group are young people (mainly European), who are on the verge of choosing their future paths of professional career and who recognize the relevance of work-life balance for this process.

Due to the specificity of qualitative-quantitative analysis, the presented research consists of five stages: (1) literature review (above); (2) conceptual research (elaboration of an AHP decision-making model); (3) methodological research (two-stage expert selection); (4) exploratory research (significance rankings by experts); (5) explanatory research (graphical and descriptive presentation of obtained results).

Ad (2) Applied research methodology bases on the Analytic Hierarchy Process (AHP). It is a method for multicriteria decision-making developed by Saaty [47]. AHP can be considered for complex hierarchical decision problems, when the optimal solution has to be chosen from a set of alternatives on a subjective basis [48]. The method consists of



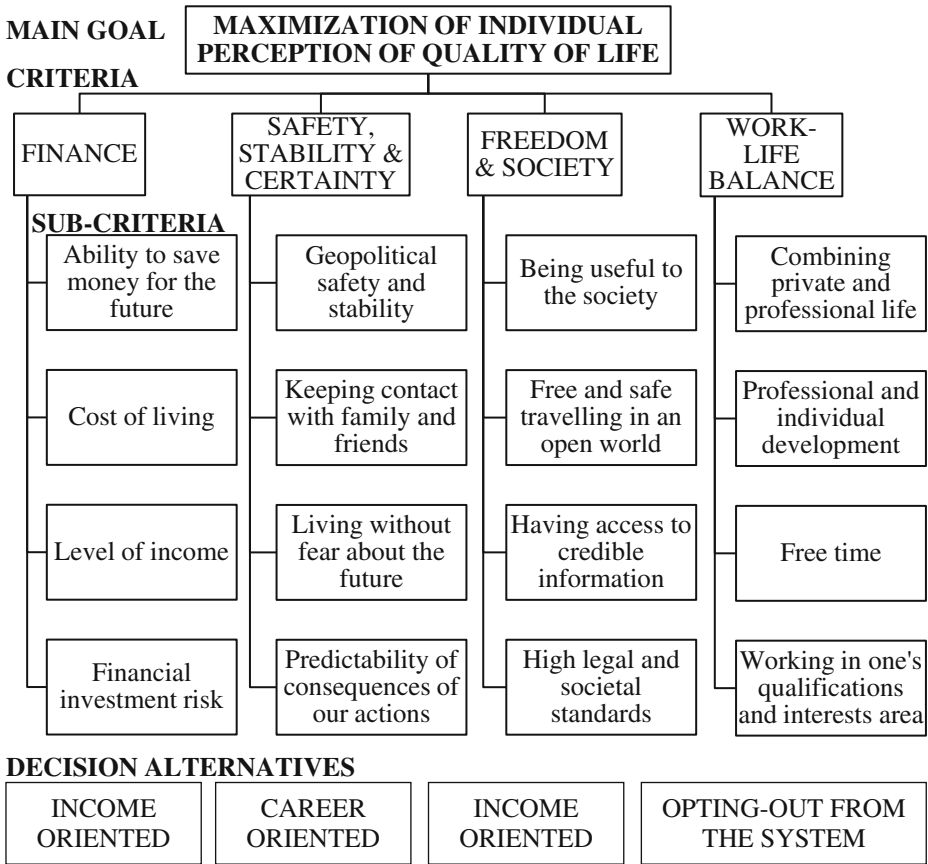


Fig. 1. AHP-based decision-making model for early career decision-making of Youth.

three levels: (i) main goal of the decision-making process; (ii) decision criteria, sub-criteria and their indicators; decision alternatives, that lead to the optimal solution [49]. Although research in Economics is mostly based on quantitative data, the description of socio-economic reality should also encompass qualitative factors. Quantitative indexes provide the researchers with comparative knowledge on the analyzed occurrence, whereas the qualitative features explain its context and environment. Therefore, the use of a methodology that allows incorporating qualitative measures into quantitative research is advised. In fact, AHP allows including both quantitative and qualitative criteria into the decision-making process, by accrediting those last ones a digit. Therefore, a credible proof of preference of criterion A over criterion B is obtained. Such mathematical notation allows picking one of decision alternatives as the possibly optimal solution. The above justifies the methodological correctness of AHP application for the construction of a model that encompasses work-life balance into early career decision-making of young people (Fig. 1).

The practical AHP application consists of building a hierarchy of independent criteria. Then pairwise comparisons of alternatives, criteria, sub-criteria and their

indicators are being performed (each-with-each, based on the fundamental comparison scale). As a result, the dominant factor from the pair below is being linked with the dominant factor from the pair straight above, which gives us a ranking of importance of different criteria in form of the pair-wise comparison matrix. Finally, a consistency check of obtained comparisons is being performed [49]. [47–50] present a more detailed description of AHP method and its application.

In past years several critical works on AHP methodology have been published, addressing such problems as lack of theoretical bases for construction of hierarchies, subjectivity of final rankings and a low research repetitiveness [51–53]. Nevertheless, most of criticism has been answered in [54].

The set of determinants of quality of life (decision criteria) has been identified and discussed in author’s previous research [55–57]. Their identification, together with work-life balance strategies (decision alternatives) have been obtained with help of a self-administered, web-based questionnaire with single-answer, limited choice answers of qualitative and quantitative nature, followed by direct in-depth interviews.

Ad (3) The specificity of AHP methodology allows the limitation of direct evaluators to a smaller number, which is possible due to their high level of expertise in the field of discussed research. Therefore, the two-stage expert selection process consisted of: (i) preliminary selection, based on the assessment of written assignments on candidate’s understanding of socio-economic occurrences; (ii) final selection through structured direct individual in-depth interviews with candidates. The final set of evaluators has been composed of 14 carefully chosen international experts from a sample of almost 200 University students. The entire expert selection process has been discussed in [58]. The judgments of each evaluator has been attributed an equal weight. Ad (4&5) Sect. 4 presents obtained research results, whereas Sect. 5 summarizes them.

### 4 Results and Discussion

After obtaining the preference statements about each pair of decision criteria (all pairwise comparisons accomplished) by every evaluator, aggregated research results can be presented (Fig. 2). They have been normalized for all evaluators.

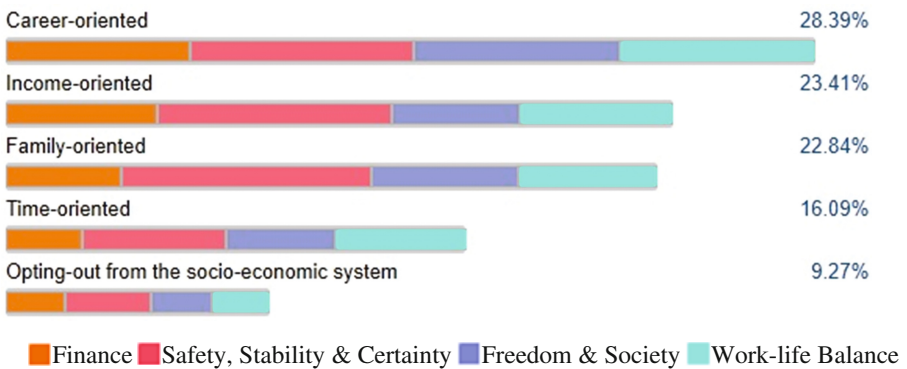


Fig. 2. Aggregated AHP evaluation results with prioritization of parent criteria (%).

The results on Fig. 2 prove that the assessments of significance of all criteria and sub-criteria of the model (see Fig. 1 and Table 1) show respondents' strongest preference towards a career-oriented life strategy (28,39%). The second preferred life strategy was income-oriented (23,41%), with an almost similar preference for family-oriented one (22,84%). A significantly lower attractiveness has been attributed to time-oriented (16,09%) and opt-out (9,27%) life strategies. It seems rational, that young people on the verge of starting their professional life show a predominant interest in their future career and income. Family values and free time, although still important, leave the field for the need of independence, which is also comprehensible. Most interesting is the wish of almost 10% of Youth to opt-out entirely from the socio-economic system, which apparently does not answer sufficiently their needs and expectations within any of the other four life strategies. Different colors represent the relevance of respective parent criterion in the assessment of a given life strategy.

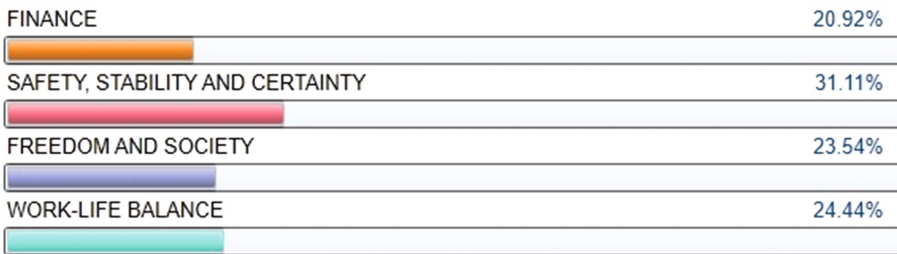


Fig. 3. Aggregated prioritization of parent criteria (%).

Figure 3 shows the aggregated prioritization of parent criteria in obtained responses, i.e. their importance for early-career decision making of young people. The highest rank has been attributed to the group of criteria named Safety, Stability and Certainty. The respondents perceived its relevance in the maximization of their overall life satisfaction at the level of 31,11% (out of 100%). Work-life Balance came 2<sup>nd</sup> (24,44%), Freedom and Society 3<sup>rd</sup> (23,54%) and Finance 4<sup>th</sup> (20,92%). These results stand in opposition to those presented on Fig. 2. Several explanations are possible, e.g. the difference between internal motivations and those declared publicly by the respondents, the pressure for success from their environment, the wish to combine colliding life strategies, etc. This issue definitely needs further research, as it could also bring light on the unexpectedly high attractiveness of the opt-out strategy.

Table 1 below presents local and global prioritizations of decision criteria and sub-criteria that have resulted from the discussed research project. The local priorities are the ratio-scale weights of a sub-criteria node with respect to the parent criterion. They add up to 100% inside one parent criterion. Global priorities are the ratio-scale weights of any parent criterion with respect to the main goal. Global priorities of all the lowest level sub-criteria sum up to 100%. Here the global priorities sum up to 99,97%, because the inconsistency level of evaluators' answers is above zero and below the

**Table 1.** Local and global prioritization of decision criteria and sub-criteria (%).

Criteria and sub-criteria	Prioritization (%)	
	Local	Global
<i>Finance</i>	25,29%	25,29%
Ability to save money and future retirement pension level	29,46%	7,45%
Cost of living	23,62%	5,97%
Level of income	35,94%	9,09%
Level of risk related to financial investments	10,98%	2,78%
<i>Safety, Stability and Certainty</i>	32,38%	32,38%
Geopolitical safety and stability	22,52%	7,29%
Keeping contact with family and friends	28,14%	9,11%
Living without fear about the future	24,44%	7,92%
Predictability of consequences of our actions	24,89%	8,06%
<i>Freedom and Society</i>	25,10%	25,10%
Being useful to the society	19,38%	4,86%
Free and safe travelling in an open world	22,69%	5,70%
Having access to credible information	15,06%	3,78%
Living accordingly to high legal and societal standards	42,88%	10,76%
<i>Work-Life Balance</i>	17,22%	17,22%
Being able to combine private and professional life	28,04%	4,83%
Being able to develop professionally and pursue self-development	30,31%	5,22%
Free time	9,68%	1,67%
Working accordingly to your qualifications and interests	31,96%	5,50%

tolerated inconsistency level of 10% [49]. The same can be observed on Fig. 3, which sums to 100,01%, which is due to similar reasons.

A consistency check was performed after each round of evaluations, when all pairwise comparisons for one parent criterion have been finalized. An abbreviated consistency report has been presented to evaluators, who were asked to reassess their evaluations each time when the inconsistency of their preference statements was higher than 10% (Consistency Ratio  $\geq 0,1$ ). Due to low consistency, the preference statements of two evaluators out of initial 14 have not been included into final results.

Expert significance rankings have been collected via Expert Choice Inc. Comparion™ Suite, academic license. Complete data grids for all evaluations, including the inconsistency report, are available for inspection. Conclusion follows below (Sect. 5).

## 5 Concluding Remarks

This last section presents an explanatory summary of performed research. It has been divided into findings, implications, limitations & future research and value added.

Findings: The outcome of presented research is a decision-making model that aims at maximizing the life satisfaction of future employees as a function of their individual

assessments of significance of particular determinants of quality of life. The model can be optimized in relation to each level of proposed decision-making model, i.e. AHP main goal (maximizing life satisfaction in general), AHP parent criteria and particular sub-criteria and AHP decision alternatives. The significance rankings can be analyzed both as individual evaluations of particular experts or as a group result.

Implications: the cognitive value of the research consists of the following: (i) it identifies and helps understanding the relations between social, economic and psychological determinants of early career decisions of future employees; (ii) it supports the recent trend in economic research that forces researchers to reassess traditional rationales of decision-making processes of individuals (i.e. the paradigm of rationality of human behavior); (iii) it promotes an interdisciplinary approach to science, which should result in a more and more frequent inclusion of phenomena traditionally belonging to other scientific disciplines into socio-economic studies.

Limitations and future research: The main limitation comes from the narrowing the group of experts to University students. Nevertheless, obtained results are satisfactory enough to extend the composition of experts' sample in future studies by people with non-academic background. Moreover, a similar research should be lead between groups of employers and employees that have been active on the job market between 5–10, 10–20, above 20 years and up to 5 years before their retirement. Further in-depth insight into individual motivations of early career decision-making of future employees could prove useful as well. It could result in a closer modelling of this phenomenon, including a more accurate adaptation to trends on the labor market and creation of new business models. A separate research should be devoted to a deeper understanding of motivations of young people attracted by the opt-out life strategy.

Value added: if the presented model gains attention from its potential users (future employees and employers), both sides will profit from growing knowledge on the nature of one of the most important decisions in human life – the choice of career path with accordance to individual preferences on work-life balance. Companies will gain more focused and better-motivated employees, who will be able to follow closer their own development paths, leaving less space for frustration and professional burnouts. Moreover, a satisfactory level of work-life balance indirectly contributes to the increase of overall satisfaction level in the society. Newman et al. [59] back it by stating that initiatives by organizations to foster enhanced work-life balance would be expected to reap benefits not only to individuals and to organizations, but also to communities. More economists incorporating qualitative studies into their research and applying decision-making models would as well add some value.

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# Safety Culture and Collective Commitment in Organizational Context

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**Abstract.** In nuclear power plants and process industry safety is the number one priority over profitability and productivity. In such high-risk environments where individuals work independently their decisions can lead to dangerous situations to coworkers, organizations or even to society. In many cases, a loose commitment to occupational role causes individual to perceive safety culture as something too much detailed which makes them to lose focus on what is important regarding the safety culture. In our view, this is a problem for collective safety culture to raise to a higher level. To understand organizations collective safety culture and safety consciousness it is important to analyze employees individually to see what are their internal feelings, understanding and aims. This paper presents a joint analysis of organization's safety culture and commitment towards their organization by utilizing also Company Democracy Model (CDM).

**Keywords:** Safety culture · Commitment · Organization · Ontology · Evaluation · Self-assessment · Company democracy · Model

## 1 Introduction

In nuclear power plants and process industry safety is the number one priority over profitability, productivity and performance. In such high-risk environments where individuals work independently their decisions can lead to dangerous situations to coworkers, organization or even to society. In these kinds of organizations employees' safety consciousness, collective safety culture and their commitment to the organization and occupational role becomes extremely important.

A strong safety culture and the employees' organizational commitment are tightly linked together and complement each other. A safety culture is an extensive, organization-wide approach to safety management and is the end result of joint individual and group efforts toward values, attitudes, goals and proficiency of an organization's health and safety program [1].

The term Safety Culture is composed from the words ‘Safety’ and ‘Culture’. The key word in this term is the Culture which is applied in Safety. Without a culture safety efforts, projects, initiatives and activities would be static, predictable, finite and non-deterministic.

When a person is committed to the company and its values, he also commits to its safety values and overall safety culture is developing. On the other hand, if the company has a strong safety culture, it also reflects to the commitment of the employees. Organizational commitment, therefore, provides a direct or indirect effects of various features affecting safety, such as people’s levels of motivation [2].

Organizations with a safety culture show a deep concern for employee wellbeing which will lead to higher organizational commitment. According to Cooper [2] organizations with strong, clear cultures are associated with higher levels of employee commitment. A strong safety culture typically leads to organization having few at-risk behaviors, consequently they also experience low accident rates, low employee turn-over, low absenteeism, and high productivity [3].

In organizations with strong safety culture, everyone feels responsible for safety issues and tries to pursue them every day. Similarly, as employees with strong affective organizational commitment show “willingness to go beyond their immediate job requirements” for the sake of the organization, employees in organization with strong safety culture go beyond “the call of duty” to identify unsafe conditions and behaviors, and intervene to correct them [3]. Cooper [2] defines commitment to safety as ‘an individual’s identification with and involvement in safety activities’, characterized by a strong acceptance of and belief in the organization’s safety goals and a willingness to exert effort to improve safety in the workplace. This definition follows Porter et al. [4] definition of organizational commitment. According to their definition organizational commitment refers to “the relative strength of an individual’s identification with and involvement in a particular organization”, and also Rusbult and Farrell’s [5] definition of organizational commitment as the willingness to deploy extra effort, the desire to remain, and the acceptance of the goals and values of the organization.

Consequently, these two aspects of working life i.e. safety culture and commitment are very well connected to each other in the development of the company’s profitability and competitiveness as highly-committed employees are doing their best to help the company to be successful, and when a person is safety conscious and committed to the development and improvement of safety less costly accidents and at-risk behaviors are likely to happen, which in turn will boost the company’s profitability and performance.

A good safety culture can also contribute to competitiveness in many other ways. Cooper [2] gives example that positive safety culture is used to rate contractors in tendering processes and therefore can make the difference between winning or losing a contract. Also, strong safety culture can affect people’s way of thinking and lead to the development of safety features for some products which are then used as marketing devices to relay marketing messages to prospective customers; and it also positively impacts on employees’ commitment and loyalty to the organization, resulting in greater job satisfaction, productivity and reduced absenteeism [2].

It must be emphasized that the development of a comprehensive “safety culture” at all levels of an organization takes time, and it requires visible and consistent leadership from senior management [6]. It is frequently a multi-year continuous process to

integrate safety as a value of the organization and to an integral part of daily operations [3]. However, Parker, Lawrie and Hudson [7] point out that safety culture can vary within the organization based on the size and complexity of modern organizations.

Because low commitment and low safety culture can create very difficult problems for organization it is very important for management and leadership to understand these complex concepts. To understand organizations collective degree of safety culture and the degree of commitment of the employees it is important to analyze employees individually to see what are their internal feelings, understanding and aims.

In this paper a multi-stage assessment process of these two important organizational characteristics that can contribute to organization's competitiveness; safety culture and organizational commitment is presented. This joint analysis is using newly developed Company Democracy Model (CDM) by Markopoulos and Vanharanta [8] and self-assessment based Evolute-methodology [9]. The Company Democracy Model considers the people to represent the most significant and valuable resources and assets that any organization has and supports high levels of individual commitment and motivation within the organization in the form of cooperation and inclusiveness regarding the decisions, plans and actions of the organization.

## 2 Hybrid Ontology Methodology

There is wide variety among organizations and people in their understanding of what "safety culture" and "organizational commitment" is and how to act to influence them in a positive way. It is also true that many individuals working in the field of safety do not know what a safety culture really is [2] even though they are talking about it. This is also without a doubt true for many managers who do not completely understand and realize what organizational commitment means and is comprised of and how to affect its development.

To understand, represent and evaluate these concepts we use ontologies. An ontology is an explicit specification of the conceptualization of a domain [10]. Ontologies define the common words and concepts (meanings) that describe and represent an area of knowledge [11]. Therefore, ontologies can explicitly define the meaning of concepts related both to safety culture and organizational commitment. By clarifying the conceptual structures of the concepts to all stakeholders, decisions are based on the proper and relevant information. This hybrid ontology-based approach aids understanding and managing the whole clearer than previous methods. Also, the changes become transparent and easy to visualize [12].

We have created two separate ontologies to evaluate these two concepts. In the Safety Culture model, there are 17 features and 51 statements, measuring different features of safety culture [13]. The statements specify an aspect of one or more features. According to Cooper's model, safety culture is an entity formed through externally observable and internally psychological factors, as well as the interaction between work, organization and people. According to the model, safety culture may be analyzed by examining three sub-groups: the management system of safety, safety atmosphere/climate and attitudes as well as behavior [14].

The Organizational Commitment/Engagement model, contains 59 features which are assessed with 237 statements. These features are categorized under relevant constructs, such as work motivation, job satisfaction, person-organization fit, perceptions of organizational support, and turnover intentions [15]. All the identified categories are grouped under the three main dimensions of organizational commitment—*affective, continuance, and normative* (cf. [16]).

By using statements employees evaluate themselves in current time and they also evaluate the level they wish or target for future. For example, they evaluate themselves regarding how engaged or motivated they are in the different aspects of their work and how committed they are to their organization [15]. The evaluation is made using the Internet-based Evolute assessment system [17, 18], in which the respondent compares the statement to linguistic labels on a continuous scale, meaning that there is a non-numerical scale for answering each statement. From the values of statements, with fuzzy logic deduction, each competence is given a single value. The difference of target and current states can be considered as the creative tension or proactive vision of the statement [19]. The bigger the gap between the current and future state, the higher the proactive vision for that feature, and the greater the potential to improve. According to Senge [20], the creative tension is the energy that can move an individual from the place of current reality towards the reality of his own vision.

We use the proactive vision as the proof of motivation and aspiration. For example, if there is big proactive vision for some feature of safety culture, then people are motivated to improve that competence or if there is a big creative tension in some feature of commitment then the employees wish to develop this aspect of human resource environment further. Therefore, it is also wise, from organization's point of view, to arrange education or possibilities to improve those characters as it is organizations aim to guide and support employees' personal growth, development, and personal vision, in order to improve their core competencies according to the competitive pressures of the business world [21].

### **3 Management and Leadership Patterns and Process**

#### **3.1 Process for Occupational Commitment and Safety Culture Evaluation**

Personnel consultation involves listening as well as considering the views of employees before decisions are made. One type of consulting method is the usage of self-evaluation. Self-evaluation takes place through an examination of one's own thoughts and feelings i.e., introspection. An individual doing self-evaluation can be seen as an autopoietic (self-defining) system: he or she defines himself/herself at work in the surrounding organization. A person can also evaluate an object in his or her situation, i.e. external business process by making a bottom-up extroversion of a chosen business process [22].

According to Nurminen [23] self-evaluation is an efficient method to develop oneself, manage personal growth, clarify roles, and commit to project related goals. The process of self-evaluation is a way of providing a type of formal structure to the

development of organizational characteristic such as safety culture and organizational commitment. In the case of self-evaluation, the degree of its accuracy depends on whether the individuals want to evaluate themselves, and whether they do it with sufficient care to be beneficial for the purpose [24].

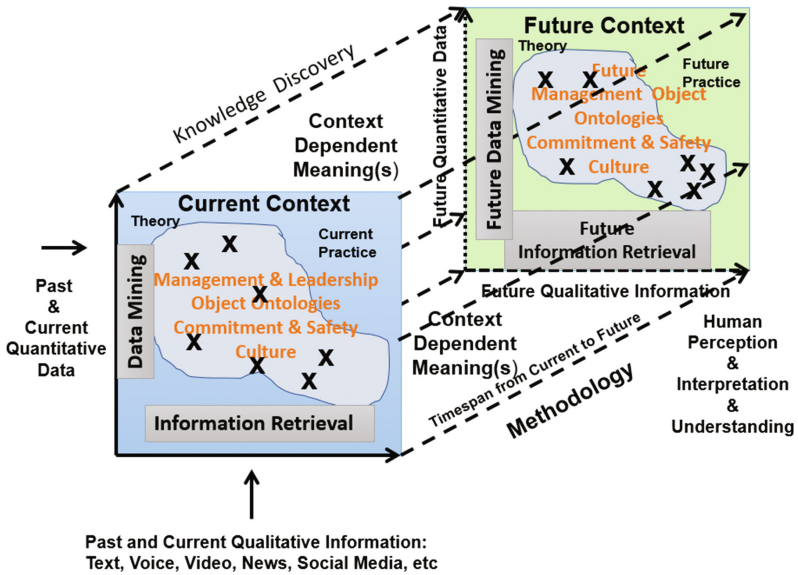
This research utilizes ontology-based self-evaluation [24] using Internet-based Evolute-environment. According to Barraclough and Carnino [6], self-evaluation of safety culture is a way to promote safety performance through the direct involvement of personnel in the critical examination and improvement of their own work. Involving personnel in the evaluation process can lead to better understanding of safety culture (in relation both to their own jobs and the organization), a broadening of knowledge of the objectives to be achieved, and the ways for achieving them.

Similarly, by asking employees to evaluate themselves regarding factors related to their commitment and engagement organization gives clear sign that they value employees' own feeling and opinions. However, this requires management to act based on the results of the evaluation. After the evaluation is conducted, employees are interested in results and how their collective opinions are utilized in decision making and put into practice. According to Ackoff [25], the values of those affected by the decision should be taken into account in a decision-making process. By consulting employees in decision-making processes, for example, by using evaluation results, makes them to feel that they are being heard, which may instill a sense of ownership over the outcomes [26]. If nothing is made accordingly, employees' engagement is likely to drop, which also makes such future project less likely to succeed because of employees increased feelings of not caring to participate such surveys.

The research methodology combines different methods to attain real situation-aware computing, to define the degree of commitment as well as the safety culture. The process focuses on covering both past and current data as well as current information in obtaining an idea of how people evaluate organizational environment regarding safety culture and sources of commitment and engagement towards their own company at present and in the future (see Fig. 1). The basic principle is to try to uncover how people view their company in their minds [22]. This evaluation is done by two ontology-based self-evaluation applications described in previous chapter.

In general, it is important first to understand the needs as well as the current state of the organization before targeting new organizational targets and expectations. This kind of proactive vision, created with the people inside the organization, gives the people the capability to collaborate and develop state of organization in harmony with top leaders and executives. The methodology, as well as the computer applications, supports the idea of evaluating the ontology in both its current and future state. This way, it is possible to capture the creative tension described by the test subjects of the human object ontologies as well as the future proactive vision from business object ontologies [24]. Therefore, by analyzing people's behavioral patterns in their work, meetings, decisions, and other activities, very important information can be gained about their past, to justify their present and forecast their future (see Fig. 1).

After the personnel evaluations are conducted the Evolute system has uncovered the overall collective picture of the company's safety culture and its employees' commitment and engagement towards the company. It leads off from the individual level towards the collective organizational level. The collective evaluations are



**Fig. 1.** Creation of context dependent meanings

analyzed and the priorities and creative tensions are calculated. This type of analysis follows principles of democratic company behavior making the analysis open which is important in the positive development of safety culture and commitment. According to Slater and Bennis [27] democracy is the only system that can successfully manage the changing demands of contemporary civilization in business, as well as in government.

In order for the organization to define a common language and establish a common understanding managers and leaders must know the constructs and concepts as well as the indicators thoroughly, so that they can manage and lead these fuzzy concepts in their organization and observe how changes occur through key figures. Therefore, democratic learning of these concepts is important because it allows all individuals, managers as well as other employees, to think through these concepts themselves and learn while giving important information for the organization.

The developed approach enables a comparison between desired future and current states. Also, asymmetries among respondents can be revealed, which is crucial information from a safety culture as well as commitment point of view. The assessment identifies the distance between the “as-is” and the “to-be” in the evaluated concepts. The assessment can also define the actions, priorities, effort cost and specific human recourses needed.

This is precisely the information, data and knowledge that is required for the management and leadership of these difficult concepts. We place this to the situation-aware computing area. The results of the test runs help us to create then a present situation-aware synthesis of meanings (See Fig. 2).

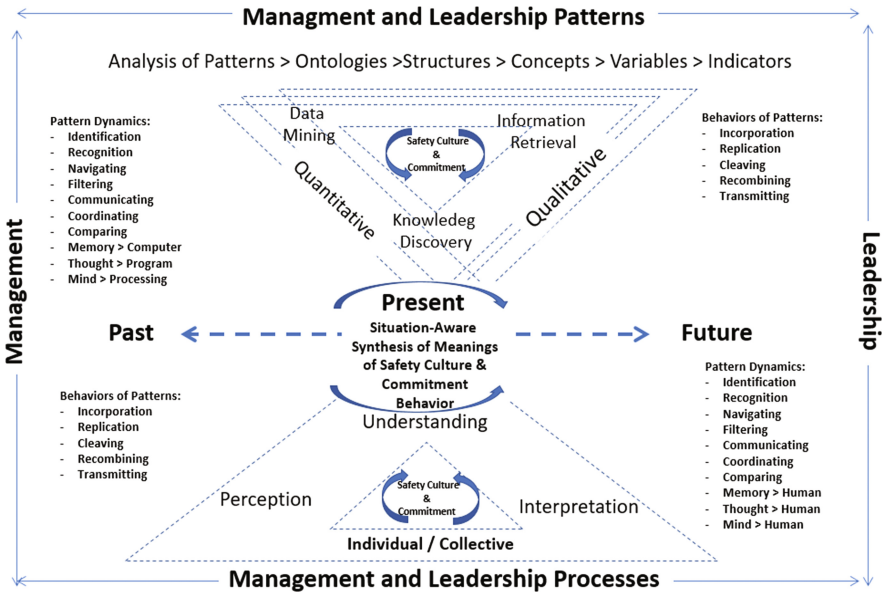


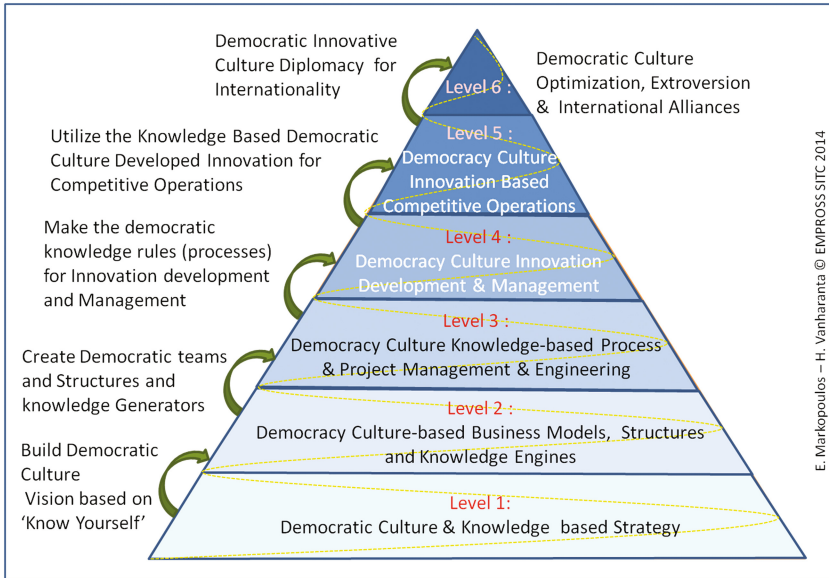
Fig. 2. Situation-aware computing through ontologies

The assessment results need to be implemented and executed towards reaching the development of the organizational human resource environment and strategy and operations framework.

### 3.2 Collective Understanding Through Company Democracy Model

The Company Democracy model is an applied philosophy model based on the creation of organizational culture that identifies, extracts, and utilizes knowledge in a collective way for the benefit of all [28]. The co-evolutionary spiral method in the model contributes towards the identification and achievement of the capacity, capability, competence, and maturity needed to turn information and knowledge into innovations. The spiral process, in this context, is based on the idea of the degree of democracy in organizations. The model is structured in such a way that the method reflects the Co-Evolute methodology [21] and its application in organizational democratic performance. Both organizational development methodologies (Co-Evolute and the Company Democracy Spiral Method) are aimed at the creation of an organizational knowledge-based culture [29, 30]. Both methods utilize organizational knowledge by developing a knowledge-based organizational culture that can constantly contribute to the organization by transforming organizational tacit knowledge into explicit knowledge [10].

The Company Democracy Spiral Method levels form a pyramid structure. The pyramid shape has been chosen to point out the incremental progression of the levels



**Fig. 3.** The company democracy model with pyramid stages

and to illustrate that not all who attempt this route can reach the top without real commitment, determination, and organizational capability and maturity (Fig. 3).

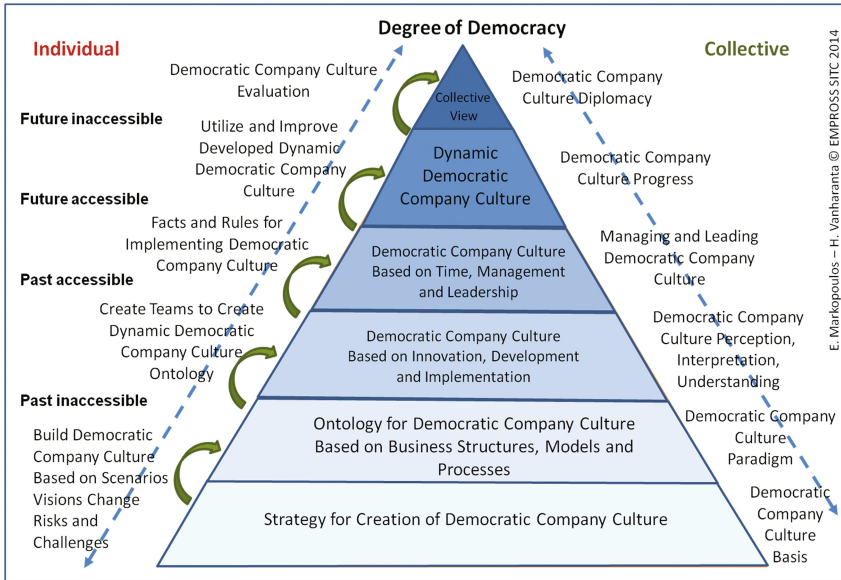
The Company Democracy levels provide the actions to be processed to proceed towards the identification of the degree of company democracy through a new pyramid-type representation based on the individual and collective evolution dimensions (Fig. 4).

The individual side of the pyramid can remember and see the past inaccessible part of the company democracy process, which may be accessible today and in the future. From a collective point of view, the democratic company culture basis must be firm, the created paradigm must contain all the known information, and the democratic company culture must be understood, interpreted, and perceived by each company member. Therefore, for an organization, it is important first to understand the current degree of democracy and how this degree should be improved over time, through democratically oriented changes.

As an example, by applying the model to Safety Culture, the levels can determine the evolution of the safety culture in the organization and indicative strategic goals archived in each level (Fig. 5).

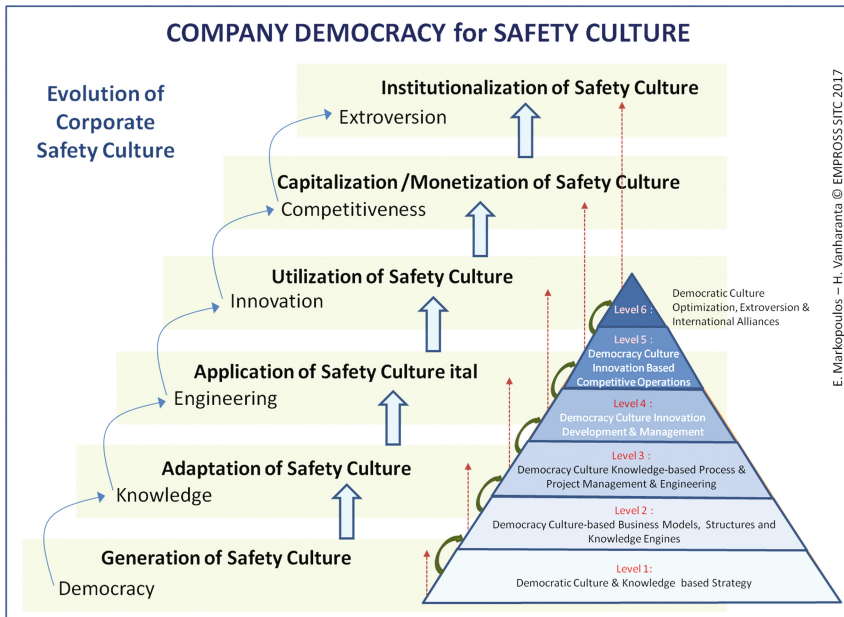
The first level of the Democratic Safety Culture establishes the culture via democratic processes where all people can propose, comment, suggest, think, and contribute in a dynamic and continuous safety culture framework. The second level generates the safety knowledge that derives from the democratic culture. The third level applies the safety knowledge in the organization via new processes, practices, projects and initiatives. The fourth level utilizes the results of the application of the safety knowledge via innovation generated from the effective application of the knowledge. The fifth





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**Fig. 4.** Co-evolutionary spiral process for dynamic democratic company culture development



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**Fig. 5.** Evolutionary of the safety culture through the company democracy model

level capitalizes in financial terms and in profit generation, the knowledge and the effectiveness of the safety culture. The sixth level institutionalizes the safety knowledge and exports its added value to the society, the economy and the market. The six levels are repeated over and over (via the spiral theory) as the safety knowledge targets can be expanded or rolled out in an organization.

### 3.3 Application Technology Behind the Evaluation Method

People are not good at making precise yet significant statements about a complex system's behavior [31]. This means that accurate observations cannot be made about safety culture and commitment. These concepts take place in complex social systems that involve many humans and other system parts.

Fuzziness in linguistics can be captured by creating linguistic variables that "contain" fuzzy sets [32, 33]. Fuzzy sets represent complex systems, such as safety culture and commitment, better than crisp sets for two reasons: (1) the predicates in propositions that represent a system don't have crisp denotations; (2) explicit and implicit quantifiers are fuzzy [34]. A fuzzy set can be defined mathematically by assigning to each possible individual in the universe of discourse a value that represents its grade of membership in the fuzzy set. This grade corresponds to the degree to which that individual is similar to or compatible with the concept represented by the fuzzy set [35]. In this work, the perception of different aspects of safety culture and commitment becomes a degree of membership in fuzzy sets. Just like in real life, everything is a matter of degree. Linguistic variables bridge the gap between the numerical space and the meaning in the human mind. This means that meaning-based research and tools can be developed in numerical space.

Fuzzy logic [31] allows reasoning using fuzzy sets and fuzzy rules. A translation system represents the meaning of semantic entities, and an inferential system arrives at an answer to a question that relates to the information resident in a knowledge base [34]. The knowledge base refers to the concepts (ontology) of safety culture and commitment in this case. A fuzzy logic application resembles an expert's task to evaluate and reason based on linguistic information.

## 4 Conclusions

As seen from the research these ontologies and applications support each other and the subject discussed requires extensive learning from organizations both from the content of a safety culture and the content of the organizational commitment and engagement.

There is a strong evidence that competence-based self-evaluation applications, i.e. human-compatible systems, clearly recognize individuals' own current reality and their needs for professional and personal development. We can show the collective feeling among the respondents, how they felt right at that moment, and where they feel there is most room for improvement. Based on the individuals' current and future visions, human resource development and other action plans of the company can then be done in a much more targeted way and also the future competence paths can be

simulated. The applications show clearly the priorities that the organization should put their mind into and work together to develop and improve.

The aim of the evaluations is to advance people's knowledge about the subjects and at the same time improve safety culture through commitment and vice versa in interactive manner via connections between the ontologies. By combining the top-down management view with bottom-up understanding, it is possible to control, steer and command both the financial and the human resources to the targeted objectives and goals.

The evaluation runs must be made from time to time and by examining the result appropriate resources should be allocated to improve these and the whole organization.

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# On the Basis of the Sales Engineering Competences and Education

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**Abstract.** Sales engineers (SE) sell technical products and services to companies. They consult the professional customer and suggest technically and economically feasible solutions with maximum utility for both the customer and their own company. They combine technical knowledge with commercial skills. They are best trained to understand the requirements of the industry. Nowadays there is no clear definition of the profession of a sales engineer. Sales engineering is a profession which includes at least as much skills than knowledge. This unique profession is a mixture of technical, sales, business, management and soft skills, internationalization included. Therefore traditional division between engineering, economics, management and other education does not seem to fit for sales engineering education and its needs. Since there is no definition for SE curricula, the state-of-the-art of the education has never been studied before. This article reveals the need for the sales engineers, introduces methods for the definition of the sales engineering education, and presents a state-of-the-art education from European perspective. Study proposes boundary limits for sales engineering education and gives a basic definition for sales engineers' education. Future research actions and needs are addressed at the end of the article.

**Keywords:** Sales engineer · Curricula · Education · Engineering · Sales · AASE

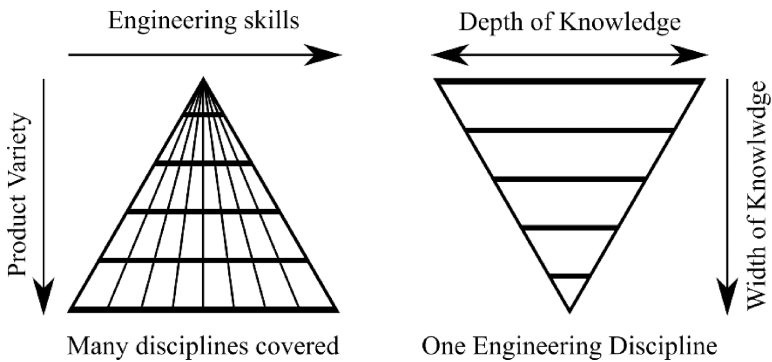
## 1 Introduction

Sales engineers (SE) sell technical products and services to companies. They consult the professional customer and suggest technically and economically feasible solutions with maximum utility for both the customer and their own company. They combine technical knowledge with commercial skills. They are best trained to understand the requirements of the industry [1].

SE understand the technology and the functions of the product. Thus, they need a base knowledge of engineering. At the same time, they are capable to link the technological viewpoints to the economically limiting conditions in terms of costs as well

as in more general macro-economic relations. As consultant to their customers they also need communication skills as well as a certain psychological competence. They must be able to ask their customers about their product, its applications and needs, thus finding out the customer’s requirements which are not given in the technical specification. As for this, they may use techniques from Kano’s model of customer satisfaction (CS) [2]. Many companies use the method of the House of Quality which is part of Akao’s Quality Function Deployment (QFD) to optimize the product with respect to its technical performance [3]. However, SE are able to combine both methods which can be described as the method of Customer Satisfaction and Quality Function Deployment (CSQFD) which is described by Schneider-Störmann [1].

SE are working in a wide field of the industry: From technology-driven enterprises selling customer tailored investment goods to technical mass products such as electronic and mechanical components as well as standardized machine elements. If the product variety is wide, the depth of knowledge in the different engineering disciplines need to be flat, but the number of engineering disciplines to be covered needs to be varied as shown in Fig. 1. Sales Engineers dealing with special tools such as customer designed investment goods need to be experts in the corresponding field of engineering. Thus, they need to have a large depth of knowledge in this field.



**Fig. 1.** Depth of knowledge vs. width of product range sold by a sales engineer [1]

SE are working in a wide range of B2B industries including but not limited to plant and machine engineering, electronics, medical industry, information and telecommunication, optics, software development or services.

Thus, a clear demand for Sales Engineer’s competences can be pointed out:

1. They need to have a solid knowledge base in engineering
2. They must have profound sales, negotiation and marketing capabilities
3. Economic and business administrative issues have to be part of their thinking and actions
4. Communication skills are essential, including negotiation skills
5. Soft skills, such as giving presentations, are obvious.

Figure 2 shows the different scientific fields which should be present and part of sales engineers competences.

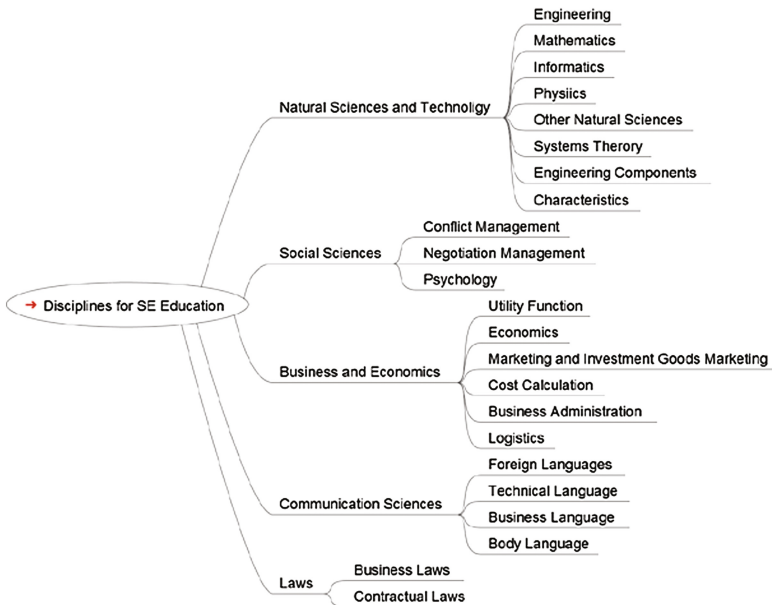


Fig. 2. Fields of sciences and education of sales engineers

Depending on their desired field of activity according to Fig. 1, their detailed educational plan needs to be changed: If SE intend to sell investment goods, the engineering part of their education should be more in depth. In general, competences in methods lead to a more flexible SE compared with persons having huge and detailed knowledge in single disciplines. By covering all scientific fields, highlighted in Fig. 2, more competent Sales Engineer can add value to his/her respected industry.

## 2 Need for Sales Engineers: A European Perspective

The internal trade between EU-28 (internal market) member states has been relatively stable from 2011 to 2015, with an annual value for 2015 of over EUR 3,063 billion €. Compared to the 1,908 billion € in 2002, value of trade has grown more than 50% since. The global financial crisis, which started between the fourth quarter of 2008 and the second quarter of 2009, decreased trade value and volume tremendously. It came back to same level as it was before the crisis only in the beginning of 2011.

This EU’s internal market, which is the sum of all the nationally international markets, mainly consists of manufactured products. Their share was 80% of the total intra-EU export in goods. Machinery and vehicles together with other manufactured goods were over 63% of this share. Chemical products, which are included in the

manufactured goods, sum up for 16% and primary products for roughly 19% of it, including food and drink (10%), energy products (10%) and raw materials (3%). Export to regions outside EU also consisted mainly in manufactured products. These products represented about 80% of the total annually EU exports. In 2013 the value of exported machinery, vehicles, and other manufactured goods reached 1,365 billion € [4, 5].

All of this trade is international. Either it is international inside the EU or international between EU countries and non-EU countries. The main destinations in extra-EU goods export (including all goods exported) in 2014 were USA, China, Russia, Turkey, Japan, South-Korea, Brazil, India, Saudi-Arabia, Canada, Australia, Mexico, South Africa, Indonesia and Argentina. USA were significantly the largest market with over 310 Billion € followed by China (165 Billion €) and Russia (100 Billion €). Turkey and Japan exceeded 50 Billion € and the other partners ordered goods for the sum of between 20 and 50 Billion €. Extra EU services export's main destinations were very similar to the goods exports in 2014. USA were extremely distinguishable with the value of 197 Billion €, which was over 25% of total extra EU service exports. When scrutinizing USA's share in goods exports, over 18% from total value, it is clearly seen that USA is most important single market area for EU [6, 7].

In 2013, manufacturing represented 2.1 million enterprises, 29.7 million employees, and an added value of 1,630 billion €, and the sole high-tech manufacturing branch consisted of 46 000 enterprises (2014) and an extra- and intra-EU trade volume of 683 billion € (2015) [8]. Manufacturing is therefore the largest contributor to non-financial business economy added value in Europe, accounting for more than one quarter of the total one in the EU [5]. Manufacturing is just one of the sectors of NASE, which is a statistical classification of economic activities in the European Community, where technical sales persons are needed. E.g. sectors of mining and quarrying, electricity, gas, steam and air-conditioning supply, construction, transportation and storage and Information and communication probably also needs SEs - just to mention a few -. Since manufacturing sector alone is about 80% of total intra-EU trade (3063 Billion €), the total value of technical intra-EU trade sums up to more than 2,000 billion €, and more than 1 300 billion extra EU-trade summing up 3 300 Billion € trade. And these numbers are not counting other sectors than manufacturing!

When underlining that the above figures do not include domestic trade (done inside different EU countries) the huge need for well qualified and performant Sales Engineers as well as an appropriate SE education becomes very clear.

If we suppose that one SE is generating 5 Million € turnover per year it means that there is 660 000 persons working as SE in EU. And if we suppose that career for SE is 40 years we end up to conclusion that every year 16 500 new people is needed in the field of technical sales. These figures are not studied but given as demonstration purposes. Even if we double the sales volume for each SE to 10 Million per year it still means that more than 8 000 new persons is needed. When comparing that number of annual SE graduates from AASE members is less than 1 000 graduates it is easy to see the gap between need and supply.



### 3 Academic Association of Sales Engineering (AASE)

Unfortunately, sales engineering is not yet a well-established academic career at European Higher Education Institutions (EuHEI) nor is it an officially recognized profession. Founded in June 2014, the AASE, the Academic Association of Sales Engineering, currently counts 47 academic members from 19 EuHEI from Austria, Finland, France and Germany. All participating EuHEI, representing universities, universities of applied sciences (UAS) and schools, offer SE training with combined technical and commercial issues, including the more practical aspects of sales issues.

The AASE aims primarily at: (1) Promoting the profession of sales engineering to politicians, industrials and the public, (2) Defining standards for the SE education, (3) Facilitating the acceptance of courses and curricula between the partner EuHEI and thereby increase the (international) student exchange and (4) Facilitating and organizing the cooperation between teachers, and lectures at partner EuHEIs.

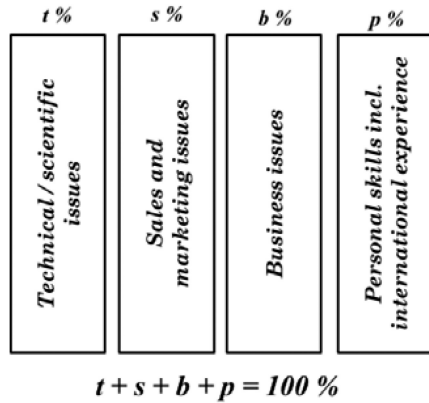
The AASE pursues these objectives initially across Europe by associating academic employees from other EuHEIs offering or planning SE trainings. This is achieved within AASE by three working groups set up focusing on teaching, on research, and on public relations. The AASE members decided to cooperate on exchange programs of teachers, to facilitate (international) student mobility between the participating EuHEIs, and to work on common teaching methods, tools and materials. The AASE members also want to initiate common research projects and to do a concerted communication.

A first analysis of available information within the AASE member EuHEIs and on Internet sites has given very different results regarding Sales Engineering training offered by Austrian, Finnish, French, German, Italian and Spanish EuHEIs. In Germany, about 30 Bachelor and Master Degrees exist at about 20 EuHEI, all of them founded within the last 15 years. In the other countries, the identified offer is quite small or not existing: Two degrees in Austria, three in Finland, one in France and none at Italian and Spanish EuHEIs. The other European countries haven't been investigated thoroughly yet. Even when this analysis isn't exhaustive, there is a clear tendency showing the poor offer of initial sales engineering studies in Europe.

All existing SE studies follow their specific curricula, guidelines, focuses, planning and internship rules. The Bachelor Degrees durations vary from six to eight semesters (3–4 full years), and the Master Degrees between two and four semesters (1–2 full years). Generally, the minimum is that at least one international study or internship semester is requested as well as an internship of three month or more in a company.

All SE curricula respect the four pillars of issues shown in Fig. 3 with different repartitions between them. These differences within the four pillars are due to local singularities such as existing infrastructures, local industrial competences or cooperation with companies.

The two first pillars are strongly characterizing SE trainings. The technical/scientific pillar (t) includes the basics such as mathematics, physics, statistics, and so on, but also the technical lectures, e.g. mechanics, electronics, or others similar technical topics. This technical part is varying from one EuHEI to another, but following one of the two alternatives, also represented in Fig. 1.



**Fig. 3.** The four pillars of a typical sales engineering training [9]

Most of the sales engineering degrees have been set up at technical oriented EuHEIs as the technical education requires highly qualified staff and heavy investments in infrastructures. As EuHEIs are generally proposing a technical specialization, the SE training is connected to this specialization to benefit from existing resources and lectures. A graduate from such an EuHEI will have a strong specialization too, and s/he will probably work in this domain. Some EuHEIs propose more generally orientated SE trainings with a large spectrum of technical basis lectures. In this case, the sales engineer is mainly a generalist who can work in multiples industrial domains, but on a lower specialized level.

The second pillar (s) is the very important sales and marketing axis. Effectively, sales is done between people, and the appropriate tools and methods need to be known and mastered to understand the customer, to analyze their problems, and to suggest them value adding and an economically viable offer. Marketing issues must focus on B2B and industrial, technical or investment goods marketing, as the SE won't mostly sell to the end consumer with different marketing approaches. This axis includes also skills like negotiation or psychology.

The third pillar (b), business and management, covers topics related such as general economics, leadership management, accounting, logistics, legal aspects, export or human resources.

And the fourth and last pillar (p) regroupes personal skills like languages, interpersonal communication and presentation; and also the international and professional experiences.

The broad range of the different contents indicates, that SE need to be able to think and act as an engineer, a business man and a sales professional at the same time. Compared with the pure engineering or economic domain, SE studies are quit a young discipline, and that is why there is an urgent need to structure and define the necessary content of the curricula.

## 4 Industries' and Students' Expectations

The industries' and of students' expectations of SE studies are not identical. Where the industry is looking for SE to respond to their needs in all aspects, students are also searching for personal fulfilment and experiences. In this paper, current division of education available at AASE member EuHEI's is presented, based on Fig. 3 pillars.

As said before, SE training is a young discipline, and there are no clear definitions of content or competences validated by studies. Therefore, minimum standards of competences and knowledge should be created. Existing SE trainings are different, and there is no guarantee that present curricula correspond to industrial needs, even if all member EuHEIs report employment rates of more than 95% at the end of the studies. That is the reason why there is a common conviction that minimum standards should be set up in line with the requirements of the industry on skills and competences to strengthen the profile of sales engineers.

These minimum standards must respond to two conditions: (1) They must define the competences and contents the industry is looking for. To achieve this a large study needs to be undertaken to identify these expectations for two time horizons: today and in five to ten years. The SE environment is changing, due to upcoming and already existing digital sales and training tools and programs, and the further technical developments. This research work could confirm the number of SE required in the next ten years, a figure which will be very important for promoting and creating new SE trainings in Europe. (2) The proposed education schemes must be sufficiently flexible and open that all EuHEIs can adopt them, as well as national or local accreditation rules. One option could be to define minimum contents  $t'$ ,  $s'$ ,  $b'$ , and  $p'$  for the four pillars from Fig. 3 responding to the following equation:

$$t' + s' + b' + p' < 100\%. \quad (1)$$

Another option could be to define a list of mandatory competences, knowledge and skills. This paper presents former one of the options.

In today's global business, adequate language skills are a must. International business language is English and therefore good English language capabilities are mandatory for each SE. A second foreign language generally would add value to every SE. That is why language skills, preferentially proven by international language certifications, should be integrated part of all SE curricula.

In addition, each student should benefit from a long lasting international experience in a non-native-language country to learn how to survive in an "unfamiliar" environment. During this experience the student will discover a foreign culture, experience new management or teaching styles, and meet new people to add to his/her future network. This first international experience should be proposed to all students, or even be compulsory during the studies. This experience could be an academic or an internship experience.

At least one internship, lasting minimum three month, should also be obligatory to force students to discover sales and/or marketing activities in a true professional environment, and to get first industrial contacts. This will be the opportunity to validate

a chosen industrial sector or a type of company such as, e.g., start-up, SME or large company.

Establishing (international) student exchange is another ambitious objective. Today, such an exchange must be organized so that the student won't lose a semester or a year, which would be disadvantageous in his curriculum vita. Two strategies from EuHEI side are conceivable: (1) The first one consists in trying to build the exchange students' study program based on existing lectures during their stay. Only by matching a certain number of subjects with the program of the host institution, this exchange will be successful from student's point of view. This strategy needs a lot of organizational effort from the host institution, and this will generally be a bilateral or trilateral agreement. (2) The second strategy is to harmonize one or several training semesters and to oblige students to do their exchange period during these semesters. Naturally organizational effort are required, but this needs to be done once. This way all student exchanges are part of the curricula and it is guaranteed that the exchange semesters are recognized at the home institution. The disadvantage of this option for the institutions is that modifications of their curricula would be necessary, which can only be done when new accreditation is requested for the degree. Sequence of accreditation varies from country to country and can be instantly or even five years.

In the beginning of cooperation, the only option is the first one with an individual program planning. But in the medium-term, the second strategy should be favored as it allows a smooth exchange between the multiple EuHEIs.

The AASE aims clearly at defining one or two semesters with a common training program once the above mentioned minimum standards have been defined. It then will be the mission of each EuHEIs to adopt their study program to this joint frame when they renew the accreditation.

One way to reinforce the visibility of sales engineers and SE education is to certificate the curricula according to defined conditions and to let industrials and politicians know about it. Such a certification has multiple advantages: (1) It permits to ensure a requested quality level of the curricula and to guarantee that the acquired knowledge and competences correspond well to what the SE will need in his/her professional live, (2) Certificated curricula are a guarantee for companies when they are looking for new SE employees. With this way, certification improves the chance for SE students to find employment, (3) Certification is an effective marketing argument to anchor this important but nearly unknown profession in the attention of society, and to draw the attention of politicians, funding organizations, industrial representatives and the public to it.

Regarding these goals and objectives this paper describes the present situation regarding the division into the pillars illustrated in Fig. 3 of 20 SE studies in AASE member EuHEIs.

## 5 Research Setting

All 19 member institutions in the AASE member EUHEIs have been asked to provide data on their specific sales engineering curriculum. Eighteen of them, corresponding to 95% of the contacted institutions, answered to the survey. By that detailed information

about 14 Bachelor Degree, 6 Master degree, and one five-year diploma curriculum is available and used for the following data analysis. The participating EuHEIs are illustrated in Table 1.

**Table 1.** List of institutions and corresponding analyzed study programs

Institution	Country	Bachelor	Master	Diploma
UAS of the bfi Vienne	Austria	x		
UAS Wiener Neustadt	Austria		x	
Turku UAS	Finland	x	x	
ESTA Belfort	France			x
HTW Aalen	Germany	x	x	
UAS Aschaffenburg	Germany	x		
Ruhr-University Bochum	Germany	x	x	
EuFH Brühl	Germany	x		
UAS Düsseldorf	Germany	x		
UAS Hannover	Germany	x		
UAS Kaiserslautern	Germany		x	
UAS Karlsruhe	Germany	x		
UAS Kiel	Germany	x		
HAW Landshut	Germany	x		
UAS Ostfalia (Salzgitter)	Germany		x	
UAS Rosenheim	Germany	x		
DHBW Stuttgart	Germany	x		
UAS Südwestfalen	Germany	x		
<b>Total</b>		<b>14</b>	<b>6</b>	<b>1</b>

The data include the type of the curriculum, the standard number of semesters to get graduated as well as the number of necessary ECTS, the type of the diploma, the distribution of the different lectures within the four above-mentioned thematic pillars, requested international internships or professional experiences, and finally general remarks concerning the study program.

The mapping of the different lectures to one of the four pillars Science and Technology, Sales and Marketing, Business and Management, and Personal Skills is done by each degree responsible. In most cases, this mapping is clear, but sometimes it is not. To harmonize the results of this analysis, some ambiguous lectures have been assigned to the same category for this evaluation. E.g. project management is assigned as well to the Scientific and Technology category as to the Business and Management category in local study programs, but always to the Business and Management category for this study.

As most degree programs offer different options for students, the degree responsible have been asked to enter a typical sales engineering curriculum. Slight differences in the individual programs of students at the same faculty are therefore possible.

## 6 Data Analysis

All study programs, follow the Bologna premises and request 30 ECTS per semester, except at the UAS Kaiserslautern, where the Bachelor is acquired with 180 ECTS in 7 semesters and the Master/MBA in 4 semesters with 90 ECTS. This data is therefore not separately described as linked to the analysis of study length.

The following data analysis is done within the groups Bachelor and Master, as basic conditions, specificities and objectives are different, completed by some remarks on the five-year Diploma degree. All below mentioned shares are calculated on the basis of the ECTS allocated to the corresponding lectures.

### 6.1 Bachelor Degrees Curricula

The majority of ten Bachelor degrees last seven semesters, whereas two last only six semesters and two others eight semesters. In all cases, the degree is completed with a Bachelor thesis, realized in the last semester in cooperation with a company or internally at the home institution of the student. Three Bachelor Degree curricula represent Dual Studies, where students are hired by a company and are working and studying in parallel. Generally, the company incurs the expenses related to the education. Three Bachelor degrees request an international stay in form of an academic exchange or an overseas internship, in one case an overseas internship and in another two ones an academic exchange period is needed. Overseas experiences must last six weeks, three or four months (one time each) until one semester (four cases).

Regarding the analyzed Bachelor Degrees, the shares of the four thematic pillars vary heavily, Table 2. The maximum share is the double of the minimum share for Science and Technology lectures, the triple for Sales and Marketing and Business and Management ones, and nearly seven times the minimum for the Personal Skills pillar. Sales engineers are selling technical products and services and thus this is well characterized by the important shares of Science and Technology (average of 40.3%) and Sales and Marketing (average 24.8%).

**Table 2.** Minimum, average and maximum shares per thematic axis of sales engineering bachelor degrees

Thematic axis	Minimum	Average	Maximum
Science and Technology	29.0%	40.3%	59.0%
Sales and Marketing	15.0%	24.8%	42.9%
Business and Management	10.5%	20.8%	33.8%
Personal skills	4.3%	14.1%	29.5%

Looking at the analyzed study programs, the two main pillars Science and Technology and Sales and Marketing should at least represent the minimum values of 30% respectively 15% in sales engineering Bachelor Degree curricula.

## 6.2 Master Degrees and the Five-Year Diploma Curricula

Information is available for six Sales Engineering Master Degrees. One of them lasts two semesters, three covers three semesters, and the two other ones last four semesters. The duration of the Master Degrees is linked to the local (national) Bachelor Degrees, insuring that a Bachelor plus a Master are lasting 10 semesters. In all programs a Master thesis must be written in the last semester. In all five cases, a successfully completed technical Bachelor Degree is requested to be admitted to the Sales Engineering Master Degree programs.

The Master Degree of UAS Ostfalia can only be obtained via correspondence courses. The Master Degree at UAS Kaiserslautern (MBA) is limited to graduated engineering or scientific students with a professional experience of at least one year, and the one of Turku UAS to those with three years of professional experience.

There are no internships included in these curricula. The minimum, average and maximum shares of the different pillars show that in Master Degree Programs Sales and Marketing and Business and Management lectures are predominant, with, looking at the average values, a total of 82.6%, Table 3.

**Table 3.** Minimum, average and maximum shares per thematic axis of sales engineering master degrees

Thematic axis	Minimum	Average	Maximum
Science and Technology	0.0%	11.5%	40.0%
Sales and Marketing	25.6%	47.6%	66.7%
Business and Management	20.8%	35.0%	69.2%
Personal skills	1.1%	5.9%	16.7%

Science and Technology and Personal skills are much less represented. The under-representation of at least scientific and especially technical lectures can be explained by the fact, that these Master Degrees address Bachelor graduates with a strong technical background, such as engineering, industrial engineering, or sales engineering bachelors. Imparting technical knowledge is considered as done, and less important within the Master Degrees. But Sales and Marketing are predominant in these study programs, with an average of nearly 50%, showing the significance degree responsible assign to this pillar for sales engineers. Beside technical knowledge, Sales and Marketing competences are the main important ones in a Sales Engineering education.

The five-year diploma is a specialty of the French private school ESTA offering this direct program to high-school graduates. Beside the specificity of a direct five-year education, this program includes also 20 month of professional internships, including one overseas semester, which is much longer than the internships requested in the Bachelor Degrees, with a maximum of six month.

The ESTA program comprises 27.1% Science and Technology and 31.5% Sales and Marketing lectures. These values need to be compared with a complete education with a seven semester lasting Bachelor Degree followed by a three semester lasting Master Degree: Effectively, the Science and Technology share accounts in such a

calculation for 20.3% (basis: minimum values) or 31.6% (basis: average values) of the total of 300 ECTS, whereas Sales and Marketing accounts for 18.2% or 31.7% respectively. Thus, both pillars of the ESTA program are, with the above mentioned shares of 27.1% and 31.5% close to the calculated values based on the average shares of 30.1% and 31.4%.

## 7 Conclusions

Products and services, which includes technical knowledge are major part of EU's exports, both intra-EU and extra-EU. These technical products and services are often sold by engineers. Depth of technical knowledge of sales engineers is depending on the complexity sold products and services. Two different technical approaches, focused but narrow and wide but not so deep, are needed. There are not remarkably many EuHEIs which provide sales engineering education nor is there consensus within the EU which issues sales engineering curricula should include. This paper describes the basic framework for analyzing sales engineering curricula by scrutinizing existing degree programs' contents and analyzing those by four main categories: technical and scientific, sales and marketing, business and management and personal skills. Analysis contains information from 18 different EuHEI and their 20 different degree programs.

The following conclusions can be drawn from this analysis: (1) The Bachelor Degrees focus on scientific and technical issues with a minimum share of 30% and an average one of 40%. This scientific and technical education is accompanied by a basic Sales and Marketing part representing about 25% (average) of the Bachelor Degree program, with a minimum of at least 15%. The Bachelor Degree programs led to sales engineers with strong technical, selling and marketing competences, being able to do their job: selling technical products and services. (2) The Master Degree considers the scientific and technical education finished and focus on in-depth Sales and Marketing topics (average of nearly 50%) as well as on Business and Management issues (average of about 35%). With these additional competences, Master Degree Sales Engineers are prepared to rapidly take over responsibility and lead functions in companies. They possess on the one hand essential technical knowledges and selling competence; and on the other hand in-depth knowledge and competences in general economic and management issues. The total conclusion is that sales engineering degree program needs all of these four pillars in order to be called sales engineering education. Graduating students should possess the knowledge, skills and experience before they graduate as sales engineers.

This research was limited to EU region and AASE members. In order to widen the perspective a similar kind of study should be executed globally. Also more in depth research should be done regarding the contents of curricula and which kind of knowledge, competences and skills these curricula are providing to graduates. A longitudinal study of graduates' careers in industry would be very feasible in order to find out which contents are found to be more useful than other in longer periods. The true sales volumes per SE for each industry should be studied in order to have need forecasting more accurate.



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# Design Thinking: User-Centered Multidisciplinary Methodology Based on People and Innovation

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**Abstract.** The Design for today's complex world requires a cross-disciplinary and multidisciplinary approach involving several domains of science and learning. Sharing knowledge has aroused a great deal of interest in Design Thinking that has been applied in many organizations and institutions in attempt to acquire creative thinking and a wide-ranged vision broader problem-solving for user-centered innovation. Adopted by individuals, public and private companies, geared towards entrepreneurial initiative, management, use of technology, systems and engineering in the corporate world, its influence has also extended to curricula of university programs. A brief analysis of DT's indexes showed an increase of 50 to 100% in the search for the term Design Thinking, and indicates that the interest in this methodological tool has intensified in recent years, reaching a considerable growth with expressive levels. This article identifies the bias of the usage application and verifies if DT is a trend, or an asset in addition to a methodology and seeks to determine its real applicability by designers and other areas and segments where strategic human factors are essential.

**Keywords:** Design Thinking (DT) · Innovation · Strategic methodology · Creative visual and spatial thinking

## 1 Introduction

The complexity and uncertain perspective defines the contemporary society problems and situations that require the application of strategies to generate innovative ideas and solutions. In this context, design has been widely used in the transition of information and communication age to an emerging era of concepts, where the sustainable and intangible become essential elements.

According to [1], for decades there has been a great deal of divergence regarding design methodologies and processes, because of their resemblance with engineering design [2, 3], to the point where the design methodology seemed to disappear. Currently, unlike this, there has been a crescent interest in the design way of thinking about products innovation for the society demand [1]. Following this changing, design methods acquired importance in several areas, and are also becoming more mature for the academic and production field, besides an important strategical tool. Nevertheless,

there is still an absence of sureness for designers upon methods, because of the lack of recognizing its specific technical capital. In fact, this situation has changed due to a sudden emerging interest in DT in this decade, and the introduction of multidisciplinary models in search for innovation [4]. In this way, old methodologies have been replaced by new multifaceted perception of the web of interdisciplinary approaches involving expertise, action and specially thought [1, 5, 6]. This process about the way of thinking the Design Method was never abandoned by engineering and product design areas [1, 6].

To address changes and the constantly moving environment, that shows hybrid necessities, turns Design Thinking relevant for several domains and organizations as a tool to solve “wicked problems” [13], known as complicated structural and organizational troubles [1, 6]. Design Process which includes the trendy concept Design Thinking is a method where ideas, information and demands are transformed into product manufacturing possibilities and benefits, services and experiences. DT refers to a strategic, integrated and associative creative thinking that allows designers to observe all sides of a problem, check several variables, inquire and apply their expertise and knowledge, in theoretical and practical possibilities.

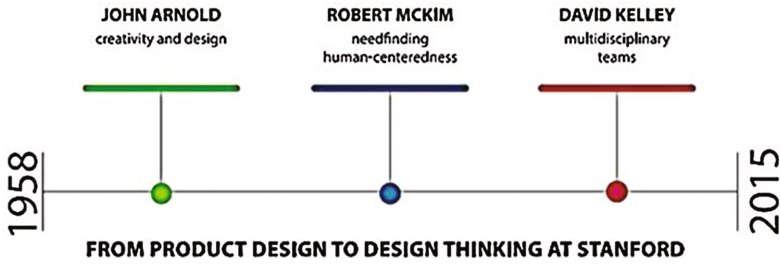
The model thinking of a project process in stages, trying to replicate the way designers think their conceptions, was given this terminology (Design Thinking) in this century (DT), after his mentor, Tim Brown, named it in 2008 [4–6]. Exactly corresponds to the Design Process method in a multidisciplinary approach of a phased project led by a team. It can be inferred that DT has been used to address the real needs of society for problem solving and to redeem McKim’s view [4] regarding the importance of user needs reviewed and expanded by [9], balancing technical resources and business in a whole vision, a holistic and systemic way, with an emphasis on strategies [3, 4].

Thus, one can see that design and science are becoming inseparable concepts [7, 8] and parts of a human-centered multidisciplinary approach [8] focused on User-Centered Design [9] “*Science is no longer perceived in terms of Methodology focused on a specific world view. It’s one more expanded rationale for identifying, structuring and solving problems. This makes the sound of scientific methodology indistinguishable from design methodology*” [7].

Creativity and product design last from 1958 until the beginning of 2000 as a kind of “one-disciplinary” management, based on the descriptions of Stanford and MIT specialists Arnold and McKim [4]. From individual Product Design to Brown and Kelley’s Design Thinking team, methodologies are essential and have in common the application of human-centered approach [6], focused on User-Centered Design [9], as shown in Fig. 1.

Kelley indicated, in [4], that the key point of Design Thinking principle lies in the fact that it is represented by a multidisciplinary cluster profile and as well, the chosen terminology who appointed it was very tactical and successful.

Checking the paradigm that shows a status change about the importance of product planning being gradually replaced by the importance of the concept planning, this study makes a DT application and usage analysis, determining if Design Thinking is characterized as a trend, a fad, or if it is indicated as a strategic application tool to achieve innovation [10].



**Fig. 1.** Design path at stanford - from product design to design thinking (1958 – 2015). Adapted from Camacho/Kelley’s testimonial (2016) [4].

## 2 DT Strategic Applications and Methodological Purpose

As stated by [10, 12], the recent evolution of Design Thinking in the field of organizational methodology has brought some important contributions. Researchers have found that standardized approaches to project management favor efficient implementation and thus become strategic. The technique includes three organizational topics: management of the exploratory phase, management of stakeholder involvement in the project, management of the project in relation to the business development process and company strategy [11]. It has been highlighted by practitioners as well as by academia as a new methodology that is potentially worthy of them to improve innovative outcomes, be they products, services, experiences or benefits. However, an idea is worthless if its execution is not carried out, and for that it is necessary to use a methodology of successive actions giving continuity and form to the creative project [1–3, 11].

The entrepreneurial initiatives of the general market, the public administration sector, the innovation and academia environments have started to apply the method in their proposals and capacities since the beginning of this century [4]. These institutions define DT as a model of organizational and spatial creative thinking and as a tool to accelerate innovation [14, 17]. It is also indicated as a potentially valuable methodology to achieve the solution of complex problems [13]. In general, the intention of using it is essentially strategic, proposing improvements and achieving breakthrough results in products, services, experiences or benefits.

The essential purpose of DT application is to enable people and teams to think like designers. On the word of [11], the knowledge generated from a DT course is generally superficial, with no guarantee of effectiveness in the generation of ideas, although there is a relative increase in the innovation potential and innovation capability [18] of the proposals generated through experimental exercises [17].

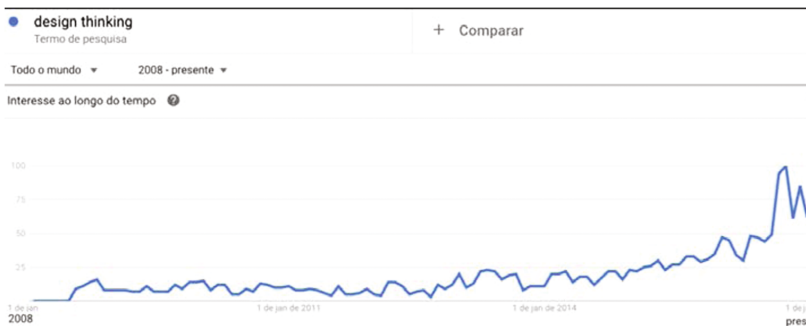
Designers think with empathy [12, 16], creative thinking, visual thinking and spatial sense [19, 20]. Spatial thinking is where the mental process accomplishes the creative conception [19]. The lack of relation to the different aspects and directives that unreturned the design can compromise the adaptation and the result of the DT [12], adapted to a simplified and generic course [10, 11], especially from the point of view of the user as the beneficiary in the final activity, which involves the analysis of usability, human factors and ergonomics [9]. Only considering these aspects is it possible to

innovate. Design-based innovation has emerged as an alternative way of generating competitive products or services; by identification, a structure is created to generate new meanings, using a set of key processes [10, 15].

## 2.1 Design Thinking Performance Search Index

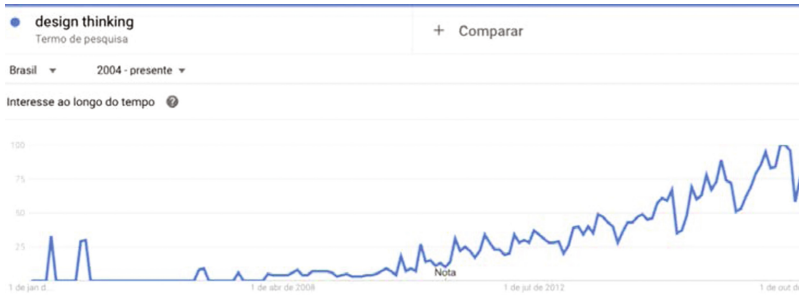
Undoubtedly the increase in the search for information about DT is evident in the last years, which can be seen by the upward curve. Design Thinking has been researched with some constancy since 2008, when it starts to intensify. Before 2014, in many countries and USA, the trend maintained the pace of growth with sharp peaks until the end of 2016, when it reached 100% increase. Recent data indicates a soft fall, close to 60% access rate for the term Design Thinking, in January and February of 2017. It also shows two sudden peaks of increase, in early 2017. Comparatively, in Fig. 3, that shows the performance of this search only in Brazil, the interest in Design Thinking intensified previously than in other countries, but its intensity stood out from the end of 2008 (due to the crisis), maintaining an upward trajectory, with oscillations, from 100% close to 65%, until now.

Figures 2 and 3 allow us to observe the indexes and make a comparison of similarities between the global search profile - including USA (above) - and Brazil's search profile (below). The quest curve of interest in DT shows some similarities between both examples presented by the images.

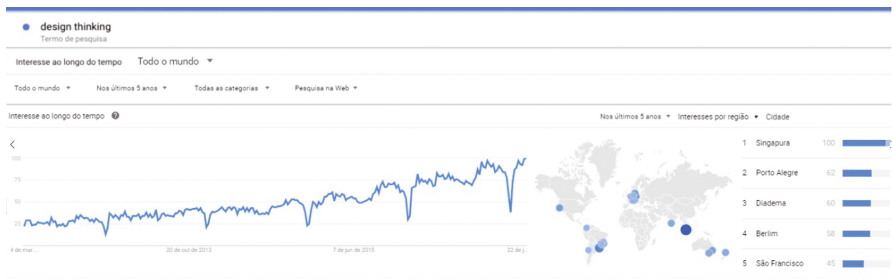


**Fig. 2.** Design Thinking World Index Search 2008–2017 - by Google Trends, March 2017.

The global search for the term Design Thinking presents a balanced chart in continuous growth, in the last five years. Some punctual drop peaks show the oscillations referring to the crisis periods, but did not affect the ascending profile of the curve of interest. The cities that stood out are all different, in culture, technological development, social and economic profile. Singapore is the city that invests more in DT, 100% search index by DT. San Francisco sustain the Silicon Valley State of California on the list with 45%, and Brazil surprisingly is the only country that has qualified two cities in the actual score: Diadema, a district of São Paulo (60%) and



**Fig. 3.** Design thinking Brazil's index search 2004–2017 - by Google Trends, March 2017.



**Fig. 4.** Design thinking world search (last five years) – by Google Trends, March 2017.

Porto Alegre a south state capital (62%). Those two Brazilian cities have common indexes with Berlin, in Germany (58%) (Fig. 3).

USA profile demonstrates the prevailing interest in West Coast, South Coast, and East Coast and some central parts of the country for the last five years. The terms related to DT that have gotten more projection, are Stanford (over 100%) and IDEO (over 60%) those two strong, respectable and innovative brands were the highlights of the survey, which also indicated the words empathy, courses and user-experience as topics with a sudden increase. The traditional states of Massachusetts and California, notorious for technological development and innovative companies, excellent academic and entrepreneurial profile remain very important within the search scope, with three Metropolitan cities in California among the most significant for Design Thinking: San Francisco (100%), San Diego and LA (38 e 28% respectively). The state of Hawaii surprises with a 100% increase in its search, in addition to the district of Columbia (78%), and Virginia (57%).

In the last five years, as shown in Fig. 5, major and minor indexes change constantly although the curve is always in an ascending path; it can be also identified in Fig. 6. The interest over time in Brazil is demonstrated in the five major capital cities that stand out over all other cities in DT search for. These capitals are all located southeast and south of the country, except Brasília, federal capital (in the center-west).

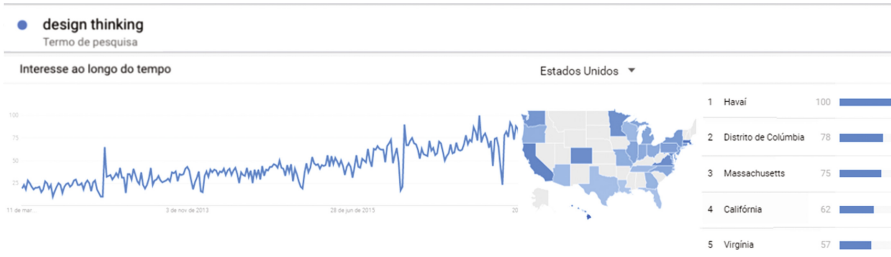


Fig. 5. Design thinking USA search index (last five years) – by Google Trends, March 2017.

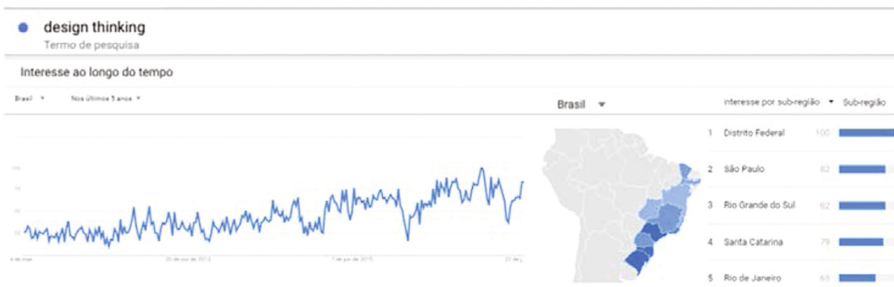


Fig. 6. Design thinking Brazil’s search index (last five years) – by Google Trends, March 2017.

## 2.2 Innovation Performance and Comparison Index

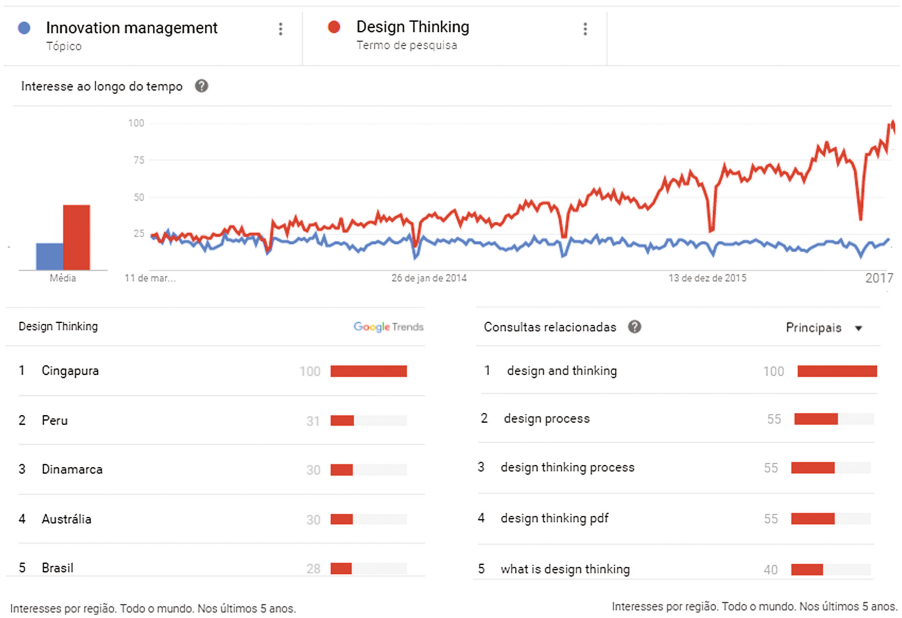
There are intersections and similarities between Design, Design Thinking and Design Process, as parts of the same methodology [2]. Figure 7, shows the relation of the main terms search for those concepts and the maximum index, identified as 100% for Design and Think together, confirming the trend of exploring new types of thoughts. The map indicate that USA, Canada, Europe, Australia and Brazil are searching for DT, Think and Design Process, while Asia and Russia search for Innovation and Management.

A quick comparison between Innovation management search and Design Thinking search proves that they have similarities and common indexes with other graphics presented here that are undeniable. Design Thinking is a trend and perpass Innovation management. Brazil and Singapore are relevant again and reach the top five list search for DT since 2012 until today/March 2017. Another essential aspect is that the relative terms are confirmed related to the methodological and strategic importance of design, discussed in this article: thought and process, 100% and Design Process and Design Thinking Process, that means the same models, achieve 55%.



**Fig. 7.** Map of global search (last five years) for innovation management related terms in comparison with DT search terms – by Google Trends, March 2017.

As seen in Fig. 8, Singapore, Denmark, South America and specially Brazil, are the main countries that shows big interest on DT, Design and Think and Design Process alongside USA. A quick analysis could conclude that the interest for DT grows at the same time as the search for innovation stabilized. This could be explained by the bias of innovation possibilities that DT carries with the strategic perspective expectation.



**Fig. 8.** Countries search for innovation management in comparison with DT search and its related terms (last five years) – by Google Trends, March 2017.



### 2.3 User-Centered Design Comparison Index

Empathy and user experience were two of more impacting words in the search for DT. These words reinforce the importance of these elements for the understanding of design thinking. Empathy is an elementary concept for the user-centered experience and design. Empathy and user experience were two of more impacting words in the search for DT. These words reinforce the importance of these elements for the understanding of design thinking. Empathy is an elementary concept for the user-centered experience and design. They are essential guidelines to reach the innovation results inherent to the design, and extremely important to assimilate the human factors and the wide ranged vision of design (Fig. 9).



**Fig. 9.** User-centered design world index search and relative terms, (last five years) – by Google Trends, March 2017.

Unlike the other graphs that shows intense oscillation throughout the period analyzed with constant peaks and falls without stability or balance, in this case, there is no tendency, in opposition to the DT and innovation management that maintains evident trajectories.

## 3 Conclusions

Analyzing the graphics, we could see that the search growth maintains the crescent scale. Singapore, Denmark, South America (Brazil and Peru) countries, Germany and Australia scored intensive search for DT, alongside USA, where California and Massachusetts continue to be major centers of technological development in the United States. Brazil stood out in quantity of cities. The DT terms confirm that the Design Process's way of thinking, empathy, and methodology are essential for the understanding and assimilation of this strategic tool. The variety of words demonstrate that there is still a lack of knowledge of the subject. We can conclude that DT passes the profile of a hit and is passing the trend situation. Perhaps Design Thinking can be established as part of an important interdisciplinary methodology inserted in all areas e places, in academy and businesses if the demands continuous to grow.

Among the several aspects that justify the growing interest in increasing and spreading DT the use and method and courses, it is visible that they are widely offered and available without a detailed explanation of the different approaches of design concepts. However, it does not seem that just by learning to use a process realized in steps this is being assimilated, to obtain the capacity of agreement. Thus, we can conclude that they are presenting the “Design Thinking” in a generic way. In academy, the arising of DT is causing changes not always desired in the curricula situation since DT’s courses arouse great interest and a real demand.

Currently, the main purpose of the Design Thinking application is to guide to “think outside the box”. In this sense, its use is a hit. It is quite important to change the way of thinking the problems to achieve innovation with benefits. It is also extremely important to get the user in the center of the problem. Nevertheless, it seems that DT is only a trend, besides being an action pattern, and it could be suddenly replaced by other new impact microtrend, probably in the same conceptual direction. However, it’s a strategic way to train people and teams to think globally and crosswise, but it is not enough. Thinking like a designer requires vocation and knowledge. First, it is indispensable to exercise the empathy, and then absorb the fundamental feeling about the needs to find human centralization, with expertise about human factors. It means acting and thinking as the user and not as a creator. Designers reflects about all aspects of usability and function. After certify this competence, begins the research with deepening comprehension, context analysis, operational and organizational environment associated with the necessary capability related to spatial reasoning and visual thinking of the project mentally conceptualized acquiring specific training and technique, with attributes based on creative thinking. The Process depends on the demand of the embedded technology creation. There is also no evidence that designers are being hired to train other individuals or professionals to use DT, except in notorious academic courses. Although there is a successful trend, designers are not getting profits from their conventional wisdom, but continuing to hide their experience in the shadows, without due recognition. Despite all conclusions, the researchers intend to extend the scope of this analysis to obtain more accurate results and to certify the status that Design Thinking will reach and the performance it can achieve in the next five years.

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# History of Social Responsibility in Mexico: A Review of the Literature

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**Abstract.** This article discusses the history of the Social Responsibility (SR) in Mexico are presented. When words social responsibility are used, usually refer to donations and philanthropy. Some engineers think the environment is, in their ecological responsibility. It is believed that the company in addition to fulfilling its legal obligations, is required to “return to society” a certain annual amount, thinking thus becomes the RS in a “social quota”. Late last century, the third sector or nonprofit sector in Mexico had a major expansion to increase the generation of new laws to strengthen civil society, supporting with funding to private welfare organizations to acquire legally, and either a civil partnership or private assistance institution. For the realization of this work was carried out a literature review to find a relationship between the theoretical and the empirical study of the subject.

**Keywords:** Social responsibility · Philanthropy · Grants · Legal obligations

## 1 Introduction

It is intended as a first part, the review of the background of Social Responsibility (RS) in Mexico. The purpose of the review of the literature will be to identify the approaches prior to the definition, modeling and measurement of Corporate Social Responsibility, to evaluate its advantages and disadvantages, who are the participants, what the objective of each one of them has been Role of the industrial engineer to implement social responsibility in enterprises confirm the need for a deeper study of it.

## 2 Historical Background

The Social Responsibility has taken many forms, one of the oldest in our country (Mexico) is known as TEQUIO. This is a custom of the native civilizations of Mexico and of some regions of America and consists in the cooperation in kind and with work

of the members of a community to realize a work for the benefit of all. This activity is the basis of the progress of the living conditions of the native peoples of America. This custom is an important part of the development and progress of pre-Columbian cultures.

With the Conquest this concept changed completely, being considered as the tribute imposed by the *encomenderos* (Person that by concession of competent authority had ordered Indians) and colonial authorities as a substitute for the servile work of the vassals in Europe to their king.

After the fall of the Gran Tenochtitlán (1521), the conquistadors treated the Indians atrociously, which facilitated the emergence of the so-called “exercise of Christian charity”, in the hands of religious orders, mainly Franciscans, Dominicans and Augustinians, which consisted of the creation of hospitals, which, in addition to caring for the sick, had a school, a nursery, a lodging center and a church.

The religious orders, considering the Indians as “defenseless children and in need of protection” [1], adopted paternalistic protection in favor of them. In the beginnings of the Colony, the schools attached to the convents were created. These institutions abounded mainly because of the violence of the conquistadores towards the indigenous, undermining their health and well-being [2]. Thus, the main institutions of the solidarity support system of the colonial era were hospitals, schools and *cofradías* (Congregation or brotherhood formed by some devotees, with competent authorization, to exercise in works of piety) [2].

With the conquest came the religious groups that fomented and created charitable institutions, among which are: Hospital of the Immaculate Conception or Jesus, founded by Hernán Cortes himself; The Hospital of Real de Indios or of San José with the auspices of the Franciscans; The Hospital of the Love of God, whose creator was Fray Juan de Zumárraga; To attend to the lepers was founded the hospital of San Lázaro; And Bernardino Alvarez, who organized a religious order and founded the Hospital of San Hipólito, dedicated to the care of the mentally ill. At this time, the Women’s Hospital, the Hospital de Jesús, the Vizcainan patronage were founded to support orphaned children; The Sisters of Charity and the Vincentian Ladies, formed patronates whose purpose was to support children, elderly and parents of limited resources. The Sacro and Real Monte de Piedad de Ánimas was founded by Don Pedro Romero de Terreros, First Count of Santa María de Regla, on Saturday, February 25, 1775, with an amount of 300,000 pesos of gold for this charitable work, Own property of the founder. To constitute a non-profit Monte de Piedad, which had the purpose of providing relief to the needy through the loan, was the vision that Don Pedro most interested him, so he asked the Spanish Crown for authorization to establish what Later it would be the Sacrum and Real Monte de Piedad de Animas, (pawnshop).

In the year of 1872 is appointed an establishment of Public Beneficencia by the government of Don Benito Juárez.

In the beginnings of the independent life of the Colony, the Catholic Church was the one in charge of the social assistance. Under the Reform Laws, the government took over a portion of its welfare functions by creating the Directorate of Public Benefit Funds, whose functions were very limited. At this stage the division between public and private beneficence arises. The ideological struggle between the Church and the State as a consequence of the Reform Laws led to a decrease in social assistance, since

the State did not have the capacity to serve this sector; And the Church because of the prohibition to participate in the sector and the confiscation of their property did not have the capacity or resources to do so.

During the government of Benito Juárez, the Spanish Beneficence and the French Beneficence arrived in the country and the National Lottery for Public Assistance was created. By 1873 there were 32 lotteries, some organized by the Church as they also raised funds for private charity [2].

During the Porfiriato was strongly promoted private beneficence, by presidential decree of 1891 states that as an act of private charity should be considered all those that were made with private funds whose objectives were charity or education, with this originated the Assistance Board Private at this stage of our country's history, both public and private charities had a significant advance: countless lotteries were developed for public assistance, mutual societies for the support of their members in health, unemployment, old age, Disability and death: hospitals, homes, maternity clubs and hospices were also founded.

1898: The Spanish Red Cross asks the Mexican government for information on the relationship between institutions and public assistance associations with military health units.

The efforts of the first volunteers, and particularly the efforts of Ms. Luz González Cosío de López, were crowned when General Porfirio Díaz issued Presidential Decree No. 401 dated February 21, 1910, in which he was given Official recognition to the Mexican Red Cross, although in its statutes it was denominated the Mexican Association of the Red Cross; This decree enters into force with its publication in the Official Gazette of the Federation on March 12 of the same year. On April 26, the first official board of directors is appointed [3].

In the Revolutionary period, several of the social assistance institutions and solidarity organizations subsisted in the armed struggle, and some were created. In 1911, the White Cross was formed in the Federal District, which was dedicated to caring for the wounded The revolution, being declared "National Institution by President Francisco I. Madero, which originated its expansion to the states of the Republic. And their functions were to raise funds to help fight disease, form savings banks and cooperatives, as well as founding schools, asylums and orphanages.

At the end of the Revolution there was a boom in the creation of private charitable institutions, since in 1904 the number of these institutions was 16, by 1921 it was 33 and in 1937 the number had been increased to 54 welfare institutions [2]. In the post-revolutionary period from 1940 to 1965, the economic boom allowed the State and the ruling party to exercise strong control over activities related to philanthropy, especially in health and social services, discouraging any attempt to form autonomous associations and [4].

In the period from 1940 to the 1970s, the state, supported by a single official party based on a corporate organization of the various social sectors, created huge government departments that controlled basic health, education and housing services, for Which neglected the public charity, which was relegated to "national volunteering" formed by the wives of public officials.

In 1942 the Mexican Social Security Institute (IMSS) was created, which facilitated the disappearance of mutual societies, since in 1938 there were more than 400 duly

regulated societies. Private social assistance at that time consisted mainly of: curative services, educational services, shelters for children and the elderly, homeless, nursing homes, various services such as dining rooms, dormitories, distribution of clothing and food, burials and cash assistance to individuals and institutions. At this time, different pledge institutions have also emerged that channel their profits to different charitable works. Subsequently within the business sector arise the Social Union of Entrepreneurs of Mexico and the Mexican Foundation for Rural Development.

In the sixties and seventies, charities had a gradual increase. By the middle of the eighties began to change the concept of social assistance by moving from an individualistic attitude to a broader and integral vision. For this reason, the first symposium on Private Social Assistance identified the three fundamental principles on which social assistance should be based: (a) organize the community, which implies active participation in the social assistance programs of community members; (b) co-responsibility commitments, that is, to coordinate the joint effort of the public and private sectors; (c) the reorientation of social assistance, from protectionism to prevention, rehabilitation and promotion that favor the development and improvement of the standard of living of the social sectors that suffer deficiencies [2].

This led to a change of consciousness in the private sector, which led to the creation of support foundations in the different fields of social assistance and promotion. The Mexican Foundation for Health (Funsalud), also arising other foundations of corporate character oriented mainly to the promotion of culture, education and ecology.

In 1988, the Mexican Center for Philanthropy (Cemefi) was created, with the objective of carrying out activities aimed at promoting philanthropy in Mexico and abroad, constituted from foundations and personalities of the private sector. This institution belongs to both WINGS (Global Initiatives for Grantmakers Support-WINGS), a global network of donor service associations and philanthropic support organizations, and WINGS-CF (WINGS-CF Refers to those organizations that support the development and work of community foundations (CFs) in different areas of the world) [5].

Unfortunately, the Mexican Revenue Law, by favoring donations and allowing them to be deducted from taxes, continues to lead to the confusion of charity and social responsibility.

A close vision places social responsibility in the philanthropic practices of nineteenth-century factory owners and factories, who used to provide workers, their families, orphans and the sick and outcasts, canteens and homes through donations and acts. In the first half of the twentieth century, became, at the end of it, the “social responsibility of enterprises”, at the beginning of the twenty-first century the “Corporate Social Responsibility ‘is the theme, always associated with charities, compassions and foundations.

The Economic Commission for Latin America (ECLAC), in a 2006 study, diagnoses the situation in Mexico of social responsibility; As follows:

“As in most developing countries, (in Mexico) social responsibility has developed from philanthropy, that is, with a paternalistic spirit, with little strategic focus and no control of the resources that are donated. Then, with the globalization of the markets, greater demands have been experienced by different interest groups and more competitive demands are being faced. [...]”

The RS begins to be adopted mainly by multinational companies, by demands of their parent companies and in large Mexican companies. Small and Medium-sized Enterprises (SMEs) are behind in the implementation of this type of initiatives.

The Political Constitution of the United Mexican States [6] in the reform published in the Official Gazette of the Federation on February 26, 2013 [7], in the third paragraph of Article 25 states “The national economic development will concur, with social responsibility, the public sector, The social sector and the private sector without diminishing other forms of economic activity that contribute to the development of the Nation”, and in the fifth paragraph to the letter says “Under criteria of social equity and productivity support and encourage companies of The social and private sectors of the economy, subject to the modalities dictated by the public interest and to the general use of productive resources, taking care of their conservation and the environment”.

For its part, the Code of Ethics of the National College of Industrial Engineers [8], in its articles III, Of the Duties of the Industrial Engineer, paragraph F: “to respect at all times the human rights of its clients, colleagues and society in general.” VI, Of the duties with his profession, subsection D: To contribute to the development of his profession through the investigation. VII Duty to the Society, paragraph D: Seek the balance between the different aspects of human development, conservation of natural resources and the environment, taking care of the rights of future generations.

In our country (Mexico) there is a big difference in the development of different companies and sectors regarding social responsibility. The greatest effort has been focused on philanthropic and environmental issues. In the philanthropic field, as mentioned above, it comes with the creation of the National Monte de Piedad, in a paternalistic model based more on charity than in the RS, from which emanate a series of institutions that claim to be promoters of social responsibility. Efforts have mostly focused on environmental regulations through regulatory and control mechanisms, with a clearly sanitary approach (regulation in order to process). In the eighties, a more systematic environmental vision was given, including measures of control and prevention (optimization of processes). In the 1990s, the Regulatory System was created by promoting the national program of environmental audits, which led companies to seek self-regulation and ISO certifications.

In the sixties and seventies, charities had a gradual increase. By the middle of the eighties began to change the concept of social assistance by moving from an individualistic attitude to a broader and integral vision. For this reason, the first symposium on Private Social Assistance identified the three fundamental principles on which social assistance should be based: (a) organize the community, which implies active participation in the social assistance programs of community members; (b) co-responsibility commitments, that is, to coordinate the joint effort of the public and private sectors; (c) the reorientation of social assistance, from protectionism to prevention, rehabilitation and promotion that favor the development and improvement of the standard of living of the social sectors that suffer deficiencies.

At the beginning of the 21st century, the need to change the mechanisms of environmental control to ecological preservation, conservation and restoration mechanisms is highlighted.

This is how some companies think that they fulfill their Social Responsibility based on environmental policies.



Today more than ever, Industrial Engineering faces the challenge of undertaking a transformative process, our ways of producing are in crisis and it is very important to find new forms of production. Our forms of meaning and appropriation of the world, our value system, our rationality and our referents of progress have made crises both in our microcosm: inequity, extreme poverty, famine and confrontation between cultures; As in the macrocosm: climate change, deterioration of the ozone layer, extinction of species, loss and deterioration of ecosystems. Today's production systems are unsustainable. New forms of production are required to take all these factors into account. The Industrial Engineering for its vocation of knowledge and its critical value acquires a fundamental role in this company.

Almost half a century ago, different sectors of different nations began to express their concern about the environmental deterioration and the repercussions on the world economy. It was in 1972 at the "World Environment Conference" held in Stockholm that the environmental crisis was recognized and there was a need for a change in legislation that impacts on its planning and development processes, including public policy strategies.

Incorporating in its structure and functions, official agencies in charge of environmental and social issues, generating preventive and corrective measures on the environmental impacts of production and consumption practices, establishing new standards and criteria for industrial and service activity.

Considering the broad implications of CSR for organizations, it is necessary to study in depth their different areas, especially the role of the Industrial Engineer, given its importance in the competitiveness of companies and their economic, social impacts And environmental, under a complete perspective and considering all levels of management both strategic, tactical and operational.

It would be difficult for anyone today to declare itself against sustainable development, since this would imply both political and social isolation, which would eventually result in a competitive disadvantage that may prove more damaging than a mistaken assimilation of the concept. Even in view of the fact that all stakeholders adhere to the sustainability paradigm, not necessarily the conceptual starting point is the same in all actors. The unanimous adherence to the concept of sustainability can be interpreted as the search for a consensus that does not necessarily imply or express a coincidence in conception and practice.

Corporate Social Responsibility is both an imperative for business and a competitive advantage. A successful business strategy must have the following pillars: adequate capital, good management, quality products and services, technology mastery, optimal customer service and a comprehensive Social Responsibility strategy. These pillars are interlinked and interdependent.

The company must be aware of its own Social Responsibility and that this is something inherent to itself, to its status as a corporate citizen, is not something that is adopted or acquired.

More and more companies perceive that Social Responsibility is an issue that is not restricted only to the social or environmental actions developed by the organization in the community, but also involves dialogue and interaction with the various audiences of the company. In order for the company to work on the issue of Social Responsibility, in a systemic and broad perspective, it is necessary that this concept be incorporated

into the management processes and therefore be an integral part of the business strategies and the internal planning system of the company.

### 3 Conclusion

The fact that a large part of the population in Mexico lives in conditions of poverty and extreme poverty favors the organizations' agenda to focus on ways that foster the social development of Mexican communities. And although in our country traditionally has confused Social Responsibility with Philanthropy, have begun to emerge a new type of organization whose primary purpose is to promote sustainable development. These organizations propose not only helping to alleviate philanthropic palliatives, but also proportionate to the middle communities and elements that require for integral development, which has led to the creation of civil organizations that promote education, health, housing, culture, Human rights, civic education and with greater emphasis on environmental conservation and ecology. The flexibility to react and adapt, a relative independence to assume new tasks ignored by the government, propose changes and are promoters of social participation.

Civil Society Organizations (CSOs) have special qualities: flexibility to react and adapt, relative independence to take on new tasks ignored by others, reliability of society and accessibility and receptivity for their close contact with the community. And they also make a decalogue of the special roles they play: they liberate citizen talent, identify problems, mobilize resources, mediate among different interest groups, promote change, monitor public policy, generate leadership, have social representation, legitimize Policies with popular support and in general, are promoters of social participation.

The CIVICUS organization: Global Alliance for Citizen Participation, together with CEMEFI, provides us with the following list of sub-sectors that make up CSOs in Mexico:

- Religious Organizations
- Unions
- Foundations
- CSOs for promotion and development
- CSOs dedicated to education, training and research
- Environmental CSOs
- CSOs dedicated to the defense of citizen action, social justice, human rights, etc.
- Associations of women and youth or students
- Associations that provide social and health services
- CSOs that promote indigenous traditions and culture
- CSOs dedicated to culture and art
- CSOs that provide recreational services (sports clubs, etc.)
- Organizations of professionals or entrepreneurs
- Community and other informal associations (savings banks, funeral societies, self-help groups, cooperatives)

Within civil society organizations, it is important to classify those who carry out their direct programs and the entities that finance the work of other organizations. The so-called “foundations” stand out within the latter. With the term “foundation” we refer to a private, non-governmental, non-profit institution, endowed with its own assets, created to fulfill a goal of benefit to the community. In our country there are approximately 430 organizations with the name of foundation and are classified under the following headings according to the Official Gazette, as shown below:

- 319 welfare organizations
- 45 organizations that are dedicated to the financial support of other authorized grantees
- 8 educational institutions
- 25 cultural organizations promoting the fine arts
- 25 scientific and technological organizations
- 2 organizations dedicated to the preservation of flora and fauna (ecological)
- 20 grant-awarding organizations
- 1 organization supporting public works or services.

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# Technological Capability of the Small and Medium-Sized Enterprises Manufacturing Sector

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**Abstract.** The purpose of this research is to analyze the technological capability that small and medium-sized enterprises (SMEs) currently have in the electronics sector. For this purpose, theories and models for the measurement of technological capabilities are presented. This is a descriptive and correlational research; the methodology consists in carrying out semi-structured interview with managers of large companies, as well as questionnaires to entrepreneurs and/or managers of SMEs subject to study. To know the level of technological capability, identifying the main indicators that affect its competitiveness, with the aim of making the results known to nongovernmental organizations, to make better decisions when proposing new strategies and to support SMEs manufacturing sector in its competitiveness increase.

**Keywords:** Technology capability · SMEs · Manufacturing sector

## 1 Introduction

This paper shows the results of a descriptive and correlational research study; which aims to identify the technological capability of the current SME sector in Tijuana, Baja California, Mexico. Studies are scarce but allow entrepreneurs to have a real precision of the needs and requirements that they must fulfill in terms of inputs and of operational and administrative logistics, to have greater rapprochement and contact with large companies. With this purpose, different theories that have stimulated the productive chain were reviewed, with reference to the expected benefits. In addition, a brief analysis of the different models that have been useful to measure the technological capabilities of a company was made, based on Bell and Pavitt's technological capabilities model, to analyze the relationship between the type of technological capabilities that integrate it, and to make the results known to nongovernmental organizations to make better decisions by proposing new strategies to support SMEs manufacturing sector in the growth of their competitiveness.

## 2 Framework

There are different theories that try to respond to the formation of productive chains as a result of the agglomeration of companies that interact to obtain greater benefits and increase their competitiveness.

According to García and Paredes [1], small and medium-sized enterprises have had to face great challenges in order to compete in an increasingly globalized market, allowing and giving way to productive groupings as a way of increasing competitiveness.

Bracamontes and Contreras [2] refer that traditional entrepreneurs have not been able to play a relevant role in the new productive scheme woven around the maquiladora industry and its large suppliers. The technological capabilities required to participate are very low and represent an important line of analysis.

Hirschman [3] first raised the theory of backward and forward linkages in 1958, which are a sequence of investment decisions that take place during the processes of industrialization that characterized economic development. Backward linkages are represented by investment and cooperation decisions aimed at strengthening the production of raw materials and goods necessary for the production of finished products. Meanwhile, forward linking involves the incorporation of new technology, research, and development that enhances or creates new products. The types of linkage can be product development, raw materials, secondary goods, infrastructure, human capital, manufacturing and logistics. The vertical cooperation relations allow both the specialization of companies, resulting in the formation of a highly fragmented production chain (from suppliers of basic inputs to marketing agents), and at the same time strongly integrated and cohesive within the agglomeration. Carrillo and Novick [4]

López [5] states that horizontal integration is characterized by an alliance between a group of companies offering the same product or service cooperating with each other in some activities, but competing with each other in the same market. This type of integration is usually composed of groups of micro, small and medium enterprises in the same locality or the same sector. Horizontal cooperation makes it possible for small businesses to access collective benefits, which they would hardly achieve on an individual basis.

### 2.1 Technological Capability

Richardson [6] points out that the technological capabilities of a company are rooted in its internal organization, that is, in the knowledge generated by its experience and productive skills.

Avalos [7] defines technological capabilities as: “a set of intangible elements that support the products, processes and production methods, as well as the organizational methods of the company, and from which not only can this market their products, but also improve, transform and replace their productive system and products.”

Lall [8], Kim [9], Dutrénit, Arias and Vera-Cruz [10], Arias [11], Torres [12] agree that technological capabilities are the set of skills a company has to use knowledge efficiently Acquired technology; To assimilate, use, adapt and change existing

technologies, as well as the ability to create new technologies and develop new products and processes.

Following Lall [8], the technological capabilities of the company are grouped into three categories: investment, production and support. Investment capabilities are those necessary to identify, prepare and obtain the technologies required for the design, construction and equipment of a new plant, including the skills to recruit staff. Production capabilities range from quality control, operation and maintenance activities. Support capabilities are needed to receive and transmit information, experience and technology from suppliers of components and raw materials from subcontractors, consultants, service companies and technology institutions.

## 2.2 Models of Measurement of Technological Capability

Dutrénit and Capdevielle model [13] They use Pavitt's (1984) classification of technological trajectories [14] to evaluate the technological capabilities of firms based on three variables: average remuneration (as an approximation to the skills technology), Investment in machinery and equipment (as an approximation to hard technology) and research and development (as an approximation to soft technology).

Model of Bell and Pavitt [15]. Based on the work of Lall [8] they constructed a taxonomy represented by a matrix, which allows classifying technological capabilities, in relation to the most important technical functions performed by a company. These functions will vary or become more relevant, depending on the sector in which the company is inserted. The matrix includes four levels of accumulation: one of technological capabilities of routine production and three of innovative technological capabilities: basic, intermediate and advanced. Routine technological production capabilities are those that use and operate the existing technology. The innovative are capabilities to generate and manage technical change. Basic innovative ones are capabilities that allow only a relatively small and incremental contribution to change; But at the intermediate and advanced levels technological capabilities can have a greater, novel and ambitious contribution to change. Production capabilities: can be ranked in basic, intermediate and advanced. Basic skills include skills in quality control, equipment operation and maintenance. Intermediates account for in-house capabilities for adapting equipment, enhancing products and processes or their use in other applications, as well as skills to assimilate imported technologies. The advanced ones involve innovative high risk capabilities based on research and development that allow the improvement of processes and products at home, as well as the ability to establish links with research and development institutions outside the company. For the purposes of this research, this model was chosen because it is the most complete and adequate for the study. It should be clarified that the framework proposed by Bell and Pavitt was created based on the characteristics of the manufacturing sector and does not contemplate other types of capabilities like the organizational ones, nevertheless they have been suggestive in some case studies. Another reason for selecting this model was that it is the most widely adopted framework for analyzing developing countries. Mexico has used this model to address empirical studies in manufacturing firms, since it distinguishes more clearly the analysis of the dimensions of technological

capabilities, which tend to be very varied, ranging from very routine and operative activities to the most advanced.

Tremblay Model [16] Measures the technological capabilities of the paper industry in Canada and India to examine the association of these capabilities with total factor productivity. It emphasizes the neglect of technological capabilities in the group structure and in the organization in which individuals work. In their research human resources, skills or human capital were evaluated by formal aspects, such as the number of employees engaged in technical activities and their educational level (depending on having at least a bachelor's degree). Using a Likert scale, we measured change efforts with four variables: scale, intensity, role and responsibility.

Model of Yan Aw and Batra [17] their investigations were carried out on the Taiwanese industry. The criteria for quantifying the acquired technology were: the training of the plant, as well as research and development activities, also the presence of foreign direct investment, the use of foreign patents and contact with international clients through exports They analyze the correlation between the efficiency of a company and its investments in research and development, training and international linkage.

Model Romijn [18] focuses on the measurement of technological capabilities through a process of learning by imitation of designs and reproduction of increasingly complex manufacturing goods known as "diversification upwards" where it is possible to manufacture different products with a same group of machinery and equipment, identifying different degrees of complexity requiring different degrees of skills. As a result of his research, he develops an indicator of production capability in a sample of 50 products to identify in each item the level of skill and knowledge, giving a grade to the degree of technological complexity

Brown and Dominguez model [19] Elaborated indicators to measure technological capabilities of Mexican manufacturing companies, identifying four factors that express the main learning sources of manufacturing companies in Mexico: personnel training policy, innovation in continuous improvement, information and documentation systems and investment in new technologies. They showed the results of their research through a "cluster analysis" where they identified the following findings: the association between size of establishments and level of capabilities, making groupings: the routines of documentation and planning; The minimum necessary for the learning, the training of plant until arriving at the continuous improvement to reach the most complete effort of learning, in order to achieve the objective of the research, the following activities were carried out: (1) Analyze the technological production capability that currently has the local electronic sector SME and (2) Propose an outline of the key indicators of technological capability of production that affect their limitation as potential suppliers of large companies. The objective of the research is to identify information related to the technological production capacity that currently have the electronic sector SMEs in Tijuana, B.C., Mexico. As a study universe, all (SMEs) in the electronic sector were considered and registered in the Mexican Business Information System (SIEM), as well as in the directories of the National Chamber of the Transformation Industry (CANACINTRA), the National Chamber of the Electronic Industry of telecommunications and information technologies (CANIETI), the National Statistical Directory of Economic Units (DENUE) INEGI 2012 and the Directory of the Maquiladora Industry

of Baja California 2012. After debugging the listings of different directories, the size of the population was very small; in this way the criterion used is to apply the instrument to 9 companies, which represents 100%.

### 2.3 Qualitative Results

According to the in-depth interviews conducted with heads of 20 maquiladora companies considered as the most important transnational companies established in Tijuana, B.C. Mexico (representing the best global practices and therefore the highest level of competitiveness to which a business organization should aspire), the following findings were made: (a) Plants installed in Mexico already had local suppliers in place with whom they had already established a relationship of trust in quality and delivery times; (b) customers of the maquiladora industry exporting in the electronic business establish criteria in advance when selecting suppliers, which must always be transnational companies; (c) there is little interest in Mexican SMEs due to their limited technological capability; (d) the maquiladora supply volume is large and the time spent by purchasing personnel is small; Since only when starting projects are sought recognized suppliers, and hence the inclusion of others; (e) the local SME does not have the capacity to handle high and changing volumes; (f) inability of local Mexican suppliers to deliver on time the material with competitive prices; (g) lack of capacity of the supplier to maintain a high and constant level of quality; (h) lack of ability of the supplier to deliver on time the material with competitive prices; (i) local Mexican SMEs do not manufacture the inputs they need; (j) they lack quality certifications, which are demanded by their clients; (k) there is no interest in developing suppliers because they consider that local suppliers lack financial soundness; (l) the distribution chains by the Mexican SME are not strong and; (m) the service capacity of the local SME is limited by its investment in personnel or equipment.

### 2.4 Quantitative Results

The following results were obtained by capturing data in the SPSS program and determining the Pearson correlation coefficient in each of the variables (Table 1).

**Table 1.** Production/Integration correlation

		Integration	Production
Integration	Pearson Correlation	1	.902*
	Sig. (bilateral)		.000
	N	9	9
production	Correlación de Pearson	.902*	1
	Sig. (bilateral)	.000	
	N	9	9

\*The correlation is significant at the 0.01 level (bilateral).



According to the results presented and the manifestation of a positive correlation, with a result of 0.902 and a level of significance of 0.01.

Applying the model of Bell and Pavitt described above to SMEs analyzed, the results show that have a lower incidence in each of the stages of technological capabilities of production (basic, intermediate and advanced); which can serve as key indicators that affect the competitiveness of SMEs in the electronics sector in order to penetrate large companies. The results of low incidence in the basic operative capabilities are presented in Tables 2, 3, 4 and 5.

**Table 2.** Activities to ensure quality in their products/processes/customer recommendation (quality program)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	2	22.2	22.2	22.2
	Regularly	4	44.4	44.4	66.7
	Always	3	33.3	33.3	100.0
	Total	9	100.0	100.0	

**Table 3.** Activities to ensure quality in their products/processes/customer recommendation (maintenance machinery and equipment)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	3	33.3	33.3	33.3
	Regularly	2	22.2	22.2	55.6
	Always	4	44.4	44.4	100.0
	Total	9	100.0	100.0	

**Table 4.** Activities to ensure quality in their products/processes/customer recommendation (introduction of new raw materials)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	5	55.6	55.6	55.6
	Regularly	2	22.2	22.2	77.8
	Always	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

**Table 5.** Activities to ensure quality in their products/processes/customer recommendation (process documentation)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	6	66.7	66.7	66.7
	Regularmente	1	11.1	11.1	77.8
	Siempre	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

This table describes the interest of SMEs electronic sector in Tijuana, B.C. Mexico for involving quality programs to guarantee the quality of its products, which is very low, only 33% always carry it out.

The results in this table present a low index of 44% of the electronic sector SMEs in Tijuana, B.C. Mexico, who are always interested in maintenance activities in their machinery and equipment to ensure the quality of their products.

As can be seen in this table, only 22% of SMEs electronic sector in Tijuana, B.C. Mexico, is concerned with the introduction of new raw materials to ensure the quality of its products and processes.

The interest of the SMEs electronic sector in Tijuana, B.C. Mexico for documenting its processes continuously, to ensure the quality of its products and processes, is only 22%.

In relation to the results of low incidence in the innovative capacities in -term are presented in Tables 6, 7 and 8.

**Table 6.** Organizational innovations (implementation of advanced management techniques)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	3	33.3	33.3	33.3
	Eventually	2	22.2	22.2	55.6
	Regularly	4	44.4	44.4	100.0
	Total	9	100.0	100.0	

**Table 7.** Organizational innovations (implementation of new organizational forms to attend organizational practices)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	4	44.4	44.4	44.4
	Regularly	5	55.6	55.6	100.0
	Total	9	100.0	100.0	

**Table 8.** Motivation for the development of new projects/processes (on own initiative)

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	1	11.1	11.1	11.1
	Eventually	2	22.2	22.2	33.3
	Regularly	5	55.6	55.6	88.9
	Always	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

The results shown in this table indicate that only 44% of SMEs in the electronics sector in Tijuana, B.C. Mexico, are regularly concerned with implementing advanced management techniques to achieve organizational innovations.

This table shows that only 55% of electronic sector SMEs in Tijuana, B.C. Mexico, regularly seek organizational innovations through the implementation of new forms of organization.

As indicated in this table, only 11% of SMEs electronic sector in Tijuana, B.C. Mexico, always on their own initiative are motivated for the development of new projects or processes.

Regarding the results of low incidence in advanced capabilities are presented in Tables 9, 10, 11, 12, 13 and 14.

**Table 9.** Frequency with which I carry out activities of innovation in research and development

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	2	22.2	22.2	22.2
	Eventually	6	66.7	66.7	88.9
	Regularly	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

**Table 10.** Frequency with which I carry out innovation activities in the acquisition of machinery and equipment

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	5	55.6	55.6	55.6
	Regularly	2	22.2	22.2	77.8
	Always	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

**Table 11.** Frequency with which I carry out activities of innovation in acquisition other technologies

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	3	33.3	33.3	33.3
	Eventually	2	22.2	22.2	55.6
	Regularly	3	33.3	33.3	88.9
	Always	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

According to the results, regularly 11% of SMEs electronic sector in Tijuana, B.C. Mexico, carries out innovation activities in research and development.

The data in this table show that 22% of the SMEs electronic sector in Tijuana, B.C. Mexico, always carry out innovation activities related to the acquisition of machinery and equipment.

**Table 12.** Frequency with which I carry out innovation activities in industrial or industrial design projects

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	2	22.2	22.2	22.2
	Eventually	5	55.6	55.6	77.8
	Regularly	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

**Table 13.** Frequency with which I carry out innovation activities in training programs

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Eventually	3	33.3	33.3	33.3
	Regularly	5	55.6	55.6	88.9
	Always	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

**Table 14.** Frequency with which innovation activities in quality management programs or organizational modernization was carried out

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Never	1	11.1	11.1	11.1
	Eventually	2	22.2	22.2	33.3
	Regularly	2	22.2	22.2	55.6
	Always	4	44.4	44.4	100.0
	Total	9	100.0	100.0	

The results indicate the frequency with which always electronic sector SMEs in Tijuana, B.C. Mexico, are concerned to carry out their innovation through the acquisition of other technologies.

This table shows the trend that the SMEs electronic sector maintains in Tijuana, B. C. Mexico, in relation to the frequency in which they carry out innovation activities related to projects or industrial designs.

As shown in the results of this table, the frequency with which electronic sector SMEs in Tijuana, B.C. Mexico carry out innovation activities in their training programs, it is only 11%.

The frequency with which the electronic sector SMEs in Tijuana, B.C. Mexico carry out innovation activities in their quality management programs is observed in this table.

After analyzing the different indicators proposed in the Bell and Pavitt model, key indicators are proposed that can directly affect the different levels of technological production capacity of the electronic sector SMEs in Tijuana, BC, Mexico, and Which consequently affect their competitiveness to integrate with large companies (see Table 15).

**Table 15.** Matrix of technological production capabilities

Matrix of technological production capabilities		
Capability levels	Focused on the processes and organization of production	Focused on products
Routine production capabilities: capabilities to use and operate existing technology		
Basic Operational Capabilities	Calibration and metrology programs, maintenance of machinery and equipment, documentation of processes, elaborate set-up for each part, procedures for the control of inventions	Quality Programs
Innovative technological capabilities: capabilities to generate and manage technical change		
Basic innovative capabilities	Training programs associated with improved processes, process documentation	Training programs associated with improved products, use of productive techniques, inputs, products and components
Innovative intermediate capabilities	Skills to make modifications to processes, skills for advanced management techniques, implementation of new forms of organization	Skills in the acquisition of other technologies, activities of innovation in the product
Advanced Innovative Capabilities	Innovation activities in: industrial projects, acquisition of machinery and equipment; And training programs	Product innovation activities

This table presents the technological production capabilities of the electronic sector SMEs in Tijuana, B.C., Mexico, which are necessary to be able to penetrate the large companies, according to the analysis that was carried out. Source: own elaboration.

### 3 Conclusions

For the analysis of the technological capability of production, this capability was hierarchized in basic, intermediate and advanced activities. The results allowed to conclude that within the indicators studied in the basic activities were the quality programs; the use of productive techniques, equipment, inputs and components and the documentation of the processes, as they were those that reached a lower frequency. For the intermediate activities, the indicators that showed a strong concern for their low index were the skills for the implementation of advanced techniques of management; Organizational innovations (implementation of new forms of organization to attend organizational practices), skills to make changes and improvements in products and processes. In terms of advanced activities, the indicators that present results to work in them were: innovation activities in industrial projects or industrial design; Innovation activities in the acquisition of other technologies, innovation activities in the

acquisition of machinery and equipment, research and development innovation activities; and innovation activities in training programs.

The analysis of the technological production capability that currently has the SME electronic sector, allows to generate important conclusions for them. First, there is precision in terms of inputs and operational logistics, as well as the type of technological capabilities that must meet to get closer to the big companies. And secondly, the key indicators of the technological production capability applicable to this type of SMEs are presented, based on the technological capabilities model of Bell and Pavitt.

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# **Tools and Methods**



# Strategic Port Human Resource Talent Acquisition and Training: Challenges and Opportunities

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**Abstract.** Strategic human resource management provides a robust approach to building a foundation for strategic advantage by creating an effective organizational port structure and design, proposition, systems thinking, culture, workforce value, and an appropriate communication strategy. Effective human resource asset management brings the skill, talent, and productivity to the port organizations. The looming challenges and opportunities facing the next generation of public port and private marine terminal management professionals are unprecedented. The main contribution of this study is investigating a talent acquisition challenges and required professional training to provide a guidance for aligning strategic human resource asset management with the strategic and long-term goals of the port operation and management. While the need for professional training through a higher education degree program focused on the needs of the industry has never been so acute, the port managers can best leverage their human capital by focusing on the potential opportunity and solutions.

**Keywords:** Human factors · Port asset management · Port industry · Talent acquisition · Higher education · Maritime and port operation

## 1 Introduction

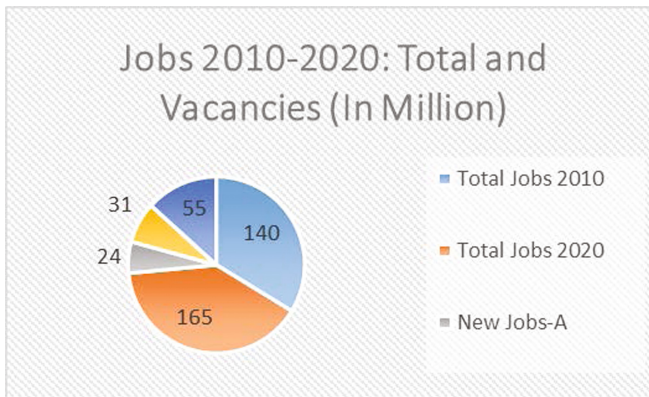
Port asset management can be defined as the entire life cycle of managerial decisions, including planning, construction, maintenance, and operations. Integration, resource allocation, and investments in port assets are key processes of this system and require a broad set of objectives, such as physical preservation, security, economic productivity, environmental stewardship, and such. One important asset of any port is the human resource component. Human assets have characteristics that differ from most other resources in the port, such as recruitment, retention, development, culture, career management, mobility, talent management, performance management, employee administration and legal issues. The port and marine terminal industry attract professionals with a broad range of experience and education. In order for bright, young people in the industry to transition from entry-level jobs to management, they need to possess diverse skill sets encompassing different disciplines.

The most recent nationwide port economic impact study illustrates that the contributions of America's seaports to the nation's economy have increased intensely. The total economic value that United State Ports provide rose 43% to \$4.6 T only from 2007 to 2014. This growth accounted for 26% of the nation's \$17.4 T economy in 2014. Other notable gains (2007–2014) stated in the new report include: (1) federal, state and local tax revenues generated increased 51% to \$321.1 B; (2) job opportunities generated by port-related activity rose 74% to 23.1 M; and (3) personal wages rose to \$1.1 T [1]. The public port and private marine terminal industry are facing challenges of historic proportions. The list of threats, and in some cases, opportunities the resolution of which will fundamentally affect the economies of southeast Texas, the State, and our entire nation would include the following: (1) Significant changes in international trade and international supply chains, (2) A dynamic and uncertain market for port and marine terminal facilities and services, including major upheaval in the ocean carrier industry, (3) Major funding shortfalls for much needed capital investment, especially given aging infrastructure, (4) Technology changes that both improve and challenge port management and terminal operations, (5) The new threat to information systems requiring critical attention to cyber security, (6) Risks to marine terminal structures and connecting infrastructure from sea-level rise and other impacts of climate change, (7) Continuing pressure of environmental regulation and social license-to-operate requirements from surrounding communities, and (8) The loss of institutional knowledge and leadership as baby boomers retire. Another important challenge is the increasing influence and change in the global business arena due to globalization. Every industry is playing on the same field in terms of competition, talent and asset acquisition. Athey (2004) stated that globalization is a driver for both collaboration and competition [2]. In this environment, the success, regardless of the size, type, and location of the organization, is now more dependent upon skilled people. The ability to attract and retain talent is rapidly becoming one of the key issues for human resource managers and their organizations across the globe [3]. The Annual Global Survey showed that 89% of CEOs surveyed put the 'people agenda' as one of their top priorities [4]. In port industry, similar to other industries, attracting and retaining best people in the organization become one of the key challenges now.

### 1.1 Talent and Skill

According to McKinsey, talent is "the sum of a person's abilities... his or her intrinsic gifts, skills, knowledge, experience, intelligence, judgment, attitude, character and drive" [5]. In the age of Globalization, operating business is not the sole driver for profit. Modern Business is driven by several different factors. Today, talent management represents one of the greatest challenges in the field of human resource management [6]. All managers and industry experts around the world seem to agree that one of the critical challenges facing their firms is forming and sustaining an effective talent pipeline [7]. Both the management and the employees need to be aware of the trends and prospects and learn to adopt new complexities and regulations so that they can contribute towards the growth of the business. From a recent survey of 300 companies conducted, managers ranked finding the right number of strong leaders as

their top challenge. These managers indicated that demand for leaders would rise in the near future [8]. The skills gap, for U.S. not just a term rather it is a national challenge. The term “skill gap” is nicely described by “the mismatch between supply and demand between the required skilled workforces in a specific industry [9]. An estimated 2.7 million jobs will be created because of retirements of the existing workforce and 700,000 jobs will be existed due to natural economic growth [10]. The skill shortage is also visible in many of the recent surveys conducted by the different organization. One of the “Talent Shortage Surveys” regularly conducted worldwide by the Manpower Group, a human resources consultancy company. In 2013, 35% of 38,000 employers had difficulty hiring people because of a lack of appropriate talent; 39% of the U.S. employers had the same difficulty [11]. As reported by the Economic Modeling Specialists International (EMSI), more than 11 million Americans, by 2013, are unemployed or dropped out from the workforce by different industry/business [12]. In US skills gap/talent shortage is neither an “employer whining;” nor a new phenomenon. It has been widely discussed for a long time. As per the survey, by 2020, the number of new job creation will be 24 million, and the replacement, due to retirements will be 31 million. Together, total job vacancies will be 55 million [13] (Fig. 1).



**Fig. 1.** Job growth and education requirements [13].

The Academics, government and local business people and authorities are struggling to find a solution for this shortage. Here are some recent real-life U.S. perspectives: (1) Hiring difficulties, as reported by the employers, in the United States was 32% in 2015. But in 2016, it rose to 45% [14]; (2) According to Labor Department data, published in February 2016, there will be 5.6 million job opening by December. This huge number of job opening can also indicate that the employers are not finding qualified applicant as they are expecting. The following graph shows the number of apprenticeship in us from 2003 to 2015. The level of apprenticeship is declining at a significant rate. In 2003, the total number was 32200 and in 2015 the number is down to 21000, which clearly implies that the skills gap is widening day by day [15]; (3) In 1998, For instance, three-quarters of the 400 corporate officers recently surveyed said

their companies had ‘insufficient talent sometimes’ or were ‘chronically talent-short across the board’ [16].

### 1.2 Talent Requirements and Shortage in United States Port Operation

Water transport is considered one of the cheapest sectors for carriage of products. As Mentioned in Review of Maritime Transport, 2002, by United Nations Conference on Trade and Development (UNCTAD), maritime transport is the principal means of moving goods, growing the market, and incorporating the activities of transnational businesses all around the globe [17]. As a mode of transportation, the contribution of water transport is highest among three. In 2011, the U.S. export, in terms of US dollars, by water was 38% as opposed to air (29%) and Land (33%) [18] (Fig. 2).

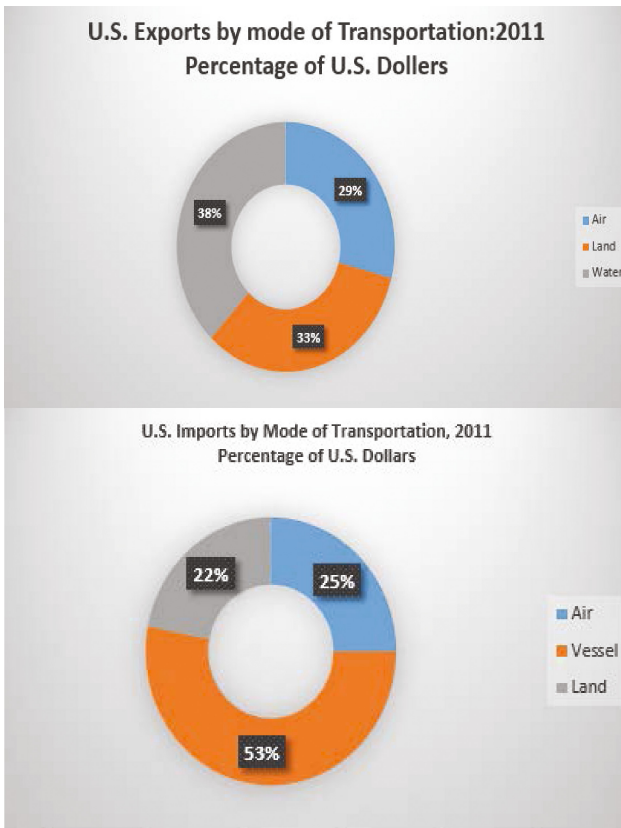


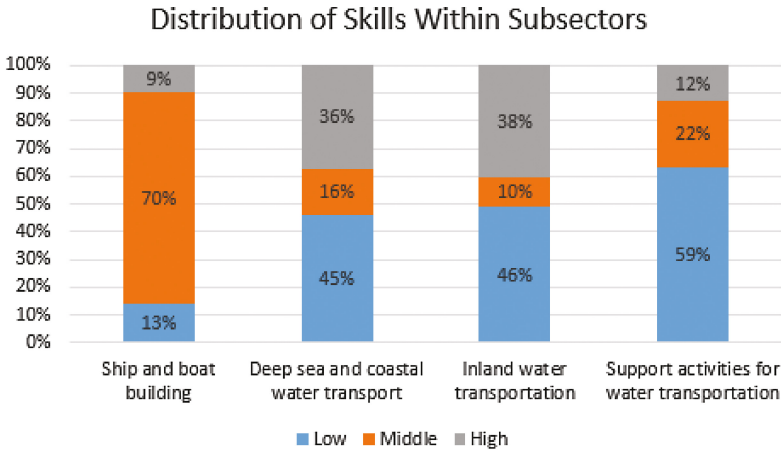
Fig. 2. Maritime trade and transportation [18].

On the other hand, in the US, Vessel/Water transport contributes more than half (53%) of the total imports [18]. The operation of a port consists of several different sub-group/group of employees, who most of the cases work independently to make the whole process smooth and successful. Port Community System (PCS) consist of different stakeholders such as Freight forwarder, shipping agency, port authority, ocean carrier and so on [19]. If any maladjustment or lack of rhythm found in any of these groups, it will affect the whole operation of the port. And talent or skilled workforce shortage can seriously hamper the rhythm of any of the working groups. Some key areas where the shortage found in the supply of skilled workforce are listed as follow: (1) As per the update a shortage of truck drivers, who are the part of “container depot of PCS” has led the stoppage of work after half of the day working [20]; (2) Another acute skilled labor shortage in County’s Marine business reported in the MyPalmBeachPost on Friday, March 18, 2016. The Marine and related business employ more than 18000 people. According to Tom Duncan, president the university’s Flagship Campus in West Palm Beach, the level of training and education need to be stronger to meet new complex demand. Mr. Chuck Collins also had the same tone about skilled worker, when he asked the business associates/members they said it is getting hard to find skilled people [21]; (3) Port of Oakland had a labor shortage, which made vessel loading operations and harmony of the port operation in August, 2015 [22]; (4) Shortage was reported in NY/NJ port in April 2014. As per “American Shipper”, this time the shortage of dock workers” has led to congestion in the ports. Later, the port authority has constructed a taskforce to find out the probable solution so that the port doesn’t face “disruption” later [23]; (5) A huge shortage found when the baby boomers are ready to retiring form the active labor force. They have been supporting the U/S economy for years.

## **2 A Case Example: Houston Maritime Industry and Port of Houston**

Houston is among one of the top the business cities in the United States both in terms of business opportunities and in terms of population. As a city, it is attracting hundreds of national and international business organizations to operate in this area. That includes financial, non-financial, service, and manufacturing Multi-national organization. Port of Houston, a major attraction for the business, has the same magnetic influence over the different business organization. The estimated direct economic value is 118 million for Houston/Galveston port area [24]. This large port has a huge contribution to US economy not only by facilitating export-import business but also by creating several jobs and other related opportunities. The Port of Houston is number one, in terms of import tonnage, for 24 straight years and largest gulf coast container port ranked second nationally for 23 straight years [25]. The number of jobs grew only in transport and warehouse and utility, in Houston from December 2015 to 2016 is 2000 [26]. As per the self-evaluation report 2006 by Port of Houston, the total number of job opportunities in this port is 785049 and the economic value is \$117589676000 [27]. According to Bob Harvey, President and CEO, Greater Houston Partnership, Houston has tremendous gaps in skills. The gap is widely visible in different industries in Houston. The areas

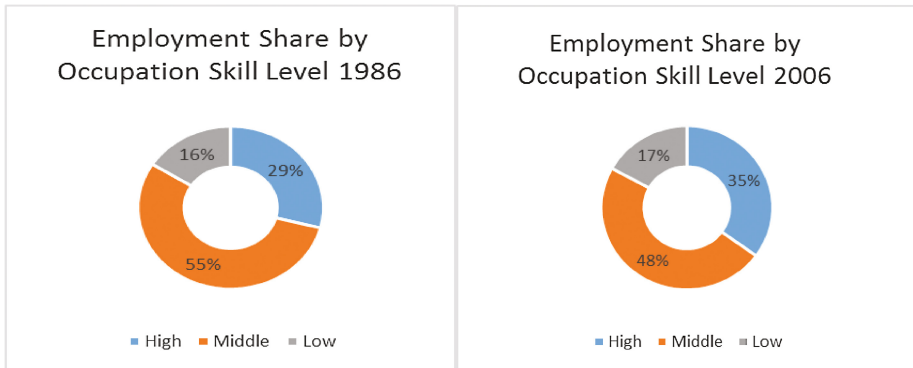
include advanced manufacturing, technology, energy, construction, aerospace and aviation, biotechnology and life sciences, distribution and logistics, education [28]. A closer look at the maritime industry/port industry at Houston area can show us the following skills gap distribution: The table above shows that the deep sea, 36%, and inland water transportation sector, 38%, employs the highest level of the skilled labor force in Houston area [29] (Fig. 3).



**Fig. 3.** Addressing Houston’s middle skills job challenges [29]

The government and the various local authority/economic analysts are also aware of the skills gap in Houston. To address that gap they already started several different steps: Here are some: (1) With the help of business leaders, educators, and social service organizations, San Jacinto College came forward to fill ‘skill gaps’ by providing appropriate technical education to the community of Gulf region [30]; (2) “Dream It. Do It. Southeast Texas”, a nonprofit organization had arranged a Tour to Houston port to let youth know about the prospective job opportunity. They also ushered a do-it-yourself session to encourage youth about the engineering [31]; (3) Several different independent organization are coming forward to combat this problem. Such as “Dream It. Do It. Southeast Texas,” [32], Upskill Houston, and Greater Houston Partnership [33]. Their mission is to address the skills gap in Houston. Even though the skillset required in jobs differs, most of the job, now a day, are technically diversified/inclined and need more than a regular high school education. But if we take a closer look to a 20-year span from 1986 to 2006, the employment share of middle-skill is the highest. In 1986 the middle skill level occupation was 55%, while in the year 2006, the percentage is decreased a little bit, 48%, but still the highest among three levels [34] (Fig. 4).

The 69% of the HR executives reported that they have difficulties to fill up middle skill job vacancies [35]. The middle-skill jobs need more education than a high school and less education than four-year degree [36]. And the Mid-skill job, sectors is facing the most



**Fig. 4.** Employment shares by occupation skill level [35].

devastating problem of skilled labor shortage. For example, the mid-skill worker's gap, in Houston, is estimated to be 5,135 each year. [37]. In 2014, there were 1.4 million middle-skill jobs in Houston. Houston is growing very fast in terms of jobs and economic way. On the month of October 2016 alone Houston has accrued 18400 jobs, which is more than the 25-year average. More than 855,000 residents aged older than 25 years have not completed their high school [38]. There are some reasons for the skilled labor shortage below: (1) the baby boomer have retired or will be retiring in next 5 years. It will create a huge vacuum in skilled/experienced labor market. Houston is among top seven bearing 23.7% senior growth rate due to the aging of baby Boomers. [39]; (2) Change in technology and nature of the jobs, which now need special knowledge; (3) Lack of adequate opportunity to address the new demand and fill up the existing gap; (4) The "talent pipeline" is not so robust to support the required workforce [40].

### 3 A Potential Solution: A Southeast East Texas Port Management Program Example

The port and terminal industry attract professionals with diverse backgrounds: sciences, humanities, engineering, and business. When these professionals transition from entry-level jobs to positions that require managerial experience, they are required to develop a diverse skillset that encompasses different disciplines. The need to train the next generation of port and marine terminal industry leaders has never been so acute. Recognizing that professionals need training for a mid-career (rather than an entry-level) position, Lamar University's Center for Advances in Port Management is proposing a new program at the masters level rather than the bachelor's level, so that professionals from diverse backgrounds in the port and terminal industry can be prepared to take managerial positions. These efforts will aid ports and marine terminals in southeast Texas, throughout the State, our nation, and ports around the world. Moreover, there are too few institutions of higher learning in the US and around the world that offer dedicated post-graduate programs in port and marine terminal management. As Kurt Nagle, CEO of the American Association of Port Authorities stated recently,

“The Center will fulfill our industry’s long-standing dream of having an academic venue to gain both the theoretical and practical knowledge that will well prepare the next generation of port managers.”

The Southeast Texas region is vital in terms of our nation’s economy, energy, and security. The Ports of Beaumont, Port Arthur, Orange, and Houston are located within our region as well as a number of other ports along the Gulf of Mexico. Six of the Nation’s ten leading ports in terms of tonnage are located in the Gulf of Mexico region. Four major petrochemical refineries and other critical infrastructures are located in our immediate vicinity with several others nearby. Over 40% of total US petroleum refining capacity and approximately 30% of the total US natural gas processing plant capacity are located along the Gulf coast. Approximately one-half of US production of crude oil and natural gas occurs in the Gulf of Mexico. The expansion of the Panama Canal, the deepening of the Sabine-Neches Waterway, the changing oil and gas markets, and advances in maritime vessel production are soon to transform the economics of transporting goods to and from international markets. Lamar University is proximally located to the ports of Beaumont, Port Arthur, Houston, Lake Charles and Galveston, which present a laboratory in which to identify and address critical port and marine terminal challenges and opportunities [41]. The proposed Masters of Science degree in Port and Terminal Management is a unique opportunity for young professionals in the global port and marine terminal operating industry to enhance their knowledge and skills through a program totally focused on the needs of that particular and critical segment of economies in countries around the world. Understanding the importance of entry-level management to the industry, the program will accept some traditional students continuing their education and seeking a master’s degree in this field. Given the broad array of responsibilities and required skill sets that port and marine terminal management encompass, the Center’s master’s program will utilize expertise found throughout the University’s academic portfolio, with the industrial engineering and business colleges providing the vast majority of faculty. Disciplines engaged at Lamar include strategic planning, master facility planning, decision modeling, risk analysis, logistics and supply chain management, capital project planning and implementation, macro and microeconomics, advanced project management, risk and resilience, safety, security, ergonomics, environmental engineering and regulation, information technology, port engineering management, leadership, communication, negotiating skills, international business, international law, financial and managerial accounting, management theory and practice.

According to the Bureau of Labor Statistics, Occupational Outlook Handbook (2015), employment in the water transportation occupations is projected to increase by 13%, freight transportation by 19%, and inland water transportation by 29% from 2012–2022. This growth will be driven by commodities such as petroleum products, iron ore, and grain, as well others (BLS, 2015) [42]. In addition to these growth projections and additional job openings in the water transportation industry, the intermodal transportation systems are expected to expand. It is precisely these multi-modal (ship, rail, truck, barge, pipeline, etc.) transportation systems and other emerging technologies and challenges, such as cyber security, that today’s and future port and terminal professionals will be required to understand in order to effectively manage ports and marine terminals. Acknowledging that the BLS statistics for water



transportation includes the smaller sector representing port and marine terminal operator employment, it is nonetheless expected there will be more than sufficient demand for the program to thrive [42]. The majority of the students in the proposed program will be working professionals in the port and marine terminal operating industry. There are over 1,000 senior managerial positions and over 12,000 salaried positions among the 126 US public port authorities. There are approximately 8,000 salaried positions employed by the approximately 200 private marine terminal operators in the US. Globally, with nearly 5,000 ports across 200 countries, the number of potential candidates will likely be many more times the size of the US market [43]. As evidenced by the port industry's eager interest in the program, there are few options in the form of institutions of higher learning, in the US and abroad, that offer an online masters programs focused on the needs of the port and marine terminal industry.

## 4 Conclusion

Even though several steps taken by the different groups, such as government, business leaders, local author, port authorities, to minimize the skills gap, a holistic approach is required where the participation of the different stakeholders is a must. The university degrees in Port and Terminal Management can provide a unique opportunity for young professionals in the global port and marine terminal operating industry to enhance their knowledge and skills. Understanding the importance of entry-level management to the industry, these programs could prepare the new generation of the port leaders. It should be noted that the port operation consists of a huge number of different organizations and entities. Hence, it is very difficult to pin down such a big issue in a single study. However, this study provides an opportunity to explore more about the prevailing talent shortage/skills gap in U.S. port industry.

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# The Trust of the Information from Employer Rating Platforms

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**Abstract.** Employer rating platforms are an important platform for potential candidates to collect and provide information about employer. The research investigates the reason to use employer rating platforms by individuals. The focus is on the factor trust for employment rating platforms. Trust is important for the exchange of information and use of employer rating platforms. This paper evaluates the factor of trust for the use of employment rating platforms. The analysis of empirical data obtained in survey has been processed with statistical analysis. The research has been done by survey with 514 participants who are living in Germany. The research provide the result that the use of employer rating platforms depends on demographic factors and there is a weak tendency that people trust employer rating platforms and they are aware that they can be manipulated with the information at employer rating platforms.

**Keywords:** Employer-rating platform · Application process · Human resource management · Social capital

## 1 Introduction

Employer rating platforms provide information about employer e.g. the environment in companies, company culture, benefits or leadership style. Rating platforms for products or hotels for example are very popular and useful for individuals. Those platforms provide additional information from the perspective of employees, customers or guests for example. They present their experience or share ideas about products or services, on gained experience: positive or negative. The value of the information at rating platforms is that many people evaluate a service or product [1]. The power of rating platforms is the recommendation, of products, companies or services and the influence of other people. The person who shares or provides the information on those pages are independent from the company and has a personal perspective. This person can create an opinion leadership in the community and be a motivation to use employer rating platforms [2]. Employer rating platforms provides new insights in companies which are interesting for potential candidates. Individuals believe and trust in rating platforms

more than other information channels [3, 4]. The research investigates the trust of individuals in employer rating platforms because the current research concentrates on other rating platforms. The knowledge about companies support the decision to apply or not to apply. The employer rating platform is a software based tool in the internet. The new technological opportunities provide the opportunity to distribute information to many individuals fast and easily world-wide. Employer rating platforms are a kind of social media and a very useful tool for the human resources management [5, 6]. That makes employer rating platforms to an interesting tool for employment seeking individuals to collect information about employer. The power of the employment rating platforms is the effective and efficient exchange of information without any control fast and easily. The product marketing departments know the power of rating platforms and that a negative evaluation can be responsible for fundamental damages for the company. Employer rating platforms are a beneficial channel to exchange information [7]. Rating platforms have the potential to create communities who discuss via rating platforms the advantages and disadvantages of employer for example. Social media changes the employment seeking process. The internet creates new opportunities and places to find an employer [8]. The labour market in Germany is changing. There exists a gap of needed candidates. The demand for employees is increasing and the number of skilled employees is decreasing. The demographic changes lead to a gap between employees and open positions. Individuals have the opportunity to choice their employer. The companies have to motivate individuals to apply. They need a good employer branding that people take under consideration to apply [9]. Companies need skilled employees to be successful.

There are different reasons to use employer rating platforms. One reason to use those platforms is trust. Individuals need trust to use employer rating platforms. An untrusted information is not valuable and useable for decisions. If people do not trust employer rating platforms than the platform would be not used. The people have to believe the information at rating platforms or they would not use the information to find a decision [10]. Individuals provide their confidential information. The provided information can be dangerous for the whistle-blower. The individuals who present their information need trust to the employer rating platform. If the company can investigate who provides the information than could be the reaction of the company for the employee negative. The data protection is important that individuals provide information [11, 12]. Another reason can be that people expect benefits for their provided information. Some rating platforms provide vouchers, gifts or points for example to motivate individuals to provide or evaluate information. Individuals who provide information expect obligations for their information e.g. that other people provide useful information in the future too. Some people have the desire to help other people or to warn other people. They share their knowledge to provide an advantage to their community, to support their friends with beneficial information. The reason to share information can be the sympathy and friendliness to other people [13, 14]. They have the ethical feeling or personality to help other people. That is cultural influenced and has to be under consideration for the analysis of the results that the research is concentrating on Germany.

## 2 Employer Rating Platforms as a Tool for the Employment Seeking Process

The paper is about trust under consideration of the use of employment rating platforms. Trust is the prediction of situations in the future based on statements from individuals. The reliability of promised statements is important to create trust. Trust is developed on the experience with other individuals and the history of the relationship influence the trust. Trust is an important part of social capital theory and a reason to use employer rating platforms [15]. Individuals would not use employer rating platforms if they would not trust the content of those pages.

The social capital theory explains the exchange of information in communities. People who are living in a community have the same cultural background. Companies have a culture and the company could be like a community. The similar norms and ethical standards make the exchange of information more effective and efficient [16]. That reduces the transaction cost and makes the membership in communities more valuable. The users of the employer rating platforms are a kind of community. They exchange information via the employer rating platforms, have similar interests and they are connected via the employer rating platform. Individuals exchange information because they expect obligations for their provided information. They expect in the future that they can use the employer rating platform with information from other user for their benefits [17, 19]. Trust is an important factor for the social capital theory and the exchange of information. The investment is the information about employer and the return of investment in the future is information which support decision to apply or not to apply.

The word of mouth concept describes the exchange of unofficial information between individuals via a platform. The use of word of mouth is an information source for the employment seeking process [20]. The individuals provide additional information to their community which is based on their experience. They share their knowledge to inform other individuals about their company. The word of mouth information is the perspective of an individual. The information is influenced by the situation and background of an individual [21]. The special thing is that the information is not pimped by the marketing department for example. The reality of the information and authenticity of the information makes the information valuable and unique. Individuals trust more recommendations from user than marketing sentence from companies. Individuals recommend only employer which satisfies their employees. The interest of companies and individuals who report about the employment environment are different. Individuals describe their feelings and sense about the company. The company tries to convince individuals to apply. The word of mouth would not have only positive effects because the information cannot be controlled by the company. Negative comments from frustrated or emotional negative influenced employees can lead to a negative evaluation [22, 23]. The presented information at employer rating platform is the opinion and the personal perspective of one individual. That can influence the trust in the shared information at employer rating platforms.

The human resource management is responsible that the company has enough skilled employees to provide a service or produce a product successfully. To fulfil the

task has the human resources management to recruit new employees [24]. The task for human resources management is to identify the channels to inform these individuals about open position and to motivate them to apply. The employer rating platform is a channel to get in touch with employment seeking individuals and to inform people about the situation in the company. The employer rating platform is important to transfer the employer brand to a large audience with real information and impressions from employees [25]. That is valuable information for potential candidates to find out more about the employer branding relevant issues e.g. leadership style, culture or tasks. This information support individuals to decide about an application for job position. The employer rating platform is a good channel to collect information about employer and for employer a good way to get in touch with individuals. But the employers depend on the efforts and activities of their employees on employer rating platforms.

### 3 Research Methods to Investigate Employer Rating Platforms

The data has been collected with a research project at University of Ludwigshafen. The empirical research used 514 respondents – all respondents were randomly selected and invited to participate in the survey. The data has been collected with an online survey in May and June 2016. Online surveys are useful for this population because the user of employer rating platforms has experience with the internet and online applications [26, 27]. The participants reported about their experience and knowledge. That provides an insight in their opinion. Their opinion explains their use of employer rating platforms. The required sample for a population with more than 10 000 individuals is minimum 384 participants. The sample is large enough for all used statistical procedures and to create reliable results [28]. The distribution for the demographic data is presented in Table 1.

**Table 1.** Distribution of the respondents by demographic factors: age, social status, education and employment seeking; results in %.

Age group (years)	%	Social status	%	Education	%	Employment seeking status	%
Below 22	5.8	Employed	53.4	School degree	6.3	Active	13.0
23 to 26	22.7	Educational program	0.8	Apprenticeship degree	38.1	Passive	19.8
27 to 31	33.3	Student	41.2	University degree	49.0	Not looking at the moment	66.0
32 to 36	14.7	Unemployed	1.8	Other	6.5	No answer	1.2
37 to 41	8	Other	2.8	n	504	n	500
Above 41	15.5	n	502				
n	502						

The research used a six-level evaluation scale. This scale provides the opportunity that respondents have to express their views from full agreement or full disagreement. The scale is from 1 for full agreement to six to full disagreement. The data has been analyzed with indicators of descriptive statistics: indicators of central tendency or location (arithmetic mean, median, mode) and indicators of variability (standard deviation and range); Spearman correlation analysis for the correlations of age groups with the evaluations on analysed statements, t-test to evaluate differences of evaluations between men and women respondents and ANOVA to analyze differences of evaluations between different demographic groups.

Employer rating platforms are of interest for people who are interested in information about employer. They need access to the internet to use employer rating platforms. Mainly young individuals with an apprenticeship or university degree are interested in employment opportunities. Apprenticeship degree or university degree is important to be well qualified for the German labour market.

The gender is indicated by 504 respondents with 62.8% women and 37.2% men. The people of interest in the respective research are individuals who could be potential candidates for the job or employment seeking individuals who have access to the internet.

## 4 Results and Discussion

The paper evaluates five statements regarding the research question “Do you trust the information from employer rating platforms?”. The first statement is related to the role from companies. Companies can misuse the channel employer rating platforms with positive comments. They are writing their own comments to influence potential candidates and to appear more positive. The evaluations by respondents on statement “Companies are responsible for the evaluation at the employer rating platform to present them in better fashion to receive more applications” has median and mode three. That is a weak tendency to full agreement. People are aware that rating platforms can be misused with embellish information from companies but they do not expect that this happens at employer rating platforms. The evaluations on statement “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals” is the only statement with median four and mode three. There is a weak tendency to full disagreement. The evaluations on statement about trust and authentic are evaluated critically. Statement “The evaluations are created by unsatisfied employees to present their company as an evil” is evaluated with mode and median three. The tendency is to full agreement. The expectation of the respondents is that people use employer rating platforms to give a revenge, to damage the company with extensive negative reports. This knowledge influences the trust in employer rating platforms. People are aware that they receive individual perspective from a single person. Individuals would use employer rating platforms if they would apply for the respective job position.



The median for the fourth statement “If I would apply for a position than I would use employee rating platforms” is three. That is a weak tendency to full agreement but the tendency is supported with the mode one (it means that respondents gave evaluation 1 more than to other evaluations in the evaluation scale) for this statement. People would not use employer rating platforms if they would not trust these platforms. This result is supported with the last statement “I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities”. The median and mode is three for this statement. That is a weak tendency to full agreement. The results are supported with the mean for the statements. Table 2 presents the main results of the survey.

**Table 2.** Main indicators of descriptive statistics on evaluations for the statements regarding the research question “Do you trust the information from employer rating platforms?”, Evaluation scale from 1 for full agreement to 6 for full disagreement.

	Companies are responsible for the evaluation at the employer rating platform to present them in better fashion to receive more applications	The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals	The evaluations are created by unsatisfied employees to present their company as an evil	If I would apply for a position than I would use employee rating platforms	I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities
n	511	512	512	514	514
Mean	3.41	3.84	3.16	2.98	3.31
Median	3	4	3	3	3
Mode	3	3	3	1	3
Standard deviation	1.233	1.221	1.249	1.675	1.518
Range	5	5	5	5	5

The statements are evaluated and analyzed under consideration of demographic factors. This provides a deeper insight if demographic factors influence the use of employer rating platforms. The assumption is that the current situation of individuals influences the behaviour and use of individuals for employer rating platforms. The paper presents only relevant results for the research e.g. correlation coefficients on a significant relevant level.

The first statistical results are the Spearman correlation coefficient between the age group and evaluations on statement “The evaluation at employer rating platforms provide an authentic and trustful assessment for individuals”. The assumption would be that individuals with more life experience are more convinced to use employer rating

platforms than young people with less life experience. In addition are young people more aware about risks in the internet [29] that is another assumption. The only statement with a significant Spearman correlation coefficient with 0.111 is between “The evaluation at employer rating platforms provide an authentic and trustful assessment for individuals” and the age group. That means the age is in relation with the statement but the Spearman correlation coefficient is significant with significance level 0.013. That can confirm the assumption that the experience of the individuals and collected knowledge of older people have more positive experience than young individuals.

There are differences in the use of social media between men and women. The assumption is that men and women have a different opinion about employer statements platforms [30, 31]. The differences of the evaluations between men and women have been analyzed with a t-test.

There are existing two statements with significant differences in evaluations between men and women by significance level on 0.02. The statements are “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals” and “I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities”. Both statements are trust related, nobody would recommend a source if the source would not provide a benefit or would provide unauthentic information.

The tendency of evaluations by men to full agreement is larger than for women. Men have on the first two evaluation stages for both statements the majority. Women have a majority on the last two stages compared with men. That means men have more trust in employer rating platforms than women. Companies which are interested in employing male persons have more opportunities to reach them via employer rating platforms compared with women.

The educational level has important influence on the use of employer rating platforms. The education level compared with each other is significant for three statements but not between all education levels. Especially the degree level apprenticeship is involved in all significant differences of the statements. Particular under observation are two statements. One statement is “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals”. This statement has significant differences in evaluations for apprenticeship with all other educational degrees (school degree, university degree, other). The second statement is “If I would apply for a position than I would use employee rating platforms or I have used employee rating platforms already” with significant differences in evaluations between apprenticeship, school and university degree. The statement with only one significant difference between apprenticeship and university degree is “I would recommend employee rating platforms to friends/family members. if they are looking for new employment opportunities”. The results in detail for the two statements with more than one significant difference are presented in Tables 3 and 4.

The apprenticeship degree and school degree is involved in all results with a significant result of 0.004 and 0.049. The university degree and apprenticeship degree have significant level of 0.006 and 0. The statement “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals” has in addition a significant result between apprenticeship degree and other of 0.017.

**Table 3.** Results of ANOVA to analyze significant differences in evaluations between the different educational levels.

The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals

Educational degree	Educational degree (J)	Mean difference (I – J)	Std. Error	Sig.
Apprenticeship degree	School degree	0.668	0.231	0.004
	University degree	0.324	0.117	0.006
	Other	0.558	0.234	0.017

**Table 4.** Results of ANOVA to analyze significant differences in evaluations between the different educational levels.

If I would apply for a position than I would use employee rating platforms or I have used employee rating platforms already

Educational degree	Educational degree (J)	Mean difference (I – J)	Std. Error	Sig.
Apprenticeship degree	School degree	0.616	0.312	0.049
	University degree	0.757	0.158	0.000
	Other	0.397	0.316	0.210

The two statements with more than two different significant results in evaluations regarding the educational degree are explored deeper. The school degree has on the first three stages of the evaluations the majority for the statement “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals”. The last three stages are dominated by the apprenticeship degree. The distribution of the results is mainly normal distributed for this statement.

The participants with university degree have the majority of the evaluations on stage one and two on the evaluation stage for the statement “If I would apply I would use employee rating platforms or I have used employee rating platforms already”. On the last two stages of the evaluation scale the majority of respondents are with an apprenticeship degree. The school degree respondents are mainly normal distributed and the majority of those respondents is concentrating on the central values of the evaluation scale used in this research.

The employment seeking level is differentiated in active looking for employment, passive looking for employment or not looking for employment at the moment. The assumption is that the employment seeking level influences the use of employment rating platforms. The statistically significantly different statements are presented in Tables 5 and 6.

The evaluations on statement “The evaluation at employer rating platforms provide an authentic and trustful assessment for individuals” has significant differences between the group “passive” and “not looking at the moment” is on a significance level of 0.044. The second statement with statistically significant differences in evaluations is “I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities”. The groups with statistically significant

**Table 5.** Results of ANOVA to analyze significant differences of evaluations between the employment seeking levels (active, passive or not looking at the moment) for the statement.

The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals

Employment seeking (I)	Employment seeking (J)	Mean difference (I – J)	Std. Error	Sig.
Passive	Active	-0.056	0.194	0.773
	Not looking at the moment	-0.283	0.140	0.044

**Table 6.** Results of ANOVA to analyze significant differences in evaluations between the employment seeking levels (active, passive or not looking at the moment) for the statement.

I would recommend employee rating platforms to friends/family members, if they are looking for new employment opportunities

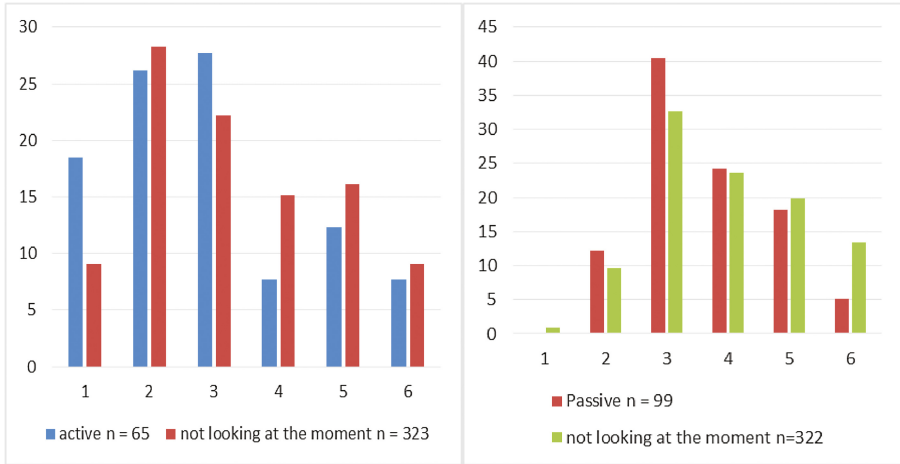
Employment seeking (I)	Employment seeking (J)	Mean difference (I – J)	Std. Error	Sig.
Active	Passive	-0.360	0.241	0.136
	Not looking at the moment	-0.439	0.205	0.033

differences in evaluations are “active” and “not looking at the moment” for employment opportunities; analysed current employment status of respondents “not looking at the moment” is on a significance level of 0.033. More detailed information on results of analysis on current employment levels of the respondents is included in Table 6.

Participants who are not looking for job at the moment have the majority for the tendency to full disagreement for the two statements. The two statements are presented in the Fig. 1. That means they do not have a need at the moment to use employer rating platforms. The benefit of an employer rating platform is not given for them. The statement “I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities” has the tendency to full agreement. They need information to make a decision about an application for an open position. They trust the employer rating platforms because they would recommend the platforms to other people. Individuals would not recommend an employer rating platform to other people if they would not trust this page.

The second statement is “The evaluation of employer rating platforms provides an authentic and trustful assessment for individuals” has a significant difference between the groups “not looking at the moment” and “passive”. The majority of 52% of the passive user has selected the first three stages for their answers. That means they have a tendency to full agreement but 40% of them selected stage three. The first stage has been not under consideration of the “passive” group.

The social status is divided in “employed”, “student”, “unemployed” and “other” to describe the current situation. The social status can have an impact on the behaviour of individuals. Individuals who are unemployed or at university would have a different



**Fig. 1.** Distribution of evaluations (frequencies in %) for the statement “I would recommend employee rating platforms to friends/family members if they are looking for new employment opportunities” And the statement “The evaluations at employer rating platforms provide an authentic and trustful assessment for individuals”, evaluation scale 1 - full agreement to; 6 - full disagreement.

interest on employer rating platforms compared with employed individuals. The LSD ANOVA provides the answer that evaluations on statement “If I would apply for a position than I would use employee rating platforms or I have used employee rating platforms already” has significant differences between students, employed and unemployed. But the number of unemployed participants is low and not under consideration for further investigations. The results are presented in Table 7.

The deeper investigation provides the result that 49.8% of the employed individuals answered on the first two stages on the evaluation scale. The distribution of the respondents by those evaluations is skewed to full agreement. That means the majority of the individuals would use employment rating platforms and the platforms support them with their employment seeking process.

**Table 7.** Results of ANOVA to analyze significant differences of evaluations between the social status (employed, student, unemployed or other) for the statement.

If I would apply for a position than I would use employee rating platforms or I have used employee rating platforms already				
Social status (I)	Social status (J)	Mean difference (I – J)	Std. Error	Sig.
Student	Employed	0.328	0.154	0.034
	Unemployed	10.273	0.564	0.025
	Other	0.239	0.474	0.615

The students have only 40.18% on the first two stages of the evaluation scale and more students select the full disagreement option compared with employed individuals. The group of unemployed individuals has had only 9 respondents. That is the reason not to include this group in further analysis because that would bias the results. The results provide a deeper insight in the employer rating platforms and presents differences in the trust of employer rating platforms. That is important to know for companies that they can use effective and efficient employer rating platforms.

## 5 Conclusions

The assumption is that employed individuals have experience with the employment seeking process and reality of the employer and office environment. They know that additional information about employer is useful. The perspective of individuals who are responsible for a position can give valuable additional information to find a decision. They trust employer rating platforms and would use them if they are employment seeking. But the tendencies of the respondents to full agreement are weak and the medians and modes are mainly three. The influence of demographic factors is investigated and the research identified statistically significant differences in evaluations on analyzed statements. The human resources management who use employer rating platforms has to take those differences in evaluations under consideration. The human resources management cannot reach all individuals in the same way with employer rating platforms.

Research proved that the experience of individuals and history has an influence on the trust of employer rating platforms explaining that older people are more positive compared with young people. Men trust more employer rating platforms than women. Hence the human resources department has to be aware that men are more influenced by employer rating platforms than women. The educational level influences the trust of employer rating platforms and the apprenticeship degree group use employer rating platforms seldom compared with other groups. That is important to know that respondents with apprenticeship degree are not so good reachable compared to other groups. The interest of active employment seeking individuals in employer rating platforms is influenced by the trustfulness of the platform. Individuals would not recommend a platform if they do not trust the platform and research proved that the social status in society has different results.

Individual's current situation influence their use and evaluation of the statements regarding employer rating platforms. People use rating platforms to have a benefit. The benefit is to receive information to have a basis to make a decision with the employer rating platform. That is reflecting in the results and provides companies the recommendation that they should use employer rating platforms under consideration of the individuals they are looking for e.g. that the employer rating platform is more suitable for active employment seeking individuals. The second recommendation is that employer rating platforms are used by individuals to find a decision that means companies has to take care and improve their presence at this pages to influence individuals to apply or not to apply.

The limitation of the research is that the data is concentrating on Germany. The use and behaviour of individuals regarding employer rating platforms needs more and deeper research to find further thoughts of individuals regarding employer rating platforms. The reasons to use employer rating platforms are important to know for companies and further reasons are of interest.

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# Determinants of Business Overdraft Accessibility Within Small and Medium-Sized Enterprises in the South African Construction Industry: A Case of Gauteng Province

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**Abstract.** Small and medium construction enterprises (SMEs) are an important vehicle to drive the economic growth globally. However, this enterprise sector have been constrained by different factors that stifle there full participation in the mainstream economy specially finance accessibility. There is paucity of research to verify the determinants that predict business overdraft accessibility from financial banks in South Africa. The data was obtained using questionnaire survey. 179 small and medium contractors responded from conveniently sampled respondents in Gauteng province in South Africa. The data was analysed using Statistical Package for the Social Sciences (SPSS) version 22. The study found that the dependant variable i.e. business overdraft was only predicted with locality of the business. However, the other independent variables modelled with business overdraft i.e. gender, age group, current position, type of organization ownership, tax number and collateral were not good predictors of the business overdraft accessibility. The finding informs financial institutions not to force clients to submit collateral before awarding credit to the SMEs. The suggested model that was tested attained the Hosmer and Lemeshow Test goodness of fit. Hence, the results were credible. However, a further study is proposed for the entire country as the researchers acknowledge limitation on the locality of study. This will enable the researchers to generalize the findings.

**Keywords:** Construction industry · Determinants · Overdraft credit · Small and medium

## 1 Introduction

In the South African context in the construction industry, small enterprise is defined as having less than 50 employees, having an annual turnover of less than R5million, while medium enterprises have between 51 and 200 employees and less than R20million turnover [1]. The SMEs contribute immensely to the gross domestic product of most countries including South Africa.

Despite their importance to the economy in South Africa, construction SME sector is described as largely underdeveloped and lacking the managerial and technical skills

and sophistication enjoyed by larger well established firms [2]. Martin opined that lack of knowledge including knowledge of pricing procedures, contractual rights and obligations; law, management techniques and principles as well as technology were a challenge to SMEs [3]. Furthermore, SMEs are more likely to have limited formal education, which is based on a construction craft or trade training such as carpentry, plumbing, electrical installation and bricklaying. This training is probably in the form of learnership [4]. Past studies in South Africa revealed constraints and challenges of capacity and financial resources among SMEs [5, 6]. Grimsholm and Poblete inferred that SMEs are not able to access finance or credit hence stifles their growth and capability [7].

Credit has been used as a selling tool, to bind customers to a particular vendor and allow them to acquire more substantial goods for which they do not have the necessary capital [8]. The theory of credit emphasizes that financial institutions would be more willing to extend credit if, in case of default, they could easily enforce contracts by forcing repayment or seizing collateral. The amount of credit in a country would depend to some extent on the existence of legislation that protects the creditors' rights on proper procedures that lead to repayment [9].

The initial capital and expansion capital fund for South Africa construction SMEs has been a perpetual problem even though the government continuously strives to empower this sector into the mainstream economy. It is accepted that construction SMEs are a vehicle of economic empowerment in the construction industry in South Africa. However, they are faced with many challenges to be able to maximize their economic potential. Construction SMEs find it difficult to access credit in the form of business overdraft they apply for. It can be unequivocally indicated that there is lack of studies to determine the predictors determining business overdraft accessibility by construction SMEs. Based on this discussion this study is guided by two specific research questions: viz;

- What are the factors that prevent construction SMEs from accessing credit? And
- What are the personnel factors and firm factors that influence business overdraft accessibility from financial institutions?

### **1.1 Business Overdraft**

Overdrafts and loans are the most common form of external financing available to businesses. Used properly, they provide a simple and effective way of financing the growth of your business. Despite their widespread use, they are not always used wisely. Many businesses make the wrong choices or incur unnecessary costs. At best, this raises the cost of financing. At worst, the business runs the risk of failure [10]. An overdraft is the ideal way to manage your cash flow. It is linked to your business account and you can use as much as you need, up to your limit suggested by the financial institution [11]. According to the First National Bank in South Africa (FNB) the business overdraft benefits are [12]:

- It is linked to your Business Account and provides the ability to make payments even when there are no cash funds available in your account, thus avoiding penalty fees and additional charges;
- No minimum monthly payment as long as you remain within the agreed limit;
- Payments into the overdraft facility make funds available for use again;
- Flexibility, as you can deal with unexpected expenses and capitalise on any opportunities; and
- Monthly repayments are based on the amount of credit you used.

According to Standard Bank South Africa [13], the benefits of business overdraft are;

- An overdraft is quick and easy to arrange;
- The cash is available when you need it;
- You only pay interest on what you use, not on the full amount of your limit; and
- Sole proprietors can apply for an overdraft or increase their limits at an AutoPlus, via Internet Banking, Cellphone Banking or by calling 0861 012 345/0860 109075.

Despite the benefits suggested. A fee of 1.2% is levied on the unutilized portion of the business banking overdraft facilities. This fee will be accrued daily and recovered monthly [13]. However, the FNB bank [12] indicates that FNB customers applying for business overdrafts of less than R400 000.00 are not required to submit supporting documentation or collateral. In case of business overdraft of more than R400000.00 the FNB bank will require the following documents in order to process the credit.

- Security/collateral (customer dependent);
- A business finance application;
- Signed financial information (annual financial statements and year-to-date management accounts); and
- Projections (cash flow statements, income statements and balance sheets).

For non-FNB customers the following are the requirements:

- Six months' bank statements;
- Security/collateral (may be required);
- A business finance application;
- Signed financial information (annual financial statements and year-to-date management accounts);
- Projections (cash flow statements, income statements and balance sheets);
- A business plan to demonstrate the viability and sustainability of the business; and
- Should your application be successful, you are required to open an FNB Business Account.

## 2 Literature Review

### 2.1 Challenges Preventing SMEs from Accessing Credit

According to Alhassan and Sakara the factors that stifle SMEs from accessing credit are, management expertise, high default rate and monitoring as the challenges banks faced in giving credit to SMEs [14]. Bondinuba, found that the key challenges that make it difficult for SMEs to access finance include policy regulation, inadequate financial infrastructure, stringent collateral security requirement, and lack of institutional capacity of SMEs sector. The key barriers identified include informational barriers, lack of managerial skills within SMEs [15]. Nkuah, Tanyeh and Gaeten inferred that financial activities such as business registration, documentation/recording, business planning, asset ownership, impact heavily on SMEs access to bank credits [16].

Angela and Motsa Associates reviewed that entrepreneurs face several problems in their efforts to access finance, particularly from banks; viz., lack of collateral security, refusal to use own collateral, failure to make a remarkable own contribution, black-listing, failure to review attractive financial records and/or business plans and high risk of small entrepreneurs [17].

Kayanula and Quartey, argued that factor like availability and cost of finance are the most common constraints faced by SMEs. Others are lack of collateral, informational barriers, regulations and rules that impede construction firms access to finance, the legal framework and policies around investment and financial institutions (FI's) lending are fundamental, lack of access to appropriate technology, weak institutional capacity, lack of management skills and training in the construction firms, and lack of proper book keeping. The legal and regulatory frameworks that exist in Ghana also fail to provide the right support infrastructure to facilitate SMEs lending by the financial institutions. The lack of collateral, lack of proper financial management, lack of fiscal incentives for SMEs, strict prudential regulations which restrict flexibility of FI's, unduly complex or onerous administrative procedures and even simply the lack of a consistent definition or enabling law for SMEs are some of the impediments to SMEs financing. Even though SMEs tend to attract motivated managers, they can hardly compete with larger firms [18]. It can be suggested from these discussions that different set of challenges prevents SMEs from accessing finance. Hence, the importance of determining the challenges faced by SMEs in the South Africa construction industry from accessing credit.

### 2.2 Predictors of Credit Accessibility

Fatoki, in his study indicated that the availability of business plan, collateral, maintenance of a good relationship, managerial competency and a good credit score are critical lending requirements [15]. According to Etonihu, Rahaman and Usman, their findings suggested that education, distance to credit source and types of credit source as major factors that influenced farmers' access to agricultural credit [19]. In a study by Chauke et al., they found that the predictors for credit accessibility by smallholder farmers were, attitude towards risk, distance between lender and borrower, perception

on loan repayment, perception on lending procedures and total value of assets [20]. Ololade and Olagunju, posited that gender, marital status, lack of guarantor, high interest rate predicted access to credit among rural framers in Nigeria [21].

Fatoki and Odeyemi, results indicate that managerial competencies, business information, networking, location, crime, business size and incorporation are significant determinants of credit approval [22]. Dzadze, Osei Mensah, Aidoo, and Nurah (2012), in their study established that extension contact, education level and saving habit had significant positive influence on farmers' access to formal credit [23]. Kimutai and Ambrose, opined that the key factors that influenced credit rationing by commercial banks in Kenya are loan characteristics, firm characteristics and observable characteristics. The study established that most of the banks rationed credit in order to reduce risk and to avoid the risk of adverse selection and moral hazard [24]. Beck et al., found that banks in developing economies, compared to those in developed economies, tend to be less exposed to SMEs, hence charge them higher interest rates and fees [25].

Musamali and Tarus, inferred that profile such as ownership structure; size of the firm; business type; and age of the business indeed influence SMEs' access to finance [26]. Alhassan and Sakara, results indicated that, the number of employees, experience in credit use and number of fixed assets possessed, attitude towards risk, business size, sector and form of business in the economy are the critical success factors in accessing bank finance [14]. In view of these discussions there is no consensus of a set of determinants that will predict access to credit. Furthermore, no study has focused specifically on business overdraft accessibility from the financial institutions. Hence, this research poses the question:

- What are the personnel factors and firm factors that influence business overdraft accessibility from financial institutions?

### 3 Research Method

A structured questionnaire survey was used to collect data. Creswell describes a survey as a quantitative or numeric description of some fraction of the population – the sample. This enables the researcher(s) to generalize their findings from a sample of respondents to a population within the limitations of the sampling method [27]. Convenience sampling was used which consisted of contractors registered with the Construction Industry Development Board (CIDB). A total of 179 SMEs completed the questionnaire survey. Content validity was conducted on the questionnaire using pilot study administered to 30 construction SMEs.

SPSS version 22 was used to perform the binary logistic regression analysis. A binary logistic regression model with a dichotomous dependent variable of Yes or No was modelled. Yes, response was defined as having accessed business overdraft and No did not access business overdraft. The dependent variable was coded as 1 and 0, for “Yes” and “No” respectively. The independent variables of the logistic regression model were also coded and were categorical. They were the personnel profile and the firms demographic characteristics of the SMEs: *gender* if male 1 and female 2; *age group*, 30 years and below 1, 31 years to 39 years 2, 40 years to 49 years 3 and 50 years

and above 4; *current position*, director 1, owner 2, manager 3 and manager/owner 4; *ownership*, sole proprietorship 1, partnership 2, limited partnership 3, limited Liability company 4, corporation (for-profit) 5; *tax number* No, 0 and Yes, 1; *location of business*, city of Johannesburg Metropolitan Municipality 1, city of Tshwane Metropolitan Municipality 2, Ekurhuleni Metropolitan Municipality 4, West Rand District Municipality 4; *collateral* No, 0 and Yes, 1. Logistic regression is recommended over linear regression when modeling dichotomous responses and allows the researcher to estimate probabilities of the response occurring [28]. The logistic regression equation takes the following form

$$\ln(p/1 - p) = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_kx_k \quad (1)$$

Where  $p$  is the estimated probability of passing, and  $x_1, x_2, \dots, x_k$  are independent variables.

The estimated probability of the response occurring or passing ( $p$ ) divided by the probability of it not occurring or not passing ( $1 - p$ ) is called the odds ratio. Maximum likelihood method is used to estimate the odds ratios of the model. Values of odds ratios higher than 1 indicate positive association between the variables, odds ratios equal to 1 indicate no association, while odds ratios lower than 1 indicate negative association between each independent variable and the dependent variable of the model.

Furthermore, in order for an independent variable to be a predictor of the dependent variable the  $p$ -value should be less than 0.05 at 95% confidence, which connotes its significance in the model. In achieving a fitting model the Hosmer-Lemeshow goodness of fit test should be significant i.e. the value should be greater than 0.05 [29]. It can be indicated that the model tested achieved the Hosmer-Lemeshow goodness of fit test at 0.91.

The factors preventing SMEs from accessing credit were measured using Likert scale of 1 to 5. 1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly agree (SA). The Likert-scale questions are discussed based on their mean score in the interval scale. The difference between the upper and lower ends of the used scale is 4.0 since there are five points. Each range can be equated to 0.80 because a division between 4.0 and 5.0 determines the extent of the range (4/5). However, in the current study, the intervals are  $> 4.21 \leq 5.00$  Strongly agree;  $> 3.41 \leq 4.20$  Agree;  $> 2.61 \leq 3.40$  Neutral;  $> 1.81 \leq 2.60$  Disagree;  $> 1.00 \leq 1.80$  Strongly disagree.

## 4 Results and Discussions

Table 1 indicates that male respondents were the majority than female respondents, at 63% to 37% respectively. Majority i.e. 51% of the respondents were in the age group between 40–49 years old. Furthermore, 82% of the respondents were owners of the organizations. This finding is in line with the findings of Agumba [30]. This suggests that these categories of organizations are still being managed with the owners. Majority i.e. 72% of the respondents had business experience of between 6 to 10 years. 98% of

**Table 1.** Profile of respondents and organization

Gender	Frequency	Percentage
Male	112	63
Female	67	37
Age group	Frequency	Percentage
30 years and below	2	1
31–39 years	49	27
40–49 years	92	51
50 years and above	36	20
Current position	Frequency	Percentage
Director	29	16
Owner	146	82
Manager	3	2
Manager/owner	1	1
Experience of respondent	Frequency	Percentage
1–5 years	15	8
6–10 years	130	72
11–15 years	33	18
16–20 years	1	1
Ownership	Frequency	Percentage
Sole proprietorship	175	98
Partnership	2	1
Limited partnership	1	1
Limited liability company (LLC)	1	1
Location of company	Frequency	Percentage
City of Johannesburg metropolitan	74	41
City of Tshwane metropolitan	42	24
Ekurhuleni metropolitan	34	19
West Rand district municipality	29	16

Source: Field data, 2015

the SMEs are sole. Furthermore, majority i.e. 41% of the SMEs were located in the city of Johannesburg metropolitan.

Table 2 indicates that the SMEs respondents strongly agreed that lack of collateral, lack of cashflow statement and owners equity were hindering SMEs from accessing credit from financial institutions. The means were in the band of 4.21 to 5.00. Bondinuba, findings corroborates the current outcome that collateral is viewed as a major factor that hinders credit accessibility [15]. The sector of the business, lengthy and vigorous procedure for credit application, high interest rates, location of the business were in the band of 3.61 to 4.20 suggesting that the respondents agreed that they contributed to their difficulty of obtaining credit. Furthermore, the SMEs respondents disagreed that lack of appropriate education and training, and lack of managerial ability

**Table 2.** Constraints in obtaining credit

Constraints of credit accessibility	Mean	Stdev.	Rank
Lack of collateral	4.69	0.58	1
Lack of cash flow statement	4.51	0.98	2
Owner's equity	4.39	1.01	3
Sector of the business	4.14	1.21	4
Lengthy & Vigorous procedure for credit application	4.13	1.37	5
High Interest rates	3.81	1.51	6
Location of the business	3.76	1.27	7
Lack of good reference on integrity	3.03	1.66	8
Lack of awareness of existing credit schemes	2.97	1.71	9
A general lack of experience and exposure on construction project	2.75	1.73	10
Lack of information on the cost obtaining such service	2.72	1.74	11
Lack of appropriate education & Training	2.21	1.68	12
Lack of managerial ability	2.09	1.59	13

were hindering them from accessing credit. These two constraints were in the band of 1.81 to 2.60.

The result in Table 3 infers that of the 179 respondents 13 i.e. 7.26% of SMEs surveyed obtained the business overdraft they applied for. 166 of the SMEs i.e. 92.74% did not either apply for the business overdraft or got the business overdraft. This is imperative to this study as there is lack of studies that have determined the predictors that influence business overdraft accessibility globally.

**Table 3.** Business overdraft credit accessed

Accessed the credit	Respondents	Percentage
Marked	13	7.26
Unmarked	166	92.74
Total	179	100.00

The result in Table 4, suggests that of the seven independent variables i.e. gender, age, location of business, type of business ownership, tax number, current position in the company and collateral or security modelled to predict business overdraft accessibility. The locality of the business predicted business overdraft accessibility. Those businesses that are located in the West Rand municipality of Guateng province in South Africa were likely to receive business overdraft credit than businesses that were located in the city of Johannesburg. The level of significance was less than 0.05 at 0.049 hence indicating a strong predictor. The odd of getting the credit was 6.105. It can further be suggested that we are 95% confident that the actual value of odds ratio in the population lies somewhere between 1.01 and 37.01. Further, because the confidence intervals does not contain the value of 1.00, this result is statistically significant at <0.05. This finding is in



**Table 4.** Predictors of accessing business overdraft

Variable	Exp. (B) Odds ratio	95% C.I. for EXP (B) Lower	95% C.I. for EXP (B) Upper	P-value
Gender (1)	1.685	0.489	5.805	0.409
Age group				0.907
31–40 years (1)	35336706.514	0.000	.	0.999
40–49 years (2)	35216122.305	0.000	.	0.999
50 years and over (3)	59177098.015	0.000	.	0.999
Current position				0.339
Owner (1)	0.309	0.088	1.084	0.067
Manager (2)	0.000	0.000	.	0.999
Manager/owner (3)	0.000	0.000	.	1.000
Ownership				1.000
Partnership (1)	0.000	0.000	.	0.999
Limited partnership (2)	0.000	0.000	.	1.000
Limited Liability company (LLC) (3)	0.000	0.000	.	1.000
Tax number (1)	59799061.729	0.000	.	0.999
Location (municipality)				0.265
City of Tshwane Metropolitan Municipality (1)	3.733	0.618	22.533	0.151
Ekurhuleni Metropolitan Municipality (2)	2.979	0.454	19.532	0.255
West Rand District Municipality (3)	6.105	1.007	37.009	0.049
	0.000			0.999

Dependent variable: business overdraft accessibility (0 = unmarked; 1 = marked) sig. at 5%

line with the study of Fatoki and Odeyemi, conducted in South Africa [22]. However, there study focused on generic credit not a specific type of credit. This finding suggests that financial institutions might only consider businesses in West Rand municipality when SMEs apply for business overdraft for their business.

The results in Table 4 further indicate that the gender, age, type of business ownership, tax number, and current position in the company were not predicting the business overdraft accessibility. The level of significance of these variables was greater than 0.05, hence poor predictors. The result on the gender of the applicant is not in line with the finding of Ololade and Olagunju, as a predictor [21]. Kira and He in Tanzania, established that the location and collateral were predicators of business credit accessibility [31]. However, this current study did not support their findings. Furthermore, it is imperative to mention that collateral was not statistically interpreted in the output result of SPSS despite being included in the analysis as a predicting variable.

However, prior to testing this model, the goodness of fit of the model was tested which indicated a good fit. This result was justified by the Hosmer and Lemeshow test. The significance of the model was greater than 0.05 at 0.913. The result suggests that the independent variables were fitting in the proposed theoretical model.

## 5 Conclusions and Recommendations

The study found that SMEs are constraint from accessing credit because of lack of collateral/security, lack of cash flow statement and owners' equity. High interest rate was also deemed to be a factor preventing SMEs accessing credit. These factors might deter the SMEs business owners not to approach financial institutions but rather request family and friend to support them in acquiring credit.

The researchers established that for SMEs to access business overdraft the location of the business was an imperative factor. The business located in West Rand had a higher probability of accessing the business overdraft than those located in the city of Johannesburg. It is interesting to conclude that, gender, age, type of business ownership, tax number, current position in the company and collateral or security modelled to predict business overdraft accessibility were insignificant. This finding should be interpreted with caution as SMEs from Gauteng were the only respondents who participated. It is opined that the results might be different if the survey was conducted within construction SMEs in all the nine provinces in South Africa. Based on these findings, the researchers recommend that:

SMEs should provide, the requirements requested by the financial institutions as they apply for the business overdraft. However, the study informs the financial institutions that, gender, age, current position of the applicant and the business profile and requirements i.e. the tax number, collateral and type of business ownership are not a panacea in acquiring business overdraft.

In relation to the findings, the researchers propose the need to use other socio-economic and demographic characteristics that were not used in this study as the current factors are not exhaustive in relation to the full characteristic of SMEs. The factors recommended for testing are marital status of the applicant, bank account statement and managerial ability of the respondents.

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# Econometric Modeling of Time Series Bid-Ask (Spread) for a Sample of Chilean Companies

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**Abstract.** The financial literature associated with capital markets, provide a significant relationship between bid-ask and the degree of disclosure given by companies to the capital market and the bid-ask measured by the spread, this has become accepted a measure of information asymmetries. This research is concerned with the behavior of the stock intraday spread and the factors that can affect it. To carry out the study an empirical analysis of a Chilean companies representing 38% of the total market capitalization of the IPSA is used. The results provide that only the factors, quantity supplied and the broker involved in it, are relevant in explaining the bid-ask (spread).

**Keywords:** Intraday spread · Information asymmetric · Chilean capital market

## 1 Introduction

An efficient market is influenced by the proper allocation of resources and this means, among other things, that all actors have similar information. Thus, decreasing the asymmetry of information benefits investors (1) to equalize opportunities for investment, (2) facilitates financing, and (3) reduce the perception of risk and the cost of capital. All this contributes to the profitability of companies, investors and the whole society. This is especially important in emerging economies mainly when these characteristics compromise efficiency and stability of its markets.

In particular, the Chilean stock market is characterized by the lack of depth, high concentration of ownership, low liquidity and high asymmetry of information [1–3].

Usually the spread is used as a proxy for information asymmetry in the financial literature [4], assuming that the price gap (spread) is the result of the difference of information between the buyer and the seller of shares. In addition, the type of intermediary is a factor that helps characterize the spread. In the same idea, both the size of the intermediary as his investment portfolio also influence the spread [5].

Regarding the Chilean stock market, there is little evidence of behavior and characterization spread. [6] study the impact of market-makers on the average daily liquidity of 21 shares according to a regulatory standard. Moreover, some studies on

the Chilean market have only been conducted on annualized measures, but not on measures Intraday [7].

Therefore, it is very useful to recognize that factors affect the intraday spread of a small emerging market, like the Chilean. This is useful because it would make conjectures about the quality of information received by investors in this kind of market. In particular, this is important when there is asymmetry between controlling and minority investors. Diverse investigations and corruption scandals give evidence of it (such as Cascadas, Endesa and Penta cases) [8, 9]. These have mediatically exposed the importance of the quality of public information, because the losses suffered by pension funds impact the entire society.

In this study behavioral evidences we carry intraday spread of share offerings (buying and selling) and some factors that may be relevant in characterizing the spread in the Chilean market: the quantity supplied and the type of stockbroker.

## 2 Methodology

The empirical analysis has been done for a statistical sample of 11 company stocks from the Santiago de Chile stock market. The names of the company stocks are the following: AGUAS-A, BANMEDICA, CAP, CONCHATORO, COPEC, ENERSIS, FALABELLA, IAM, LAN, SECURITY y SK. The analysis has considered bid/ask prices between 11:00:00 and 14:59:00 from January 1st, 2007 until December 30th, 2014 (8 years). Most of the selected companies (8) have an important participation in the main Chilean stock-market index (IPSA). In fact, the companies of the statistical sample represent the 38% of the IPSA index. The total number of operations included in this work corresponds to 2.189.030 bid/ask offers.

Table 1 shows the main variables and the two ways to compute the spread of the companies in this study (direct and relative spreads). Note that the spread can be calculated firstly, by taken into account the difference between the bid and ask prices ( $a\_b$ ), and secondly, the same previous difference, but divided by the average of the bid and ask prices ( $ab\_med$ ).

**Table 1.** Description of the main variables to evaluate the spread

Variable	Description
corredor_com	Code name of a buying broker
cantidad_com	Quantity of a buying offer
precio_com	Price of a buying offer
corredor_ven	Code name of a selling broker
cantidad_ven	Quantity of a selling offer
precio_ven	Price of a buying offer
a_b	Direct spread calculated by the difference between $precio\_ven$ and $precio\_com$ for each offer
ab_med	Relative spread calculated by the ratio of $a\_b$ and $(precio\_ven+precio\_com)/2$ for each offer

Source: prepared by authors.

From this Table 1, it is possible to conclude that the comparative analysis between different companies has to be done by using the relative spread *ab\_med*. Table 2 shows some statistics for the spread and the selling and buying quantities.

**Table 2.** Basic statistics for the spread and the offered quantities.

	cantidad_com	cantidad_ven	a_b	ab_med
Minimum	1	1	0.01	0.00001
Maximum	11860000	16464320	2001	0.099947501
Range	11859999	16464319	2000.99	0.099937501
Average	19694.50299	20345.09809	17.13239743	0.004038767
Standard deviation	89090.98419	78622.48922	28.25774705	0.006207454
Asymmetry	47.57970019	47.29736289	7.157030419	6.001421173
Curtosis	4330.070261	5301.75696	146.2421074	53.98430549

Source: prepared by authors.

In order to perform the analysis in this work, the statistical significance of the means difference test has been used to determine the influence of the individual brokers, or groups of broker classified by the number and quantity of buying/selling offers. Thus, the study compares the average spread of a particular broker (or a group of brokers) versus the average spread of the rest of operations ( $H_0: \mu_0 - \mu_1 = 0$ ).

In the case of the analysis for the spread over the time, several tests have been performed, which include all the period of analysis, and also quarterly, semi-annual, annuals, and for the periods 2007–2009, and 2010–2014.

Finally, the test of Levene has been used to evaluate the variance homogeneity. As before, the statistical significance of the means difference test has been used to evaluate the change of the average spread over the time. The tests were performed under the assumptions of heteroscedasticity of 1%, 3% and 5% (Tukey HSD, Bonferroni, Sidak, Tamhane, Dunnett-T3 y Games-Howell).

### 3 Results

The research results provide a similar behavior in the group of brokers with more operations, which systematically to get a spread below of the market (91% in the case of offers to buy and 82% in the case of offers to sale). In addition, the results provide that in the case of the sale offer, 31% of brokers have an average spread statistically similar to the market. On the other hand, observing the results of the offer to sell, to get a smaller percentage (10%) of the brokers have a similar market spread. This leads to the conclusion that the distribution of brokers measured in terms of spread depends on the type of participation (buying or selling) having a broker in the offering. Another result is obtained when determining those brokers with a clear trend (most) behavior of its spread versus the rest of the market.

Regarding the comparison of the spread for each segment versus the spread calculated for the rest of the market, in the case of bid, it can be seen that the segment

grouping bid with lesser amounts has spread mostly below the spread of rest of the market (64%). While the quartile containing the offers to buy for large quantities of shares presents a spread generally over the spread of the market (73%). However, when is analyzing the results of the comparison between the spread of each quartile versus the spread of market in the case of offers to sale of shares, it appears that those operations involving greater quantity offered have spread mainly spread over the rest of the market (73%). This situation, however, not observed in the case of one quartile grouping smaller amounts offered, and that an absolute majority of cases of spread is not obtained below market.

One of the events observed in the sample is the average spread is not constant over time, assuming a 1% error. The results provide that the spread data for the years 2007 to 2009 are higher than those obtained from 2010 onwards; statistically those spread the years 2007–2009 are different from those that occurred in the period 2010–2014, including 1% error. Instead, by observing the spread occurred between 2010 and 2014, it can be identified when cuts are made annually no significant differences at 1%, 3% and 5%.

Analyzing of spread by segmenting the data by semester, is obtained between the period 2007–2009 no significant differences. For example, combinations between spread between semesters 1 and 5, the p-values ranging mainly between 0.5 and 1, instead of that comparison between semesters 1 and 7 and later, the p-values ranging among 0.05. Therefore, the combinations semester 1 and semester 6, the spread are more similar and more different with the last semesters.

## 4 Conclusions

Literature and financial theory focus on the efficiency of markets and investment processes as a way to create more prosperous and more developed societies. The asymmetry of information perceived by investors is part of this efficiency, as the lower asymmetry reduces costs, facilitates corporate financing and improves investment opportunities. Therefore, the bid-ask spread, as a proxy for this asymmetry, is a relevant aspect to be studied; mainly in a market as the Chilean one, that has peculiar characteristics, and with events of serious asymmetry and problems of agency.

This research presents evidences about the behavior of the intraday spread of the Chilean capital market. These refer to whether the quantity offered, the type of broker participating in the offer, and the quality of the corporate governance of the companies issuing shares, and the quality of the corporate information, they deliver influence the spread significantly. It has also been assessed whether the spread has remained constant over time, especially the existence of a financial crisis in 2007–2008. The intraday sales and purchase offers of 11 representative shares in the Chilean market for 2007–2014 have been evaluated.

Evidence has been found that brokers with the highest number of points have a lower spread than the rest of the brokers. In addition, the magnitude of the spread is not the same per broker when the sales points are segmented from those of purchase, which could imply that brokers specialize in selling or buying shares, or, their clients have different behavior in the purchase points than in sales.



It has also been found that there are brokers that consistently achieve lower spread than those obtained by the market (29% for purchase offers and 24% for sale offers) and that other brokers do so with higher spread (32% and 21%, respectively). That is, as the spread is itself a cost indicator for brokers, then there are some brokers (about 26%) that performed systematically efficient operations, while others consistently have higher costs. Consequently, the choice of brokers is not minor for investors, since some of them (between 45% and 61%, depending on whether they are sales or purchase operations, respectively) systematically achieve different spread to the rest of the market.

Regarding the number of shares offered, we find that the deals with larger amounts of shares consistently achieve higher levels of spread. In other words, investors who want to buy or sell a large volume of shares should encounter greater spread.

Consistent with the evidence of the financial and economic crises suffered since 2007–2008, there has been a significant increase in the spread over the period and a slow decline in the spread of this crisis until 2014. These evidences support the ideas given by the hypotheses of the study, in the sense that the average spread is not constant over time and that its variability is not constant. In addition, it was observed that in average terms, the spread has declined since 2008 and has stabilized since 2011. Concurrently, spread variability has declined since 2008, but has only stabilized since 2013.

Future research can go on line to find out the influence of the stock liquidity, the risk (unsystematic and volatility), the shareholding of pension funds in securities issuers and other factors in the spread. It is also promising to analyze what happens when we expand the sample or when we study specific periods of time.

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# Motivational Factors for Users' Reposting Behavior in Different Mobile UGC Online Communities

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**Abstract.** With the popularity of mobile user-generated-content (UGC) online communities, it is important to explore why the same users behave differently in different UGC communities. This study was conducted to investigate motivational factors for users' reposting behavior in two UGC communities with Chinese young adults. A field experiment was conducted, where users were required to interact with two high fidelity prototypes of mobile UGC community applications. The results indicated that interface usability, information credibility, information usefulness, affect and community reputation had both direct and indirect effects on users' reposting behavior. In addition, several factors exerted differential effects for the two UGC communities. Information usefulness was important for higher reputation in the UGC community that was featured by its quality of content, while interface usability focused more on quality of interfaces. This study has important implications for the understanding of key factors that influence viral diffusion of online content through different UGC communities.

**Keywords:** Online community · User-Generated-Content · Reposting behavior

## 1 Introduction

Recent years, mobile UGC online community application has become global trends [1]. UGC online communities are online virtual groups where members have the opportunity to generate post and share personal content, and to interact with other members through commenting, exchanging, revising and spreading the content [2]. Examples of such communities are YouTube, Facebook and Twitter.

Despite the fact that (UGC) online communities have gained dramatic increase in recent years and attract millions of users, the phenomenon that many of users get inactivated and almost not engaged in the online communities over the time should get more attention. User activity is important for many companies, since it is critical for online communities to survive and expand [3]. For many online community providers, ensuring users to actively participate in community activities is a big challenge [4].

Therefore, it is important for companies to figure out the causes for viral diffusion of user content and ascertain users' willingness to share UGC among communities.

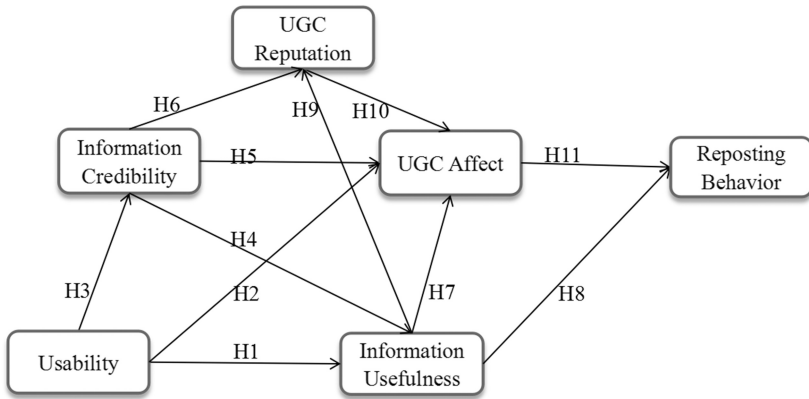
(UGC) online communities have gained an increasing popularity and made a lot of profits for the providers in recent years. As a result, the number of online community is in sustainable growth, especially in china there are many UGC and social media communities (e.g., Qiushibaik and Zhihu) [5]. These companies face a fierce competition in attracting and maintaining user activity. Besides, there is a phenomenon that the same mobile users may act differently in reposting behavior among different UGC mobile application communities. Therefore, it is meaningful to find out why the same users act differently between different UGC communities. This paper compares the reposting behavior between Qiushibaik and Zhihu to exploring this question. Qiushibaik is accredited to be one of the most widespread Social Networking Services (SNS) app based on UGC, which is growing fast in the past 2 years in China. In contrast, Zhihu, similar to the US-based Quora, is one of the biggest question-and-answer-style knowledge communities in China.

In order to remain sustainable development, it's important for UGC communities to keep users involved [6], which can include a wide range of behaviors [7]. Some scholars have identified three types of behaviors: community citizenship behaviors, content provision, audience engagement, which are important for the prospect of online communities [8]. While previous studies mostly focused on users' active participation and content contribution, and identified a number of models that could explain users' content creation and knowledge sharing behaviors [9–14], other online behaviors, such as reading and reposting, have been largely overlooked in research conducted to date [3]. However, reposting behavior has a significant impact on the survival and expansion of the UGC online communities [15]. We found that few studies committed to propose a model that can explain user reposting behavior. Therefore, we proposed a user reposting behavior model which was developed based on the modification and extension of (Technology Acceptance Model) TAM [16]. TAM is a widely accepted and utilized model for explaining technology usage behaviors, as well as findings from some other related studies [17–19]. The factors we proposed in this study included perceived information credibility and reputation of UGC online community, attempting to adjust TAM model in order to fit the scenario of our study. The following parts are what we specifically do.

## 2 Research Hypotheses and Model

### 2.1 Research Model Overview

In this study, we proposed the user reposting behavior model as indicted in Fig. 1. It was developed based on the modification and extension of TAM. And we proposed the factors of perceived information credibility and reputation of UGC online community to adjust TAM model in order to fit the scenario of our study.



**Fig. 1.** A user reposting behavior model that explore the motivation factors for users' reposting behavior in UGC communities

## 2.2 Perceived Usability

Perceived usability refers to the extent of a user's belief that a technical system is usable or it can be used easily and free of effort [20]. It has long been viewed as an important factor that affects user performance, satisfaction and intention to interact with a technical system [21]. Particularly, we argued for the importance of usability in driving online participation behaviors with mobile applications in spite of its controversial role [3, 4]. As we known, an online community performed poorly on usability may be incurred frustration and irritation for online users, so it could be a usage barrier for online community user and produce resistance that affect the online community. Oppositely, evidence shows that the easier a system is to interact with (i.e., the less time and effort needed to use it), the more time and effort that can allocate to other online activities, which may in turn increase the engagement in the online communities [22]. And previous studies have suggested that usability of user interface, such as information presentation, is related to users' perceptions of information credibility [23]. More usable interfaces (e.g., well-organized interfaces and better information presentation) are expected to yield higher level of information credibility. Thus, we hypothesized that:

- H1 Perceived usability will have a positive effect on perceived information usefulness of UGC online community.
- H2 Perceived usability will have a positive effect on user attitude towards UGC online community.
- H3 Perceived usability will have a positive effect on perceived information credibility in UGC online community.

### 2.3 Information Credibility

Information credibility refers to the extent that an individual perceives information to be believable [24]. Information credibility is very important for information seekers, especially in online UGC communities, for the reason of that it is difficult to ensure the quality of information of online community with lacking of professional gatekeepers and information verification systems. Some previous studies realize that online users consider credible information more trustworthy, useful and unbiased [25]. Some recent studies also found that there would be a positive attitude towards UGC online communities if they consider the content credible [26]. Thus, we proposed the following hypotheses:

- H4 Information credibility of online UGC will have a positive effect on user perception of information usefulness in UGC online community.
- H5 Information credibility of online UGC will have a positive effect on user affect towards the UGC online community.
- H6 Information credibility of online UGC will have a positive effect on community reputation.

### 2.4 Information Usefulness

Perceived usefulness is defined as the degree to which a person believes that the use of a system would improve his performance.

And the perceived usefulness in this study was construed as perceived information usefulness, referring to the extent to which a user believes that the UGC information is useful and helpful. As proposed by the information adoption model [19], information usefulness is a critical predictor for information adoption. Evidence showed that perceived information usefulness would influence the way users respond to the information, and therefore affect their willingness and attitudes towards the online communities [18]. Thus, we hypothesize that:

- H7 Perceived information usefulness will have a positive effect on user affect towards the UGC online community.
- H8 Perceived information usefulness will have a positive effect on a user reposting behavior in UGC online community.
- H9 Perceived information usefulness will have a positive effect on community reputation.

### 2.5 Community Reputation

Community reputation is a very important factor for users' engagement in online communities. There would be a high enthusiasm to participate in online communities if they are thriving for a high reputation. For users, a high community reputation always means that the information provided by the community was considered as useful and credible, what's more, means users could get information using less time and effort.

For example, online communities with high reputation usually include many experts who are recognized for their skills and knowledge in certain domains. Users who want to improve their status and earn the respect from their peers are more likely to share their expertise with others or repost content from other experts in order to show their agreement with recognized experts. Thus, we hypothesize that:

- H10 Community reputation will have a positive effect on user affect towards the UGC online community.

## 2.6 Affect Towards UGC Online Community

UGC affect is a very important factor for users' engagement in online communities. As UGC affect refers to the degree to which an individual depend and trust the UGC community, also the pleasure when spending time and energy on it. And there was strong and consistent association between affect and behavior intentions. It is obvious that there would be a high degree of participation if users feel happy and have a sense of belonging and security when they are in online communities. Thus, we hypothesize that:

- H11 Affect towards UGC online community will have a positive effect on a user reposting behavior in UGC online community.

## 3 Methodology

We tested the model by two of biggest online UGC online communities Qiushibaik and Zhihu. Qiushibaik is accredited to be one of the most widespread SNS app based on UGC, which is growing very fast in the past 2 years in China. It has over 20 million registered users and 30 million fans from other social communication platforms that exchange 100 million posters and 1 billion user comments so far. In October 2014, Qiushibaik get a 5-million (United States dollar) USD venture investment from Innovative works, a well-know (Venture Capital) VC Funding firms in China. Zhihu, which is China's biggest question-and-answer-style knowledge base, works very similar to the US-based Quora. Just like Quora, Zhihu's initial user-base was made up of tech savvy and entrepreneurial minds, but it has diversified quite a bit since then, with the hottest topics being movies, IT, finance, and gaming. Meanwhile, Zhihu is a good place for Chinese internet users who want expert insight into various topics.

### 3.1 Participants

We obtain survey data for a random sample of 226 users who have previous experience in using two very popular UGC mobile app in China with millions of active users. These samples are students of Shenzhen University in South China. With the fact of that college students are the largest user group in online UGC communities in China, therefore, we select college student as participants to ensure the validity of the data.

### 3.2 Measures

This study eventually chose the following variables after a carefully review of the previous literature: perceived usability, information credibility, information usefulness, community reputation, community affect and reposting behavior. Items for all variables, except reposting behavior, were rated on 7-point Likert-type scales, ranging from “strongly disagree” (1) to “strongly agree” (7). Affect towards UGC online communities was measured by three-item scale developed by Chaudhuri and Holbrook [27]. UGC reputation was assessed by two-item scale which adapted from Lau and Lee [28]. Information usefulness and usability were adopted from Elling et al. [29] in which information usefulness was measured by three-item scale, information usability was measured by nine-item scale. Information credibility was measured by four-item scale developed by Belanche et al. [30].

### 3.3 Materials and Procedures

The objective of this research is to empirically investigate users’ motivation to sharing content on two of the most popular China’s UGC online communities on mobile application platforms. For the purpose of this study, a high-fidelity prototype of QiuBai and Zhihu are developed by our research team. This prototype contained ten posters, in which five posters are randomly selected from QiuBai and other five posters were randomly selected from Zhihu. Meanwhile Random posts are selected with period from 15/05/2016 to 31/05/2016.

At the beginning of the study, participants were explicitly informed that they would be required to answer questions about perceptions on a mobile UGC online community (i.e., Qiushibaikē, Zhihu). All the participants were asked to complete an online questionnaire consisting of posters randomly selected from Zhihu and Qiubai, demographic information and measurement items of the variables examined.

### 3.4 Data Analysis

In this study we measured composite reliability which was assessed using Cranach’s  $\alpha$ , with values above 0.50 representing acceptable and above 0.8 representing good reliability [31]. And a path analysis was performed to test the fit between the research model and the data obtained using AMOS 21.

## 4 Results

### 4.1 Reliability

As shown in Table 2, the Cranach’s  $\alpha$  values of all the constructs ranged from 0.75 to 0.93 using the data collected from Zhihu, and it ranged from 0.65 to 0.92 using the data collected from QiuBai (Table 1).



**Table 1.** The result of reliability analysis

Variable	Number of items	Zhuhu			QiuBai		
		Mean	SD	Reliability	Mean	SD	Reliability
Usability	9	4.5	0.9	0.79	4.1	0.8	0.75
Information usefulness	3	4.5	1.3	0.76	3.5	1.1	0.65
Information credibility	4	4.1	1.3	0.91	3.2	1.2	0.92
UCG reputation	2	4.4	1.3	0.75	3.6	1.2	0.69
UCG affect	3	4.6	1.4	0.93	4.1	1.3	0.86
No. of sharing behavior	NA	1.7	1.5	NA	1.2	1.4	NA

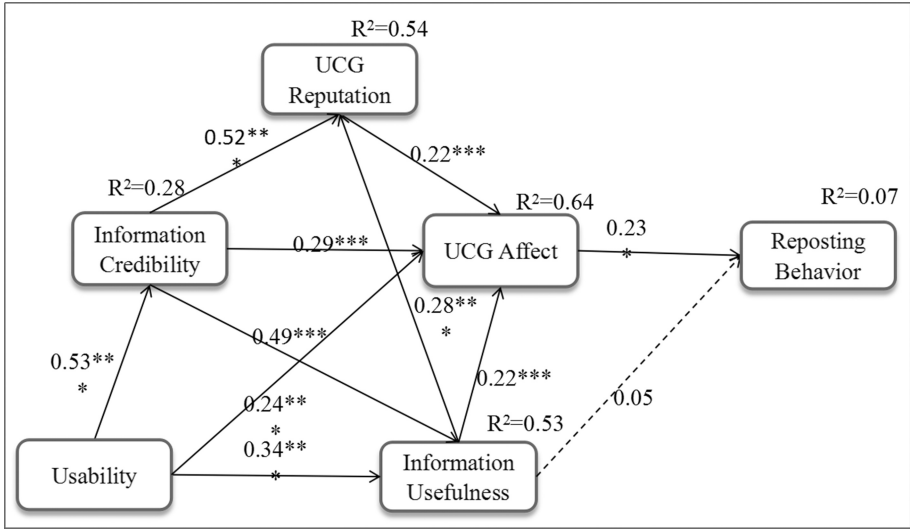
### 4.2 Model Testing

The model provided reasonable fit to the data according to the good-of-fit index from path analysis both in Zhihu and QiuBai (see Table 2).

**Table 2.** The result of a path analysis

Fit index	Zhihu		QiuBai	
	Recommended value	The tested model	Recommended value	The tested model
$\chi^2$	N.s at $p < 0.05$	7.14, $p = 0.068$ (n.s at $p < 0.05$ )	N.s at $p < 0.05$	6.185, $p = 0.103$ (n.s at $p < 0.05$ )
$\chi^2/df$	1–3	2.38	1–3	2.062
GFI	$\geq 0.9$	0.99	$\geq 0.9$	0.991
AGFI	$\geq 0.8$	0.928	$\geq 0.8$	0.937
CFI	$\geq 0.9$	0.994	$\geq 0.9$	0.994
NFI	$\geq 0.9$	0.989	$\geq 0.9$	0.989
IFI	$\geq 0.9$	0.994	$\geq 0.9$	0.994
RMSEA	$\leq 0.05$ (good); $\leq 0.08$ (acceptable)	0.078	$\leq 0.05$	0.069

Figure 2 shows the results of the estimated model using the data of Zhihu, and demonstrates the standardized path coefficients of the significant structural relationships ( $p < 0.05$ ) among the tested variables. The amount of variance in affect towards UGC online community accounted for by information credibility, information usefulness, usability and GUC reputation was 64%. And UGC affect towards Zhihu explained 7% of the total variance in reposting behavior. In the model, affect towards UGC online community ( $\beta = 0.23, p < 0.01$ ) (support for H11) predicted reposting behavior. Information credibility ( $\beta = 0.29, p < 0.01$ ) (support for H5), usability ( $\beta = 0.24, p < 0.01$ ) (support for H2), UGC reputation ( $\beta = 0.22, p < 0.01$ ) (support for H10), and information usefulness ( $\beta = 0.22, p < 0.01$ ) (support for H7) were found



**Fig. 2.** The result of a path analysis using the data from Zhihu

to have a positive effect on UGC affect. Usability ( $\beta = 0.53, p < 0.01$ ) (support for H3) significant predicted information credibility. Information credibility ( $\beta = 0.52, p < 0.01$ ) (support for H6) and information usefulness ( $\beta = 0.28, p < 0.01$ ) (support for H9) were founded directly influence UGC reputation. Information credibility ( $\beta = 0.49, p < 0.01$ ) (support for H4) and usability ( $\beta = 0.34, p < 0.01$ ) (support for H1) significant affect information usefulness. It is worth noting that it is the effect of information usefulness on reposting behavior was not significant (H8).

Figure 3 shows the results of the estimated model using the data of QiuBai, and demonstrates the standardized path coefficients of the significant structural relationships ( $p < 0.05$ ) among the tested variables. The amount of variance in affect towards UGC online community accounted for information credibility, information usefulness, usability and GUC reputation was 52%. UGC affect towards QiuBai and information usefulness explained 12% of the total variance in reposting behavior. In the model, affect towards UGC online community ( $\beta = 0.17, p < 0.01$ ) (support for H11) and information usefulness ( $\beta = 0.22, p < 0.01$ ) (support for H8) directly predicted reposting behavior. Information credibility ( $\beta = 0.14, p < 0.01$ ) (support for H5), usability ( $\beta = 0.21, p < 0.01$ ) (report for H2), UGC reputation ( $\beta = 0.33, p < 0.01$ ) (support for H10), and information usefulness ( $\beta = 0.21, p < 0.01$ ) (support for H7) were found to have a positive effect on UGC affect. Usability ( $\beta = 0.41, p < 0.01$ ) (support for H3) significant predicted information credibility. Information credibility ( $\beta = 0.51, p < 0.01$ ) (support for H6) and usability ( $\beta = 0.29, p < 0.01$ ) were founded directly influence UGC reputation. Information credibility ( $\beta = 0.56, p < 0.01$ ) (support for H4) and usability ( $\beta = 0.21, p < 0.01$ ) (support for H1) significant affect information usefulness. It is worth noting that it is the effect of information usefulness on UGC reputation was not significant (H9).

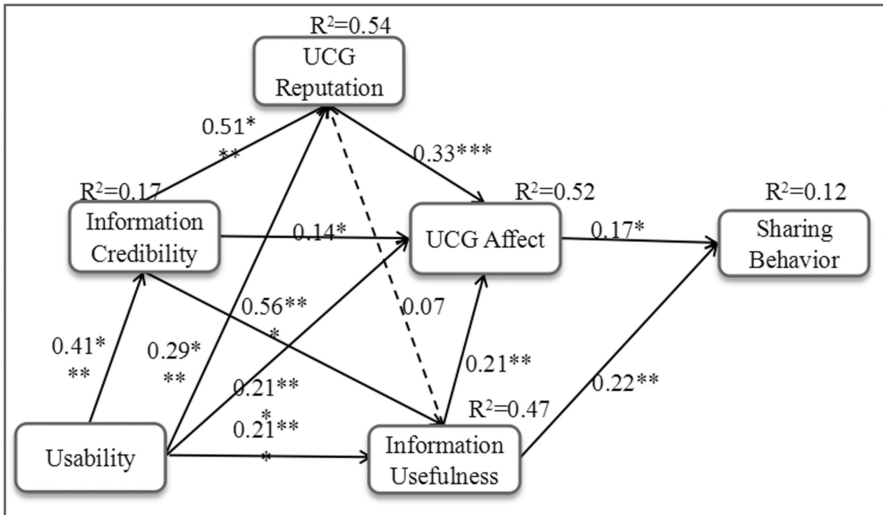


Fig. 3. The result of a path analysis using the data from QiuBai

## 5 Conclusion and Discussion

We examined a number of factors for users' reposting behavior in different mobile UGC online communities and formed a relatively complete theoretical model based on TAM model through considering some other factors such as credibility and reputation which has been less studied in online community research. Meanwhile, we tested the model in the different UGC online communities in china to explore the reason of different behavior of the same user among different UGC online communities. As indicated from the result of data analysis, all the four factors (usability, credibility, usefulness and reputation) can predict affect for both apps, reposting behavior can be predicted by affect for Zhihu and by both affect and information usefulness for QiuBai, a high level of usability can lead to improved reputation for QiuBai, but it does not work in this way for Zhihu, and information usefulness is a strong predictor of reputation for Zhihu, but not for QiuBai. From the result, we find that information usefulness was a pivotal factor which caused the same user behaved differently in QiuBai and Zhihu and usability also did some work.

### 5.1 Implications

From a theoretical point of view, this study examined a number of factors for users' reposting behavior in different mobile UGC online communities and formed a relatively complete theoretical model that enriched the TAM model greatly. From a practical point of view, the findings of this study provided several implications for online UGC communities to attract and retain users. We examined factors for reposting behavior both in Zhihu and QiuBai, and found that information usability, credibility,

usefulness and reputation have a significant positive effect on UGC affect both in QiuBai and Zhihu. Therefore, it is very important for online UGC communities to improve usability, credibility, usefulness and reputation for UGC apps in order to improve affect. Secondly, some factors exerted differential effects for the two UGC communities. Information usefulness was important for better reputation in the UGC community that was featured by its quality of content, while interface usability was desirable for better reputation in the UGC community that focused more on quality of interfaces. Information usefulness could only have an indirect effect on reposting behavior in Zhihu, while it had both direct and indirect effects on reposting behavior through affect for the QiuBai. Meanwhile, information credibility and usefulness is desirable for better reputation in APP like Zhihu (focus on quality of content) information credibility and usability is desirable for better reputation in APP like QiuBai (focus on quality of interfaces). Information usefulness and credibility were important factors for the reason of that same user behave differently between different UGC communities; therefore, information usefulness and credibility are important differentiation factors for online communities, which suggested that enterprises could focus more resources on improving information usefulness and credibility to achieve competitive advantage.

## 5.2 Limitations and Future Research

Although this study has made some progress in theory, and have guiding significance for practice, there are still some limitations which should be pointed out. Firstly, this study conducted a field experiment in which users were provided with a high fidelity prototype of the UGC communities. However, it is not a real scenario. With the possibility of that users may constrained by their available time and need to consider the impact of reposting specific UGC information in their online moments in a real scenario, there may be some different conclusion if conduct a experiment in a real scenario. Therefore, further efforts are required to examine the same users' reposting behavior between different UGC online communities with the real UGC online community application for a certain period of time. Secondly, this study has considered a number of factors for users' reposting behavior in different mobile UGC online communities, forming a relatively complete theoretical model. However, with the continuing development of UGC communities and more extensive literature reviewing, there are more contextually relevant variables should be examined. Therefore, much work remained to be done for future research. Thirdly, a longitudinal study could be considered for future researcher to explore users' actual reposting behaviors and how their behaviors are affected by variables of interest. At last, the sample included only college students, which may raise concerns about the generalization of the findings, as there are a number of users outside of university campuses. Recruitment of diverse samples could possibly address this limitation.

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# E-service Adoption: The Three Q Model

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**Abstract.** Previous studies on information technology (IT) acceptance have focused on instrumental beliefs as the drivers of behavioral intention. The factors influence adoption decisions are perceived ease of use and perceived usefulness [1]. Wixom and Todd [2] integrated the user satisfaction and the technology acceptance literatures to theorize about and account for the influence of the information technology artifact on usage. In their research, information quality (IQ) and system quality (SysQ) were found to be precursors of information satisfaction and system satisfaction which in turn predict behavioral intention. Xu, Benbasat, and Cenfetelli [3] argued that service quality (SQ) is critical to the success of e-service and has to be added into Wixom and Todd's [2] model. They assert that the adoption decisions have to factor into account of the three Qs: information quality, system quality, and service quality. This study takes a theory building approach to further develop the concepts appeared in adoption and IS success research. Xu et al.'s [3] model does not take into account the affective aspect of IT usage which found to be crucial to Web-based adoption decisions. We then proposed the 3Q model which contains the information quality, system quality, service quality, instrumental beliefs (i.e. ease of use and usefulness), affective factors (i.e., enjoyment and cognitive absorption), and flow. The 3Q model builds upon the current research efforts and advances the theories by including both cognitive and affective aspects of human judgment; by doing so, we advance the knowledge of adoption in Web context; therefore the theories can be continuously developed and refined along with the development of IT artifacts that are used in consumer contexts. Online surveys were conducted to test the 3Q model. The results with Partial least squares (PLS) analysis show the structural relationships with the 3Q model. Managerial implications were discussed.

**Keywords:** Information quality · System quality · Service quality · Adoption · Affect · Satisfaction · Hedonic value · Utilitarian value

## 1 Introduction

In today's digital economy, information technology (IT) represents an opportunity for businesses to acquire customers, especially with the provision of e-services for customers [4]. Understanding the acceptance of e-services is an increasingly crucial issue because the value of these services can be realized only when they are used by customers in a manner that contributes to businesses' goals. Compared to IT use as a

significant aspect of achieving work performance, issues related to IT use in a consumer context have been studied yet well-understood by information systems (IS) researchers. Several theoretical models have been proposed to better understand the acceptance of IT in consumer contexts [5–9].

We propose a 3Q model, which encompasses factors that is well-developed in IS literature: the 3Qs (information quality, system quality, and service quality), affective measures (satisfaction, enjoyment, and cognitive absorption), and flow. The proposed 3Q model resolved few issues yet been addressed in Xu et al.’s model.

## 2 Literature

### 2.1 What Is an E-service?

E-services range from the electronic provision of traditional services, such as banking (e.g., E\*TRADE), investing (e.g., [chase.com](http://chase.com)), and airline ticketing (e.g., [expedia.com](http://expedia.com)), to intelligent interactivity in post-sales product support (e.g., dell.com and Internet service providers) [10]. They also include hedonic e-services like on-line gaming and music downloading (e.g., [blizzard.com](http://blizzard.com) and iTunes) and socially oriented services like virtual communities and social networking sites (e.g., Second Life, MySpace, and Facebook). Wareham, Zheng, and Straub defined e-service as “the provision of some kinds of services that are substantially differentiated from traditional retailing, such as professional services, entertainment or education” [11, p. 3].

**Trends in E-services.** Along with the IT development, e-services are more diverse. E-services bundling with mobile devices (like smart phones, tablet PCs, and other handhold devises) provide new use experiences ever. Users have more options and immerse in an online environment. Below are some E-services that is currently have large user groups.

*Mobile Apps and Online Stores.* A mobile application (App) store is an e-service allows users to browse and download software applications for use on their mobile devices [12]. These Apps are designed exclusively for users mobile devices such as iPhones, Android phones, and BlackBerrys; apps are also available for tablet devices and personal computers. Currently, Apple’s App Store, Android Market (rebranded as Google Play in 2012), and App World for BlackBerry users are considered as the most successful and best-known application stores. Since January 2007, Apply released the first iPhone, it has been a mania that users are crazy about the smart phones. More than 100B mobile applications have been downloaded since the launch of the Apple iOS and Google Play stores [13]. Today Apply is the top one of the world’s most valuable brands (Forbes, 2014) and it remains to be a brand having high potential in near future. During the past 18 months (from 2013 to mid 2014), all the statistics for app stores have grown dramatically especially the number of users and the download counts. Apparently, the size of the audience for mobile apps is continuous growing and it exhibits great business opportunities [14].



## 2.2 3Qs: Information Quality, System Quality, and Service Quality

**Information Quality.** IQ is a user's evaluation of the system's conveyance of semantic meaning and/or communication of knowledge. Information quality is shaped by four dimensions: completeness represents the degree to which the system provides all necessary information; accuracy represents the user's perception that the information is correct; format represents the user's perception of how well the information is presented; and currency represents the user's perception of the degree to which the information is up to date [2].

**System Quality.** SysQ is a user's evaluation of the technical capabilities of the system and its usability, while perceived. There are five dimensions for system quality: reliability refers to the dependability of system operation, flexibility refers to the way the system adapts to changing demands of the user, integration refers to the way the system allows data to be integrated from various sources, accessibility refers to the ease with which information can be accessed or extracted from the system, and timeliness refers to the degree to which the system offers timely responses to requests for information or action [2].

**Service Quality.** There are five dimensions for service quality: tangibles, service reliability, responsiveness, assurance, and empathy. Tangibles refers to physical, facilities, equipment, and appearance of personnel, service reliability refers to ability to perform the premised service dependably and accurately, responsiveness refers to willingness to help customers and provide prompt service, assurance refers to knowledge and courtesy of employees and their ability to inspire trust and confidence, and empathy refers to caring, individualized attention the service provider give its customers [15]. These five dimensions specify the service quality in organizational context. When applied in e-service context, they need to be revised. We therefore use the conceptual definitions and adopt the measures that have been used in previous studies.

## 2.3 Cognitive and Affective Aspects of E-service Use

Previous studies have conceptually separated cognitive and affective behaviors and evaluations. For information systems, the foci of adoption decisions have been on instructional beliefs and how organizational efforts can accelerate system adoption to increase organizational effectiveness and performance. In IS, researchers believe that information behaviors involve three aspects: cognition, affects, and sensori-psychomotor [16]. System designs that follow the guidelines for building cognitive systems for problem solving and reasoning have been developed into affective/emotional systems, where system design considers human affection and emotions [17]. Similar ideas have been proposed since the 1990s on organizational behaviors. Scholars (e.g., [18, 19]) have noted that work events at the workplace serve as causal agents for positive and negative affective states that result in either satisfaction or dissatisfaction at work. Similarly, Westbrook [20] on marketing, proposed that consumers form two summary affect states (positive and negative), and that both are significantly related to satisfaction in the expected direction.

## 2.4 Utilitarian and Hedonic Value

Values are motivational constructs that serve as a standard or criterion for guiding the selection or evaluation of actions or things. Values are higher-level goals in the MEC hierarchy that motivate and direct consumers' behaviour and decision-making. For repeat/experienced customers, value judgments are derived from the past consumption experiences that facilitate (or block) the achievement of their shopping goals [21]. Hedonic and utilitarian values are important outcomes influencing future consumer decisions through feedback loops into the consumer decision processes. Accordingly, consumers should have a greater repeat purchase intention towards an online store when the store can provide higher utilitarian and hedonic values. Prior research has also shown the importance of utilitarian and hedonic values in driving repeat purchase intention [22, 23].

## 3 Research Questions

To test the explaining power of our research model, we ask the following research questions:

- **RQ1:** How well do information, service, system quality explain beliefs and in turn influence the intention to use e-services?
- **RQ2:** How well do intrinsic factors (cognitive absorption, flow, enjoyment) explain beliefs and in turn influence the intention to use e-services?
- **RQ3:** How well do hedonic and utilitarian values explain the intention to use e-services?
- **RQ3:** To what extent do the perceived risk mediate the effect of hedonic and utilitarian values and have direct effect to the intention to use e-services?

## 4 Method

A survey design was used for data collection. The study was performed in Fall, 2016 in a major Taiwan university. Students who enrolled in a 400 level IT course and grad students participated the online survey. They receive extra credits for participation. A total of 70 subjects were recruited for our study. The questionnaire developed through pre-validated measures (see Table 1 for sources of measures) and was further developed via a pretest. The English version of questionnaire was translated into Chinese and then back translated into English. The Chinese version of questionnaire was tested with 35 undergrad students and 24 graduate students. They were asked to read along the questions and then note down the sentences/phrases which they do not understand. The questionnaire items were reworded based on the results of the pretest. An online version of the survey was then developed by using the Google doc. An email message with the URL of survey was sent to subjects and the data were collected in a week.

### 5 Results and Discussion

A partial least squares (PLS) analysis using PLS Graph (Version 3.0) was conducted to examine the reliability and validity of the measures. In first study, the loading pattern was highly consistent, with most loadings above .70. In second study, all loadings were above .70. Figure 1 show the regression coefficients and variance explained. In the research model, satisfaction is postulated to have effect on trust which in turn predicts repurchase intention to online group buying. The Moderating role of perceived risk is significant.

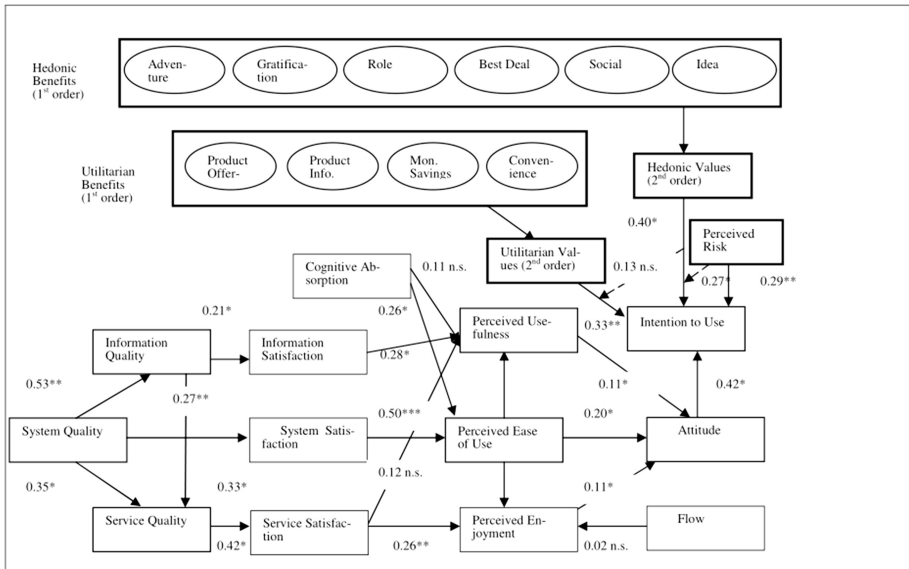


Fig. 1. Study results

### 6 Conclusion

The primary intellectual merit of the study rests on developing and testing a research model which advance the knowledge of e-service adoption behaviors. Testing the model with a variety of samples simulating a real-world situation where the Internet-based information service is being adopted will help us to pursue the goal of bring new theoretical perspective from social theories to IS. As we pursue this goal, we demonstrate that this study have significant broader impacts. First, the theoretical model under investigation benefit practitioners in continuously developing functionalities that provide the most meaningful impacts towards the e-service adoption behaviors. In particular, system developers shall pay great attention to deliver services that provide both hedonic and utilitarian values. Secondly, the study can serve as a critical starting point for future scientific investigation of technologies in customer context as the electronic commerce revolution continues to grow.

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# Measurement of Organizational Happiness

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**Abstract.** Personal well-being studies have reported a strong positive relationship between happiness and productivity, determining the need of the Human Resource (HR) function to regularly monitor and maintain employee happiness and satisfaction. However, lack of scientific precision in defining the term ‘happiness’ and inconsistency in its measurement have made this research area more challenging. The study proposes an automated detection technique that uses Natural Language Processing (NLP), to offer the HR function an easy means of implementing a technique that enables constant monitoring of happiness levels, and leverages the data into a tool for evaluating the effectiveness of programs, policies, and practices. A case study is presented to demonstrate the framework’s effectiveness.

**Keywords:** Happiness · HR metrics · Email sentiments · Natural Language Processing

## 1 Introduction

Happiness has recently received considerable attention and is currently a wide ranging topic of empirical research [1]. Since the 1930s, there has been a great deal of interest in the relationship between employee well-being and productivity [2, 3]. With the term *well-being* commonly used as a definition for, and interchangeably with, happiness, studies reported a strong positive relationship between levels of employee well-being and job performance, productivity, as well as other business unit level outcomes such as customer satisfaction, profitability, employee turnover, and sickness-absence [4, 5]. From the spectrum of employee happiness indicators examined, positive affect was most strongly tied to productivity [2]. Moreover, in addition to the link between employee happiness and productivity, Patterson, Warr and West [6] found that employee perception of concern for their own welfare was also linked to productivity [6]. Thus, providing a climate where the employee both feels happy and believes that there is a concern for her welfare would translate into positive productivity results. Some even argue that efforts to boost employee morale are manifested in bottom line financial improvements for organizations [7].

It is therefore clear that the Human Resource (HR) function should regularly monitor and maintain employee happiness and satisfaction [8–11]. This should also be an issue for HR talent management practices, since implementing strategies or systems designed to increase workplace productivity by developing processes for efficient human capital retention, utilization, and management is a significant HR mandate [12].

However, while steps towards social concern have been recently developed, (e.g., guidelines such as the creation of the ISO 26000 and the Global Reporting Initiative) which attempt to create metric systems that promote social responsibility in organizations, HR systems are not always designed in ways that promote the well-being of employees [13].

Maintaining and improving employees happiness and satisfaction includes tactics such as productivity improvement programs, incentive compensation systems [14], developing a participating management style [15], developing employee volunteer programs [16], and even employing psychologists to provide counsel on human resource issues for increasing job satisfaction and morale [17]. In order to assess the success of the implementation of HR programs, they need to be measured with quantifiable targets in order to determine performance goals. However, the measurement of happiness has proved challenging; researchers suggested that some questionable findings linking happiness and productivity were due to inconsistent measurement techniques and that the term ‘happiness’ lacks scientific precision [2].

The study employs a specific methodology aimed at detecting happiness, and real-time changes in employee’s happiness. Detection may be undertaken in real-time based on emails, a common and efficient means of information exchange [18]. Our study makes several contributions. First, the study offers a new measurement for happiness based on modern communication behavior and can be implemented in any organization for the use of the HR function. Second, this novel contribution will add considerably to existing research, which has increasingly focused its attention on this subject in the last decade, while hampered by difficulties in measuring and assessing happiness. Third, HR practitioners could apply the results of this research to improve the effectiveness of moral enhancement programs, due to their increased ability to monitor and evaluate them. Fourth, HR practitioners could apply this technique to assume a more proactive role in enhancing the effectiveness of organizations. The positive relationship between workplace happiness and success of an organization is confirmed by numerous studies. The technique can be used as an index for well-being within the organizational context, and an evaluative tool to measure the success of policies and practices.

## 2 Literature Review

### 2.1 Measuring Happiness

Happiness refers to a feeling or subjective state, and serves as an evaluation or assessment of a life, since happiness is the natural goal of life [19]. Robertson and Cooper [4: p. 52] claims that hedonic *psychological well-being* (PWB) is “pretty close” to the general assessment of *happiness*. Ryff and Keyes [20] measure PWB with six distinct dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. Later research suggested that not all dimensions are necessary [21]. Another known measurement for PWB is The Oxford Happiness Questionnaire (OHQ), an improved derivation from the Oxford Happiness Inventory (OHI) comprising 29 items, each item was presented in four

increments, which are different for each item [22]. However, Wren-Lewis [1] argues that happiness and well-being are completely different terms.

Another common designator for happiness is *Life satisfaction*. A widely used measure is The Life Satisfaction Scale [23] which contains five items inquiring into people's level of life satisfaction. Although the terms *life satisfaction* and *happiness* are conceptually different, and some researchers avoid using the latter altogether [24], it was found that they are positively correlated [25, 26], and therefore some use them interchangeably [cf. 27].

Zelenski et al. [2] refer to happiness using the term *subjective well-being* (SWB) which comprises emotional experience, life satisfaction, and job satisfaction. However, happiness is more of an emotional concept, while life satisfaction reflects a more cognitive conceptualization. [27]. Diener [24] argues that global measures of subjective well-being, such as assessments of life satisfaction and happiness, are informative and can be useful for policy debates, although more specific indicators could be helpful.

The Positive and Negative Affect Schedule (PANAS) [28] is a widely used feeling-based approach, containing two self-report scales consisting of ten words describing positive and negative emotions (e.g., upset, enthusiastic, and nervous) which the participants are asked to rate. Singh and Jha [26] found that positive affect, measured using the PANAS, is positively correlated to the general happiness scale measure using Lyubomirsky and Lepper's [29] subjective feelings of global happiness.

Along with the variety of happiness definitions and measurements that exist, another major problem which emerged is that they all measure happiness in a single point in time, without consideration of temporal changes and without the ability to monitor them.

## 2.2 Happiness Changes

While some stability in happiness does exist, and inborn factors matter, it is not permanent and happiness levels fluctuate over time, (e.g., significant life events associated with lasting changes in subjective well-being may have a strong transformative impact on happiness levels) [4: p. 43, 30]. Thus, the happiness level of an employee may change over time, with obvious effects on job productivity as a consequence. The HR's ability to continuously monitor the level of happiness for periodical changes may enable proper action. In cases of critical emotional change, such as employee incidents involving law enforcement agencies, clinical interventions such as psychological counseling may be employed in order to monitor emotional stability. However, such interventions are often not viewed positively due to the stigma attached to them in work cultures that emphasize emotional self-control [31].

The purpose of this study is to solve the dual problems of lack of scientific precision in the measurement of happiness and the organizational need for constant monitoring capability of happiness levels by developing a new happiness measurement. The proposed mechanism is based on language data mining techniques and makes use of digital age tools.



### 2.3 Language Cues

People's natural language carries important information about their personalities, social situations, and ongoing emotional and cognitive coping processes [32]. Cohn, Mehl and Pennebaker [32] demonstrated that emotional changes, including happiness, are manifested in language by analyzing language changes surrounding the September 11, 2001 attack. Researchers have even provided evidence to suggest that people's physical and mental health can be predicted by words they use [33–35]. Recently, there has been a growing interest in the automatic identification and extraction of opinions, emotions, and sentiments from text, mainly to provide tools for information analysts in the domains of government, commerce, and politics, who want to track attitudes and feelings in news media and on-line forums [36]. Emotion detection is classified into keyword-based and machine learning approaches, with the former concerned with extracting emotional keywords that recognize user emotions based on input text. Keyword approaches tend to perform better than machine learning when they are well defined to recognize the proper emotion [37].

As email is the most common, and comparatively the most efficient, means of exchanging information in today's world [18], it is unsurprisingly the preferred communication channel in many organizations [38, 39]. The study will use an analysis based on keywords mined from an organizational email corpus, specifically, that of the Enron Corp. The Enron email corpus is known as an excellent research database because it contains abundant natural conversational language [40]. Indeed, it has been used extensively for research involving data mining, text analysis, and natural language processing [41].

However, some methodological challenges first need to be confronted. Since language changes over time, implying semantic variation [42], the set of happiness keywords should be validated in the same time period as the corpus data. Second, since statistical and machine learning approaches typically require entrainment and manually annotated test corpora with respect to each language-processing task from the same set [36], in order to apply a scientific precision-based method while enabling generalization of the technique as one that may be used by any organization, the study requires a set of emotional keywords which were explored objectively, and not from the same set. On the other hand, the nature of emails is that they contains free-form writing, a more associative list of word collections, rather than a proper grammar-based collection used in books or synonyms found in specific contexts [e.g. 43]. Therefore, when exploring emails or any other free-form genre of user writing, the keyword set needs to be constructed through human experiment rather than dictionary based rules (i.e., similar to the PANAS scale) [28]. In the PANAS scale, participants provided a rating for words based on their association, and this study argues that in some cases validating a set of words using subjective association provides the most accurate results, especially when dealing with a collection of digital texts such as emails, where users write quickly and often informally without expending too much effort on grammar or spelling [39].

In order to validate the technique presented in this study, the mechanism proposed will be applied to the investigation of seniority differences in happiness, including the intersection of seniority and gender, using the Enron corpus. Mohammad and Yang [44] explored the Enron corpus for gender emotional difference, however their research

suffers from several weaknesses. First, in order to identify an emotion, they calculated the ratio of the number of words associated with an emotion to the total number of emotion keywords in the text, noting that *“This simple approach may not be reliable in determining if a particular sentence is expressing a certain emotion, but it is reliable in determining if a large piece of text has more emotional expressions compared to others.”* (p. 72). However, the Enron corpus consists of emails, which are by nature often short text messages, thus this technique may fail in identifying specific emotions in many of the emails. Moreover, different emotions, even happiness and sadness, can co-exist [45] as they are produced by different areas of the brain [46, 47]. Thus, not only may the technique fail in identifying emotions, it can even completely ignore emotions that have been identified. Second, they used a general public domain thesaurus to select emotion keywords, and therefore one unrelated to the specific period that matches Enron corpus sentiments, exemplifying the research weakness of inaccurate emotion identification. Third, in their exploration of Enron, the gender of 20 out of the 150 employees was not tagged, and all email sent from and to subjects with untagged gender was completely removed. Fourth, in relation to the category of words linked to happiness, they instead aimed to measure ‘joy,’ which differs and, at times, opposes happiness [19].

#### 2.4 Seniors vs. Non-seniors Happiness Differences

Perez, D’Hombres et al. [48] used an internationally representative data set gathered from 25 countries. They found that when the effect of other variables is unaccounted for, a managerial position provides significantly more satisfaction than a non-managerial job as a worker, and that all occupations generate more job satisfaction than manual and service positions. Their study confirms a prior study of Wofford [49] who found that employees in management positions were more satisfied than respondents in non-management positions.

In Enron’s case these findings should be even more prevalent. Formed in 1985, Enron, using an innovative business model buying electricity from generators and then selling it to consumers, emerged as one of the biggest revenue-generating U.S. companies in the short span of 15 years [50]. Signs of happiness at Enron were on display, punctuated by its ranking on Fortune’s “100 best companies to work for in America” [51] as well as getting named by Fortune magazine as “America’s most innovative company” from 1996 to 2000 [51]. On 22 October 2001, the share price of Enron decreased to \$20.65, down by \$5.40 in one day, after Enron ominously announced that they were under investigation by the Securities and Exchange Commission (SEC) for several suspicious deals, characterized as “some of the most opaque transactions with insiders ever seen” [52, 53]. A culture of arrogance and greed was evident among Enron’s top executives [54]. They behaved as if they had complete freedom to do whatever they wanted as long as results were delivered [55]. Therefore, the following is hypothesized:

*H1:* Senior Enron employees are happier than non-seniors.

*H1a:* Up until the day of Enron’s investigation’s acknowledgement, Enron seniors were happier than non-seniors.

The announcement of the SEC's fraud investigation would have naturally placed Enron senior management in an uneasy position, uncertain for their future. Naturally their happiness level should drop precipitously. With the division of the corpus into two periods, contrary to the previous hypothesis, the following is thus hypothesized:

*H1b*: from the day of Enron's investigation's acknowledgement onwards, Enron non-seniors are happier than seniors.

## 2.5 Seniors Male and Female Happiness Differences

Gender research shows that females experience more job satisfaction than males [56–58]. Furthermore, females tend to use emotional words (positive or negative) with higher frequency than males [44, 59]. This difference should be even more apparent in regard to Enron seniors, as the large majority of corporate conspirators were males. In fact, the three women out of the 34 employees charged in connection with Enron's illegal accounting practices played a minor or no role [60]. Therefore, not only should the happiness level of female seniors, generally, be higher than their male counterparts, it should be significantly apparent from the day of the SEC's announcement. Naturally, if throughout the entire date range of the Enron corpus, especially from the period marked by the SEC's announcement, shows that the senior female rate of happiness is higher than the male rate, then the other segment of the corpus (i.e., before the SEC's announcement) should express the same results. Therefore, the following is hypothesized:

*H2*: senior females are happier than senior males.

*H2a*: from the day of Enron's investigation's acknowledgement onwards, senior females are happier than senior males.

*H2b*: Up until the day of Enron's investigation's acknowledgement, senior females are happier than senior males.

## 3 Methodology

In May 2002, the Federal Energy Regulatory Commission (FERC) publicly released a corpus of actual emails from Enron employees. The FERC took this unusual step in order to improve public understanding of the various reasons for their investigation of Enron. Some e-mails specific to certain individuals have been removed for privacy and legal reasons [61]. As with a variety of studies that used the Enron corpus [cf. 62, 63], the study employs a Structured Query Language (SQL)-based processed database of Enron corpus, first processed by Shetty and Adibi [64]. They removed a large number of duplicate emails, computer generated folders, junk data, invalid email addresses, and blank messages, importing all email messages into a relational database. This modification enables query analysis using SQL, a relational database language that takes advantage of the regular structure of data stored in tables [65]. Using SQL the result of the queries is data extracted, and is then statistically analyzed. The personnel

occupation status of a subset of Enron employees was then refined by the data provided by Creamer et al. [66] who classified a subset of Enron employees into four occupational categories: senior managers, middle managers, traders, and employees. For the purposes of this study two distinctive subsets were generated; senior executives and all the rest. The gender of each employee was manually identified by their name; this was accomplished by three Americans, each of them identifying the gender of all Enron employees in order to achieve accuracy.

The most common method for text analysis using Natural Language Processing (NLP) techniques is 'Bag-of-Words' (BOW) [67], in which documents are represented as a collection of words, regardless of grammar and word order [68]. The study employed binary form of this technique (i.e. if the word exists in the text) and counted the number of happiness keywords for each email sent. The words were taken from study by Greasley, Sherrard et al. [69], who conducted an experiment where subjects were asked to use a word of their own choice which they felt most appropriately and accurately described the speaker's emotional state. Speech samples were selected from the database of emotional speech, and the samples selected were ones that registered no distinct changes in emotional state during the speech text. Finally, they presented a list of words which achieved a consensus of at least 67% on the basic emotion selection.

**Statistical analysis.** Data was analyzed using two tailed ANOVA and independent t-tests.

## 4 Results

The entire set contains 86643 emails sent from Enron employees, of which 25292 emails were sent by senior managers and 61351 by non-seniors. The sentiments are elicited from 21-Dec-1998 to 22-Sep-2002. The senior management set includes 39 of 149 employees with defined job status. 32 of the seniors are males and 7 are females.

H1, the hypothesis that senior Enron employees are happier than non-seniors, was supported. An independent t-test was performed in order to examine the happiness differences between seniors and non-seniors for the date range specified for the pilot. The t-test showed a significant difference between seniors and non-seniors for happiness, ( $t = -4.07$ ,  $df = 45966$ ,  $p < .001$ ), demonstrating that the mean of senior happiness number of keywords ( $M = .13$ ,  $SD = .379$ ) is lower than that of non-seniors ( $M = 0.12$ ,  $SD = 0.339$ ).

H1a, the hypothesis that up until the day of Enron's investigation's acknowledgement, Enron seniors were happier than non-seniors, was supported. An independent t-test was performed in order to examine the happiness differences between seniors and non-seniors up until 22 Oct' 2001. The t-test showed a significant difference between seniors and non-seniors for happiness, ( $t = -5.74$ ,  $df = 30194$ ,  $p < .001$ ), demonstrating that the mean of senior happiness number of keywords ( $M = .13$ ,  $SD = .383$ ) is lower than that of non-seniors ( $M = 0.12$ ,  $SD = 0.339$ ).

H1b, which posited that from the day of Enron's investigation's acknowledgement onwards, Enron non-seniors are happier than seniors, was supported. An independent t-test was performed in order to examine the happiness differences between seniors and

non-seniors from 22 Oct' 2001. The t-test showed a significant difference between seniors and non-seniors for happiness, ( $t = 2$ ,  $df = 16311$ ,  $p < 0.05$ ), demonstrating, in contrast to the previous hypotheses, that the mean of non-seniors' happiness words ( $M = 0.13$ ,  $SD = 0.397$ ) is higher than seniors' happiness ( $M = 0.12$ ,  $SD = 0.37$ ), as hypothesized.

H2, the hypothesis that senior females are happier than senior males, was supported. First, in order to examine the interaction effect of seniority and gender on happiness, two tailed ANOVA was performed for the date range specified for the pilot (Table 1). The two tailed ANOVA showed a statistically significant difference for Gender ( $F(1, 86639) = 4.2$ ,  $P < .05$ ) and seniority ( $F(1, 86639) = 23.7$ ,  $P < .001$ ). Moreover, statistically significant difference for the interaction variable was found ( $F(1, 86639) = 48$ ,  $P < .001$ ). From Table 1 we observe an opposite effect of gender and seniority, where senior females have the highest happiness rating over senior males, the opposite is true for non-seniors.

**Table 1.** The difference between senior males and females in happiness

	N	Mean	Std. Dev.
Seniors			
Female	10740	.14	.346
Male	14552	.12	.218
Total	25292	.13	.299
Non-seniors			
Female	29357	.11	.357
Male	31994	.12	.380
Total	61351	.12	.369
Total			
Female	40097	.12	.370
Male	46546	.12	.374
Total	86643	.12	.372

Next, an independent t-test was performed in order to examine the happiness keywords differences between senior males and females, for the entire period examined. The t-test showed a significant difference between senior males and females, ( $t = 5.13$ ,  $df = 21617$ ,  $p < .001$ ), demonstrating that the mean of female seniors' happiness number of keywords ( $M = .14$ ,  $SD = .403$ ) is higher than senior males' ( $M = .12$ ,  $SD = .361$ ), as hypothesized.

H2a, which posited that from the day of Enron's investigation's acknowledgement onwards, senior females are happier than senior males, was supported. An independent t-test was performed in order to examine the happiness differences between senior males and females, for the period from the SEC's announcement. The t-test showed a significant difference between senior males and females for happiness, ( $t = 3.80$ ,  $df = 3971$ ,  $p < .001$ ), demonstrating that the mean of female seniors' happiness number of keywords ( $M = .15$ ,  $SD = .411$ ) is higher than senior males' ( $M = .11$ ,  $SD = .349$ ).

H2b, the hypothesis that up until the day of Enron's investigation's acknowledgement, senior females are happier than senior males, was supported. An independent t-test was performed in order to examine the happiness differences between senior males and females, for the period before the SEC's announcement. The t-test showed a significant difference between senior males and females for happiness, ( $t = 3.48$ ,  $df = 17047$ ,  $p < .01$ ), demonstrating that the mean of female seniors' happiness number of keywords ( $M = .14$ ,  $SD = .401$ ) is higher than senior males' ( $M = .12$ ,  $SD = .367$ ).

## 5 Conclusions

All hypotheses were supported. Predicated on Enron's case study, the study demonstrated the methodology's strengths, notably immediate recognition of accumulated happiness cues.

Research on happiness has received considerable attention in recent years. In addition to personal emphasis on well-being, studies have shown that a happy employee is likely to be a productive employee. However, the lack of scientific precision in defining the term 'happiness' and the resulting inconsistency in terms of its measurement [2] has challenged the HR function's ability to apply happiness metrics to accurate and productive use in the workplace. The study offers a new measurement framework for happiness, based on modern communication behavior.

Scanning email raises a privacy concern. However, since the mechanism is automated, it only processes numerical data, with no individual ever reading private emails, and is therefore accessible and transparent to personnel. Furthermore, this procedure is already done by global companies such as Google [cf. 70]. The automation process is less prone to subjective judgment [71] and is easier to replicate [72], as opposed to manual identification of happiness in texts which is liable to be innately subjective or biased [73].

Since different emotions can simultaneously co-exist [45], investigating other emotions holds no immediate value for assessing rates of happiness. However, extending the research using the technique proposed in order to investigate other emotions may well offer valuable observations for different domains that can be used by the HR function, and be utilized at times to support, if not replace, the need for clinical interventions such as psychological counseling in order to monitor emotional stability.

Finally, the study employs the Bag-of-Words approach, which is a popular way of document representation [74], and serves as a basis for other techniques [cf. 75]. Future studies may extend this framework by employing other NLP techniques.

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# Human Factor Based Conceptual Framework for Construction Business Marketing

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**Abstract.** The absence of human related factors in extant construction marketing frameworks appears to have limited their applicability to construction marketing management. This paper identifies and examines human related factors relevant to construction marketing to show why they are critical success factors for marketing in construction. This paper seeks to bridge the human factor gaps in extant construction marketing frameworks by merging human related factors which are marketing acceptance and behaviour toward marketing to existing frameworks which are predominantly strategic management factors as a compliment. The paper adopts a descriptive research design which is supplemented with literature review as the method to identify and summarize the factors to show the gaps in existing knowledge on the subject. It was found that the resultant framework is a conglomerate of factors that contribute to existing frameworks to improve upon the gaps inherent in construction marketing. This amalgamated framework is adequate in addressing challenges with existing construction marketing frameworks. Construction marketing researchers will find this framework useful in examining human factor related aspects of construction marketing.

**Keywords:** Construction business · Construction education · Framework · Human factors · Marketing

## 1 Introduction

Marketing has been defined as the: ‘process by which companies create value for customers and build strong customer relationships in order to capture value from customers in return’ [1] (P. 5). Through marketing, firms are able to satisfy their clients much better than their competitor can do. Client satisfaction has the potential of creating sufficient demand for the firms’ product and services. This enables firms’ growth, survival and profitability. This underscores the importance of the marketing function in business management which stems from the solution that it provides to overcome the intensity of competition that characterizes the unforgiving business environment that threatens firms’ survival and prosperity [2].

This makes marketing the most important management function that supersedes all other management functions. The argument by [2] explains this that: “Finance, operations, accounting, and other business functions won’t really matter without sufficient demand for products and services so the firm can make a profit. In other words, there must be a top line for there to be a bottom line. Thus financial success often depends on marketing ability”. This indicates the marketing is the key management function that must exist first before the rest of the management functions will be relevant.

Marketing as a business management function [2], involves performance of activities such as analysis, planning, implementation and evaluation of some specified processes or procedures by management of an organization, in order to achieve the above objective. How well these activities can be performed becomes a factor that is influenced by the human related factors involved. Even the amount of resources provided does not guarantee success by themselves, because human related factors are required to breathe life into the resources [3]. This makes human factors by far the most critical issue that needs consideration if marketing development in construction can achieve success. This is the case in construction since construction marketing is challenged by many human factor issues.

This notwithstanding, extant construction marketing frameworks that are to guide successful implementation in construction business management does not include human related factors. The lack of recognition of the indispensable role of human related factors in construction marketing frameworks explains why such frameworks have not achieved much in improving the marketing performance of construction business enterprises.

The following discussion identifies, examines and shows why human factors are critical factors that affect construction marketing. The human factors are combined with strategic management factors that make up existing construction marketing frameworks. The human related factors and the strategic management factors are put together in conceptual scheme to illustrate the human factor based construction marketing framework.

## **2 Human Factors and Marketing Management in Construction**

Human factors are human attributes that have the tendency to impart on the effectiveness or efficiency of activities undertaken to achieve marketing objectives. Principally two main human factors are identifiable when examining construction marketing: acceptance of marketing as necessary business management function by construction management team members and behaviour of such persons towards marketing as management function. Marketing acceptance refers to construction management team member’s regard with approval of marketing as a necessary construction business management function where as behaviour towards marketing also refers to construction management team member’s disposition towards marketing as a construction business management function. These two factors are interrelated in that acceptance of marketing by construction management team members affect their behaviour towards marketing in a favorable manner.

These human factors manifest themselves in numerous ways and can range from attitude, commitment, and enthusiasm among others. In construction management and particular reference to marketing as business management function, many of such factors are exhibited which to a large extent hinders marketing performance of construction businesses. Table 1 is a summary of human factors that affects construction marketing as highlighted in literature.

**Table 1.** Summary of human related constraint factors to construction marketing.

Human related factors	References
Reluctance to adoption and integration of marketing in construction businesses	[4–10]
Misconceptions, misperceptions, lack of understanding about marketing in construction among others.	[6, 9, 11–15]
The beliefs in the construction industry production related functions are most important aspect of the business	[3, 9, 16, 17]
Lack of In-House Marketing Expertise	[3, 9]
The believe that top managers must be technical persons only	[9, 12, 15, 18]
Marketing Resource Constraint	[3, 9, 17, 19]

Source: Authors' construct based on literature review and the work of [9].

### 3 Construction Marketing Frameworks and Human Factors

Marketing in the context of construction management has been defined as ‘*All activities involved in obtaining future work*’ [20]. The definition seeks to suggest that marketing in construction is a function that is made up of a number of activities. The objective of these activities is to obtain future work. This definition is in consonance with the position of many construction management researchers who sees marketing in construction as strategic management. This view, to a large extent has influenced the key factors in construction marketing frameworks.

The activities have come to be the main constructs in extant construction marketing frameworks. In the work of [20], for instance, the author identified the activities involved in construction management to include analysis of the market environment, formulation of plan, implementation of the plan and monitoring and feedback. Similarly, [10], views the marketing process to encompass marketing planning, marketing activities, and implementation of marketing activities and evaluation of planned activities. From the perspectives of [21] the marketing process in construction comprises of knowledge of market trends, market analysis, and company analysis as the key facet. The key attributes of construction marketing can therefore be said to consist of marketing analysis, marketing planning, marketing activities, implementation of marketing activities and evaluation implemented activities.

In the view of [22], these activities that begin from the strategic marketing analysis and planning must extend to involve staff enthusiasm and performance to complete the process. According to [22], this assertion highlights the role of human related factors to the success of marketing management in construction. This view has been identified and confirmed by [10]. One author [10] draws on the work of [23], and concurs that

“effective resource allocation does not, in itself, guarantee successful strategy implementation because programme, personnel, controls, and commitment must breathe life into the resources provided” (p. 61). In the view of [10], “successful implementation of marketing programmes hinges on managers’ ability to motivate employees and also on interpersonal skills”. However, there are challenges. The challenge has been identified as stimulation of managers and employees throughout the organization to work with pride and enthusiasm towards achieving the marketing objectives. In the work of [22], human factors were highlighted when the authors outlined the steps for marketing planning:

1. Analyze the changing business environment
2. Identify the options relevant to the firms’ core competences
3. Establish firm business strategy and define marketing objectives
4. Set marketing strategies and performance targets
5. Confirm achievable by undertaking market and client research
6. Formulate tactical initiatives and action
7. Seek individuals’ commitment to implementing their part of plan
8. Create monitoring controls to evaluate performance.

Source: Adopted from [22].

The seventh step shows clearly admits the fact that without commitment from the people involved implementation cannot be archived. The seventh position given to the human factor aspect is inappropriate. This is because all the activities listed above step seven require human factor inputs to be realized. It is therefore ideal that the seventh rather begins as the first step in the steps for marketing planning. It therefore suggests that without human factor inputs the entire process may not achieve any success since it requires human factors to breathe life into whatever resources provided for process [10]. This brings into sharp focus the role of human related factors in marketing of construction business enterprises.

The need for human factors in construction is very critical for the following reasons. First of all construction management research do not focus on human factors. In fact not many researchers have examined this subject matter. Human factors in construction were and still are the least area of construction marketing research. As noted by [31] and cited in [9], only 4% of all construction marketing research from 1970 to 2009 (almost four decades of research) focused on human factors. Even when human related factors were examined, the examination context did not directly focus on the challenges highlighted by several many authors [4–18].

In the work of [3], the human related factors that were looked at included manpower for marketing activities and marketing skill of the people involved in marketing management in construction. Manpower, according to [3], refers to the “number of employees whose responsibilities are wholly dedicated to marketing functions” in construction business enterprise. How large that number is may be considered as appropriate to relieve technical persons of the burden of managing marketing as additional responsibility. However, large numbers per se cannot deal with the challenge of commitment to marketing implementation and enthusiasm of construction management team members towards marketing implementation. This is due to the fact that commitment and enthusiasm are human related factors that are closely related to

attitude which are influenced by such factors as acceptance among others. The need therefore exist for attitudinal change in construction management team members more than just an increase in the number of persons managing marketing in construction business organization. This is essential in overcoming the indifference attitude to marketing in the construction industry [3].

Marketing skills by definition, according to [3], refers to “individuals who have professional qualifications in marketing”. In the construction industry where marketing is not seen as a necessary management function, having making skills without acceptance of marketing and positive behaviour towards marketing, the marketing skill may be useful, only to some extent. Human related factors in term of acceptance and behaviour of construction management team members towards marketing as business management function is critical success factor for marketing in construction.

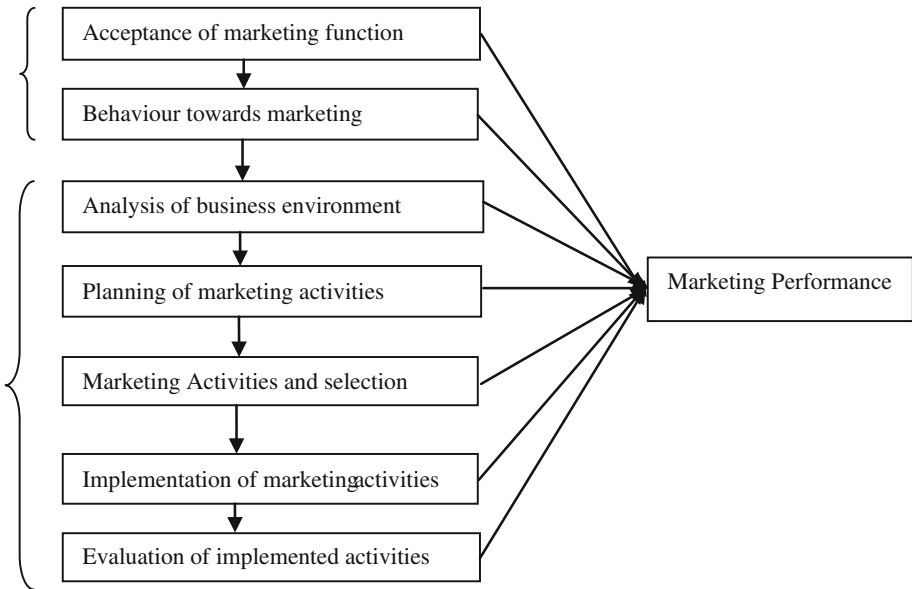
Another factor is construction education. The focus of construction education continues to focus on production of highly qualified persons with little or no management training especially with regards to marketing management [9, 17, 24]. The result is a lack of understanding, misunderstanding, misperception and misconception of marketing as a management function [11–15]. Due to this marketing has attracted only a little attention construction contractors [7] and many contractors do not see marketing as a necessary management function and many firms have formed the opinion that marketing cannot be implemented in construction [25].

The next factor has to do with the definition of marketing itself. One of widely accepted and well known definition of marketing is the one offered [26] that marketing is a “set of human activity directed at facilitating and consummating exchanges”. There are two most important messages in this definition are: the ‘human activity’ which indicates that the activities undertaken by humans, which intern leads to “facilitating and consummating exchanges” which essential in gaining credibility and the building of a long-term relationship with the client. The discussions undertaken so far undoubtedly points to human factors as integral part of construction marketing. It is therefore important that such factors are included in construction marketing frameworks.

## **4 The Proposed Human Factor Based Construction Marketing Conceptual Framework**

A framework for marketing in construction must have human factors in addition to the strategic management factors in order to be holistic in addressing marketing in construction effectively. Not only should human factors be considered, it should be the basis of the framework. In Fig. 1, the proposed conceptual model for construction marketing is given. The first set of factors is the human factor related issues that must be considered first before the strategic management factors. The second set of factors is the strategic management factors whose success depends largely on the human related factors.

Existing construction marketing frameworks encapsulates the factors that make the second group of factors which are merely strategic approach to management. This approach is well known to be effective in management. However, its application in



**Fig. 1.** Human factor based construction marketing framework. Source: Authors’ construct based on extant literature on construction marketing and strategic management.

construction for the purpose of marketing management has some challenges due to the absence of human related factors. As shown in Fig. 2, presence of human related factors in a framework for construction marketing can result in successful outcomes. On the order hand the absence of human related factor has negative consequence on the marketing performance. In the absence of positive behaviour towards marketing, the resultant effect is reluctance. Similarly, the absence of acceptance of marketing as a necessary business management function in construction can give rise to resistance.

In Fig. 2, the possible effect of implementing marketing in construction without giving due considerations to human related factors such as acceptance of marketing and behaviour towards marketing is shown.

Human related factor	Strategic management factors	Potential outcome
Acceptance + Behaviour + Strategic management factors		= success
Acceptance + [Redacted] + Strategic Management factors		= Reluctance
[Redacted] + Behaviour + Strategic management factors		= Resistance

**Fig. 2.** Managing marketing in construction. Source: Authors’ construct based on literature review.



#### 4.1 Human Behavioral Effects of Construction Marketing

According to [27], as the Theory of Planned Behaviour posits, human behaviour is factor formed by three factors that determines the intention to perform a particular behaviour.

The first is the attitude towards the behaviour (opinions of oneself about the behaviour); it refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behaviour in question [27]. With regards to marketing in construction, there is likelihood of unfavorable evaluation of the behaviour (actions or activities that needs to be performed) to implement marketing in construction. This situation can be attributed to a number of factors. Construction education place more emphasis on production efficiency than management issues of which marketing is a major aspect. Again, marketing has previously not been part of construction management. As a result its introduction to construction management is seen as new phenomenon that is viewed with skepticism. At best marketing in construction is implemented in an ad hoc manner and at worst not practiced at all. This contributes to the negative attitude towards marketing as construction management function.

The second predictor is the subjective norm (opinions of others about the behaviour); it refers to the perceived social pressure to perform or not to perform the behaviour. Here again the perceived social pressure on the part of the manager not to performs activities towards marketing implementation is greater than the pressure to do so. Such social pressure can come from other management team members, other professionals and others who operate in the construction industry environment. Due to the indifferent attitude towards marketing in the construction industry [3, 10], there is no such social pressure on the people in construction especially the manager towards performing actions for implementing marketing in construction.

The third is the degree of perceived behavioral control (self-efficacy towards the behaviour); it refers to the perceived ease or difficulty of performing the behaviour and is assumed to reflect past experience as well as anticipated impediments and obstacles [27]. In the context of construction marketing, especially construction managers perceive marketing as a difficult task. They lack marketing skills because marketing is not an integral part of construction education. Again, resources allocated for marketing is inadequate because marketing is mostly considered to be less important, compared with production related function. Again, manpower required for effective marketing are mostly non-existent since most businesses employ professionals to enhance their production efficiency rather than management issues.

Figure 3, shows the way the three factors interact to produce behavior. These three factors result in intentions which finally result in the negative behaviour of construction management team members towards marketing as a management function. This explains why there exists an apparent reluctance to adoption and implementation of marketing in construction businesses management as reported by many construction management researchers [6, 7, 14, 15, 28].

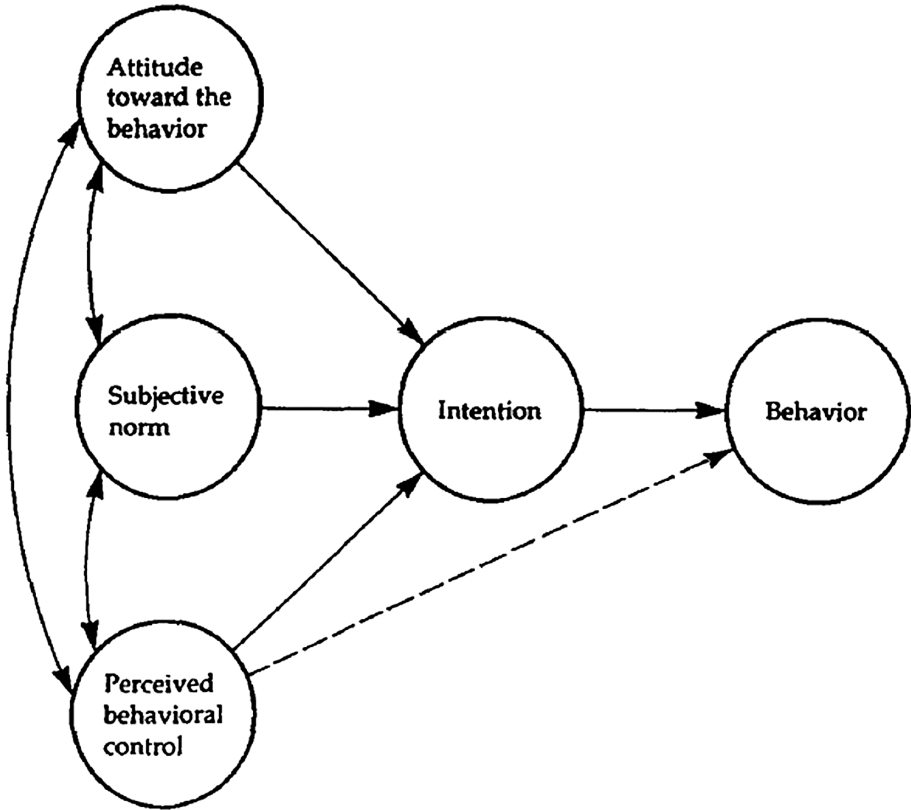
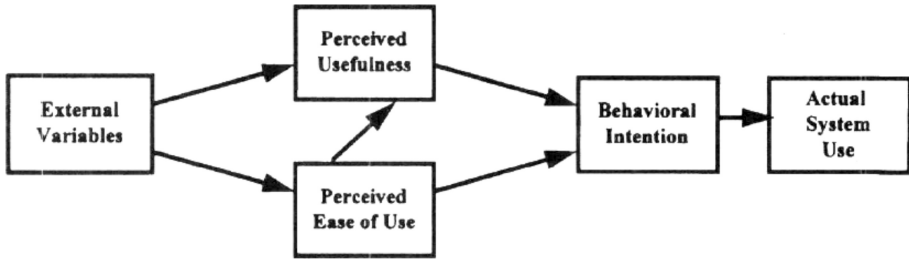


Fig. 3. The Theory of Planned Behavior (TPB). Source: Adopted from [27]

#### 4.2 Marketing Acceptance as Human Related Factor Construction Marketing

Acceptance of marketing is another critical human related factor. This reluctance that result from behaviour partly contributes to marketing acceptance and that can be examined within these two factors: perceived usefulness of marketing and the perceived ease of using marketing as a management function in the management of construction businesses enterprises. This proposition is based on the Technology Acceptance Model (TAM) which posits that organizations acceptance and utilization of new technology is influenced by the perceived usefulness and the perceived ease of use of the technology [29]. The interactions between the two main variables are given in Fig. 4.

This résistance to marketing acceptance in the construction industry can be blamed on construction education that place more emphasis on production efficiency to the neglect of management functions of which marketing is a key component. It has been noted by [3] that comparing to other construction management functions such as estimating, scheduling and cost control, literature on marketing in construction is very



**Fig. 4.** Technology Acceptance Model (TAM). Source: Adopted from [29]

sparse. This according to [3] suggests that the industry's professionals are being educated without a systematic study of this important aspect of management. According to [18], professional education and training have always been streamlined and narrowed down to production of highly scientifically trained professionals from the universities with little or no management training. This in the view of [10] is due to the most popular belief in the industry that the most important part of the organization is the production side. In the view of [20], construction contractors and professionals look for opportunities that fit their capabilities rather than adapting their capabilities to suit current and future market opportunities.

The focus of construction education has created many deeply held misconceptions about the appropriateness and value of general management skills and marketing skills in particular [13]. This is because construction education fails to grant opportunity to learners to experience marketing in order to appreciate its usefulness as a management function. Also, lack of adequate marketing education makes construction managers handicapped in terms of marketing skills. Their lack of marketing skills raises the issue of ease of use of marketing as a business function. As a result, construction managers do not perceive marketing as a useful management function. They also do not perceive marketing as a function that can be carried out with ease in construction.

These challenges create difficulty with acceptance of marketing in managing construction businesses. These results in resistance to marketing even if there exist responsive behavior among management team members towards marketing.

The acceptance of marketing and the behaviour towards marketing in construction are therefore critical human related factors for successful marketing implementation in construction Business Management.

## 5 Conclusions and Directions for Future Research

The paper has identified, examined and showed why human related factors are critical factors that affect construction marketing.

The identified human related factors when combined with strategic management factors that make up existing construction marketing frameworks, the results is a holistic and comprehensive construction marketing framework that can achieve

successful outcomes. This is put together in conceptual scheme as a human factor based construction marketing framework.

What is remarkable in the framework is the fact that the human factors are the basis upon which the strategic management parameters are built. The importance of the human factors with regards to marketing cannot be overemphasized.

Future research must focus on determination of variables for measuring human related factor and their impact on marketing performance of construction business enterprises. Validation of the proposed conceptual framework using structural equation modeling provides an avenue for further research.

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# Measuring New Product Development Project Success in Vietnamese Small and Medium-Sized Enterprises

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**Abstract.** New product development (NPD) is crucial for organizations to ensure their market positioning. The purpose of this study is to examine the measurement of NPD project success in Vietnamese manufacturing small and medium-sized enterprises (SMEs). A total of 795 questionnaires were sent to manufacturing SMEs in Hanoi, with 340 usable responses received yielding a response rate of 42.77%. Using SPSS (v.24) software to analyze the data, the findings indicated that three dimensions: subjective customer acceptance, objective customer acceptance and technical success had a significant impact on the overall NPD project success measurement. Financial performance did not have a significant impact on the overall NPD project success measurement. The study findings enhance our understanding about the key dimensions of the overall NPD project success measurement in Vietnamese organizations. Vietnamese business managers may use the results to improve NPD project success in their organizations by formulating better policies supporting both financial and non-financial innovation success.

**Keywords:** New product development · Success measurement · Vietnam · Manufacturing Industry · SMEs

## 1 Introduction

New product development (NPD) is crucial for organizations to ensure their market positioning [1]. The purpose of this study is to examine the measurement of NPD project success in Vietnamese manufacturing small and medium-sized enterprises (SMEs). It investigates several aspects of NPD project success identified as important in the Western literature. The study was conducted in Hanoi which is the capital of Vietnam's start-up ecosystem and is the second major manufacturing hub in Vietnam after Ho Chi Minh City [2].

## 2 Literature Review

NPD success can be viewed as an analysis of the new product's technical and economical results achieved since the product has been launched and introduced to markets [3]. A review of the NPD project success literature indicated there is no research addressing NPD project success in Vietnam. Furthermore, is there no research

identifying the key dimensions of overall NPD project success measurement in Vietnamese organizations.

### 3 Methodology

A total of 795 questionnaires were sent to manufacturing SMEs in Hanoi, with 340 usable responses received yielding a response rate of 42.77%. The unit of analysis was the SME's new product project. The study employed SPSS (v.24) software to conduct the data analysis. The questionnaire included the 16-item NPD success scale [4], an overall success measure [5] and demographic questions.

### 4 Findings and Discussion

In this study, more young people responded with 36.1% reporting that they were aged between 25–30 years, and 39.1% were 31–40 years. The sample was comprised of more staff (53%) than MD/CEO and managers (47%). The sample respondents showed a tendency to be more educated, with 62.4% reporting they held a four-year degree. The average years of work experience was 7.37 years.

The questionnaire included an item asking respondent if they measured NPD success. A huge rate (84.8%) did. In compared with the 76% reported by [4] and 81% reported by Huang, Soutar and Brown [5], this rate was somewhat higher.

Following [5], NPD success was divided into four major factors:

Subjective customer acceptance: including customer acceptance, and customer satisfaction.

Objective customer acceptance: including meet revenue goal, revenue growth, meet market share goal, and meet unit share goal.

Financial performance: including break-even time, attain margin goal, attain profitability goal, and attain return on investment goal.

Technical measures: including development cost, launched on time, achieve product performance goal, meet quality guideline, and speed to market.

The 16<sup>th</sup> item, which measured the percentage of an organization's sales obtained by all new products, is an organizational-level outcome.

Table 1 shows the mean scores and standard deviations of the four factors of NPD success and the organizational-level measure.

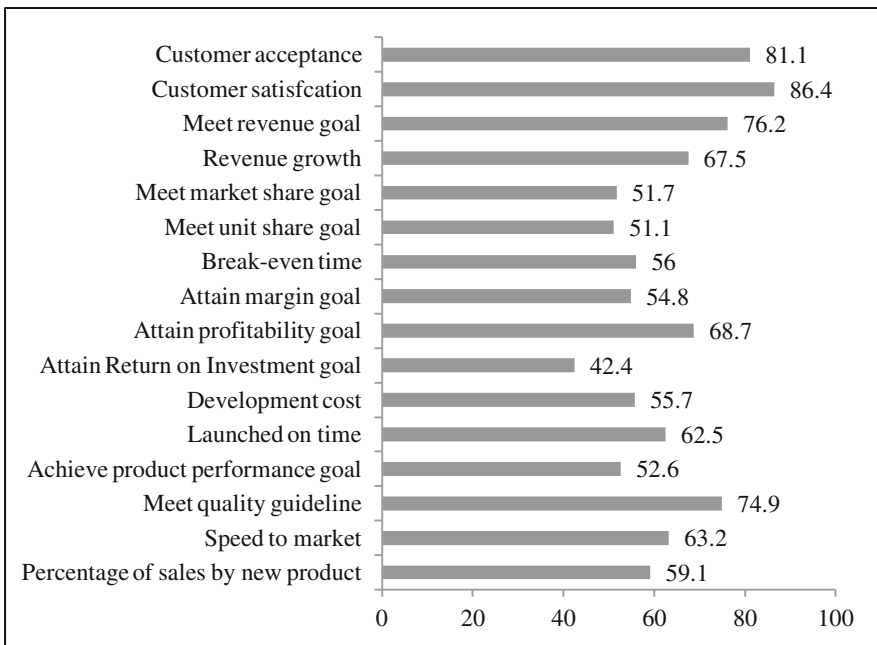
*Subjective customer acceptance* and *technical measures* have relatively high scores in compared with *objective customer acceptance*, *financial performance*, and *organizational-level measure*, suggesting that Vietnamese SMEs perceived they did well in these areas.

**Table 1.** Average score, standard deviation for four factors of NPD success and the organizational-level measure<sup>a</sup>

NPD success	Mean	S.D.
Subjective customer acceptance	4.37	.60
Objective customer acceptance	4.10	.68
Financial performance	4.02	.72
Technical measures	4.23	.65
Organizational-level measure	4.16	.73

<sup>a</sup>Mean scores on a five-point scale (1 = Well below average and 5 = Well above average)

Figure 1 showed the frequencies of the 16 PDMA criteria.



**Fig. 1.** Frequency of NPD Performance measures used in SMEs

Most frequently measures were *Customer satisfaction* (86.4%), *customer acceptance* (81.1%) and *meet quality guideline* (74.9%). These are related to subjective customer acceptance and technical measures.

*Attain Return on Investment goal* (42.4%), *meet unit share goal* (51.1%) and *meet market share goal* (51.7%) were least frequently used items. These measures are related to objective customer acceptance and financial performance. The range of other



measures' frequencies varied from 54.8% (*attain margin goal*) to 68.7% (*attain profitability goal*).

Table 2 shows the mean scores and standard deviations of the 16 measures of NPD success.

**Table 2.** Average score, standard deviation for each measure of NPD success<sup>a</sup>

NPD success measures	Mean	S.D.
Customer acceptance	4.35	.62
Customer satisfaction	4.38	.65
Meet revenue goal	4.13	.80
Revenue growth	4.09	.75
Meet market share goal	4.05	.78
Meet unit share goal	3.99	.78
Break-even time	3.79	.89
Attain margin goal	3.88	.80
Attain profitability goal	4.27	.68
Attain Return on Investment goal	3.93	.85
Development cost	3.95	.76
Launched on time	4.19	.84
Achieve product performance goal	4.17	.73
Meet quality guideline	4.46	.68
Speed to market	4.20	.75
Percentage of sales by new product	4.16	.73

<sup>a</sup>Mean scores on a five-point scale (1 = Well below average and 5 = Well above average)

The mean scores for all NPD Success measures varied from 3.79 to 4.46. Respondents perceived they executed several measures well (especially *meet quality guideline*, *customer satisfaction* and *customer acceptance*). These measures related to objective customer acceptance and technical measures. The measures that SMEs did not perceive well were subjective customer acceptance and financial performance (including *break-even time*, *attain margin goal*, *attain Return on Investment goal*, *development cost* and *meet unit share goal*).

These results and those from Fig. 1 suggest that most Vietnamese SME innovators not only used subjective customer acceptance and technical measures frequently but also perceived they have done well in the area. But some of the SMEs had difficulty measuring objective customer acceptance and financial performance. Objective customer acceptance and financial performance measures were used less frequently and not as well executed as other NPD success measures.

Table 3 shows the mean and standard deviation of NPD overall success.

The overall success measure was used to group respondents into two categories: the High Performers include successful respondents and the Low Performers include neutral and unsuccessful respondents.

**Table 3.** Mean and standard deviation of NPD overall success<sup>a</sup>

	Mean	S.D.
NPD overall success	3.37	.99

<sup>a</sup>Mean scores on a five-point scale (1 = Very unsuccessful and 5 = Very successful)

Table 4 shows the results of a series of t-tests which were used to examine whether NPD success measures impacted the overall NPD success in Vietnamese manufacturing SMEs.

**Table 4.** The impact of NPD success measures on overall NPD success<sup>a</sup>

NPD success measures	Overall (N = 323)	Low performers (N = 150)	High performers (N = 169)
Customer acceptance	4.35	4.23	4.43*
Customer satisfaction	4.38	4.29	4.45
Meet revenue goal	4.13	3.95	4.23**
Revenue growth	4.09	3.94	4.20*
Meet market share goal	4.05	3.93	4.14
Meet unit share goal	3.99	3.75	4.15**
Break-even time	3.79	3.62	3.91*
Attain margin goal	3.88	3.74	3.95
Attain profitability goal	4.27	4.13	4.37*
Attain Return on Investment goal	3.93	3.89	3.96
Development cost	3.95	3.85	4.02
Launched on time	4.19	3.93	4.37***
Achieve product performance goal	4.17	3.95	4.29**
Meet quality guideline	4.46	4.31	4.56**
Speed to market	4.20	3.95	4.37***
Percentage of sales by new product	4.16	3.93	4.29**

<sup>a</sup>Mean scores on a five-point scale (1 = Well below average and 5 = Well above average)

\* P < .05

\*\* P < .01

\*\*\* P < .001

Table 5 shows the results of a series of t-tests which were used to examine whether NPD success measures dimensions impacted the overall NPD success in Vietnamese manufacturing SMEs.

As shown, overall NPD success generally followed subjective customer acceptance, objective customer acceptance, technical success and percentage of sales by new product. The High Performers perceived they had better performance than the overall and the Low Performers in all of four success measures dimensions and the

**Table 5.** The impact of NPD success measures dimensions and the organizational-level measure on overall NPD success

NPD success measures	Overall (N = 323)	Low performers (N = 150)	High performers (N = 169)
Subjective customer acceptance	4.37	4.28	4.44*
Objective customer acceptance	4.10	3.98	4.18*
Financial performance	4.02	3.98	4.06
Technical measures	4.23	4.10	4.33**
Organizational-level measure	4.16	3.93	4.29**

\*P &lt; .05

\*\*P &lt; .01

organizational-level measure. Significant differences (at the 0.05 level) were found in subjective customer acceptance, objective customer acceptance, and significant differences (at the 0.01 level) were found in technical success and percentage of sales by new product. This suggests that, subjective customer acceptance, objective customer acceptance, technical success and percentage of sales by new product had a significant impact on the overall NPD project success. Financial performance did not have a significant impact on the overall NPD project success measurement. A possible explanation for this might be that, as Vietnam is at the starting point of innovation, financial success does not differ widely.

The finding of this study is consistent with the findings of Huang, Soutar and Brown [5]. In an analysis of 276 Australian manufacturing SMEs, they reported most Australian manufacturing SME innovators not only used subjective customer acceptance and technical measures frequently but also perceived they performed well in the area, and the least frequently used measures were related to objective customer acceptance and financial performance. In addition, [5] found a significant relationship between the four dimensions and the overall success of a new product. In general, therefore, it can thus be suggested that NPD success measures dimensions are associated with the overall NPD project success. An implication of this finding is the possibility that the literature of NPD project success measurement could be transferable from developed countries to developing countries.

## 5 Conclusion and Implications

The results of this study expand the literature by investigating different dimensions of NPD project success and providing detailed result of the relationship between NPD success dimensions and overall NPD project success in Vietnamese manufacturing SMEs. In future studies, it might be possible to investigate the measurement of NPD project success in large enterprises and the service industry. The study findings enhance our understanding about the key dimensions of the overall NPD project success

measurement in Vietnamese organizations. Vietnamese business managers may use the results to improve NPD project success in their organizations by formulating better policies supporting both financial and non-financial innovation success.

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# **Leadership and Skill Development**

# Mind Steering Leadership Game

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**Abstract.** We report on a Game based learning system, in which players can freely explore consequential judgment and dynamic decision making tasks based on an inquiry learning paradigm. The simplified dynamic game model integrates and balances several game components allowing players reading and steering minds of in-game characters, and subsequently influencing game stories. We implemented parts of a leadership competency framework allowing players discovering and influencing key stakeholders in order to influence key outcomes.

**Keywords:** Game based learning · Storytelling · Inquire based learning · Leadership development

## 1 Introduction

People love telling stories; stories have great communicating value [1]. Telling stories also reveals how we think, reason, judge, or simply make sense out of ‘something’. If you are asked to tell how your day was, you probably end up making a first order perspective story that you will actively (re)construe based on gluing and blending several memorable situations, persons you met, relevant knowledge facts together into a plausible, however subjective epic. Stories can be told from the perspective of the storyteller, or just taken from another point of view, or from a third or gods view perspective. However, the stories people tell can also be viewed as a kind of rationalization or even justification of their behaviors. You might even build up and start telling stories to anticipate (social or expected) behaviors. Basically, a ‘story’ is a sequence of events and the concept of ‘narrative’ points to the ordering of events [2]. Therefore, the same old story can be told through various branching narrative structures from linear, elastic, concentric, branching, nodal to constellation narrative structures. Suppose we could create a playground for storytelling, then people have the opportunity to explore different narrative structures and storylines, and see pro and cons of their impacts. If we could combine this with personal feedback on how you told your story then we might

have created an interesting learning experience environment on how various behaviors lead to different stories, or how various stories can be explained by various type of behaviors. The Mind Matters game we present here is such a playground for game based learning and exploring ‘leadership’ competencies in terms of influencing tactics. The idea presented here therefore combines leadership competency development, serious gaming (where the meta-goal lies outside the game) and didactics. The outline of the (work in progress) paper is as follows. First, we start with discussing the influencing tactics. Second, we focus on the Mind Matters Game. Third, we dive into an inquiry learning paradigm, which provides an interesting paradigm for game based learning. We wrap up with some conclusions and our next steps. So, let the story begin.

## 2 Leadership Development

Leadership is crucial for business success but rather difficult to develop and maintain. Its has been argued that to be an effective leader, being able to influence others is key. Various influencing tactics have been studied. Here we adopt the taxonomy by [3]. These authors distinguish between hard and soft tactics. Hard influence tactics behaviors are perceived as more forceful and push the person to comply. Soft tactics are influence behaviors which are considered thoughtful and constructive. Hard tactics include: *exchange* (behavior makes explicit or implicit a promise that others will receive rewards or tangible benefits if they comply with a request or reminds others of a favor that should be reciprocated), *legitimizing* (behavior seeks to persuade others that the request is something they should comply with given their situation or position), *pressure* (behavior includes demands, threats or intimidation to convince others to comply with a request or to support a proposal), *assertiveness* (behavior includes repeatedly making requests, setting timelines for project completion or expressing anger toward individuals who do not meet expectations), *upward appeal* (behavior seeks the approval/acceptance of those in higher positions within the organization prior to making a request of someone), and *coalitions* (behavior seeks the aid of others to persuade them to do something or uses the support of others as an argument for them to agree). Soft tactics are: *personal appeal* (behavior seeks others’ compliance to their request by asking a “special favor for them,” or relying on interpersonal relationships to influence their behavior), *consultation* (behavior seeks others’ participation in making a decision or planning how to implement a proposed policy, strategy or change), *inspirational appeal* (behavior makes an emotional request or proposal that arouses enthusiasm by appealing to other’s values and ideals, or by increasing their confidence that they can succeed), *ingratiation* (behavior seeks to get others in a good mood or to think favorably of them before asking them to do something), and *rational persuasion* (behavior uses logical arguments and factual evidence to persuade others that a proposal or request is viable and likely to result in task objectives). For more information and complete definitions on these influence tactics, see [3]. Note that no one influence strategy works in all situations – or with all people. The key is to be aware of what you can do, and the impact it will have on the situation you are in. We will now describe the Mind Matters game that allow you to play with these influencing tactics, tell stories with them, and experience the consequences of your actions, and learn.

### 3 Mind Matters Game

The simplified dynamic game model [4] integrates and balances several game components [5]: *mechanics* (the procedures and rules of the game), *aesthetics* (how the game looks and sounds), *technology* (the tools and systems to implement the gameplay) and *story* (the narrative aspect of the game). The *story* should be plausible, realistic, valid with a high degree of fidelity from the player's point of view. To put it differently, the player should be able to mentally map his/her world to the in-game world and vice versa. Player agency – the perceived experience that you can influence the narrative and storyline – increases the user experience.

Within the Mind Matters game, the player assumes the role of junior researcher in a fictional company. Player's task is to try out a mind steering device (Fig. 1) by temporarily 'taking over' game characters and steer their behaviors. By doing so, the player influences the dialogue between game characters in the scene. With this intervention the player influences the storyline of certain characters, and subsequently the game narrative and overall story.



**Fig. 1.** Mind steering device.

As junior researcher you may choose one of three playing styles defining the in-game goals (Fig. 2).

- Play as a “Mad scientist” and read the minds of all game characters and push them hard;
- Play like an “Engineer” and choose the most appropriate character to steer;
- Play like an “Activist” focusing on increasing competence of all selectable characters.





Fig. 2. Choose your approach

We have implemented several business situations and defined case files for each in-game character. Case files describe the personal background of the game character as well as their competency profile (Fig. 3).

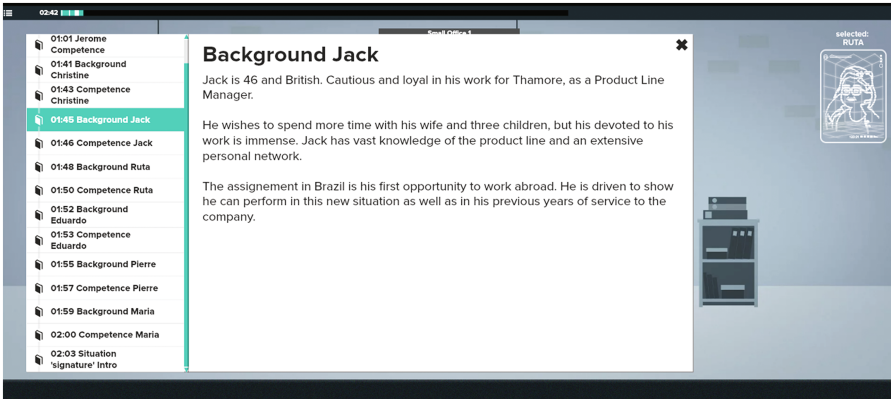


Fig. 3. Case files of game characters

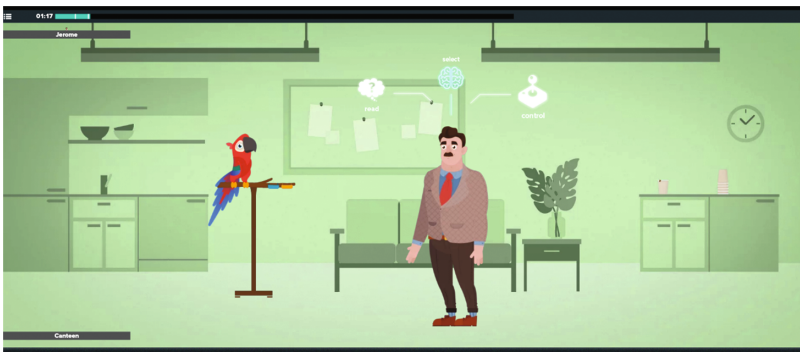
Game characters are animated and having lively conversations in various business situations. Players can choose a situation from which it is immediately clear that leadership in terms of ‘influencing key stakeholders’ is required. The player is tasked to use

the mind-steering device and ‘take over’ one of the game characters in a scene, and continue the dialogue with the other game characters. The player cannot completely ‘take over’ a game character but the player can ‘influence’ his/her behavior steering him in a direction that fits the situation, dialogue and other game characters in the scene. Game characters are in various degrees ‘influence able’, depending on their profiles (Fig. 3). Thus, it is up to the player in which situations s/he likes to intervene by influencing game characters during the conversations. Players are provided an overview screen depicting the influenceable characters and their current state. These states in terms of personal background and competency development may change over the course of playing time.



**Fig. 4.** Current state of the influenceable game characters

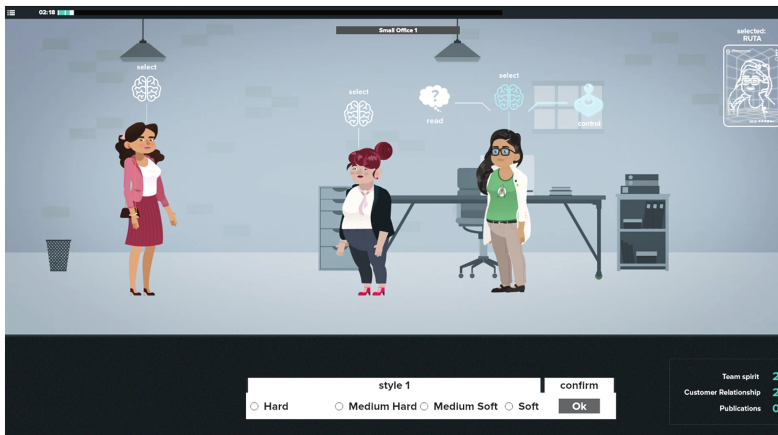
Players are able to read & control the mind of the game character: reading minds shows situational and generic character related information, and writing minds, steers the game character in taking one of four allowed actions (Fig. 5).



**Fig. 5.** Read and control the game character mind.

If you take over a game character you may adopt (a) a medium hard or (b) hard, or (c) medium soft or (d) soft influencing tactic. For this we clustered the influencing tactics [4] into these four categories: hard (pressure, assertiveness, legitimating), medium hard (coalition, exchange, upwards appeals), medium soft (ingratiating, rational persuasion, personal appeals), soft (inspirational appeals, consultation). Note that as a player you have no control over the utterances but merely over which type of influence tactics the game character will adopt. In addition, you have to ‘guesstimate’ if your choice has a positive, neutral or negative impact on the following key performance indicators: team spirit, customer relationship and publications.

- Team spirit, describes the overall mood of the “core team” - the six influenceable game characters;
- Customer relationship, describes the general quality of relationship between the core team and customer representatives;
- Research progress, in terms of publication outputs (Fig. 6).

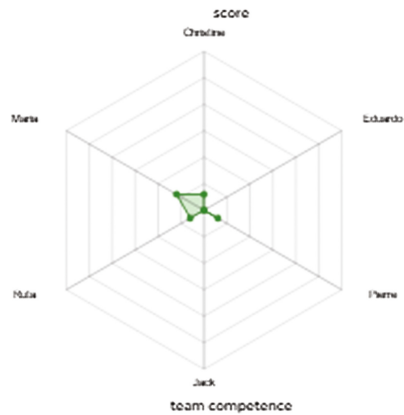


**Fig. 6.** Playing style and KPIs

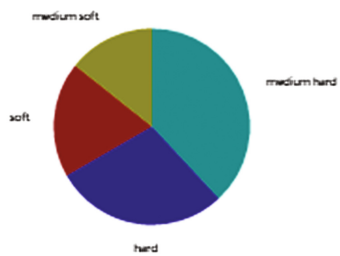
Each situation where player intervention is allowed is based on a conflict between the characters in the scene. This conflict can evolve (each action may require a different approach). Player choice defines how each conflict is resolved<sup>1</sup>. It takes about 45 min to play the game.

The in-game feedback relates to the game goals you choose as a junior researcher. Thus, in-game feedback specifies your performance as a researcher and if you achieved the in-game goals (score on Team spirit, Customer relation & Research KPIs). You will also receive in-game feedback on the competence development of the game characters that you influenced over time depicted in the overview screen (Fig. 4). After or post-game feedback (Fig. 7) pertains to the meta goal of the game and provides

<sup>1</sup> More game mechanics are defined and implemented.



In the graph below the selected styles are shown.



graph 3: used styles

Soft: inspirational appeals, consultation.

Medium Soft: ingratiation, rational persuasion, personal appeals.

Medium Hard: coalition, exchange, upwards appeals.

Hard: pressure, assertiveness, legitimating.

#### graph 4: style over time

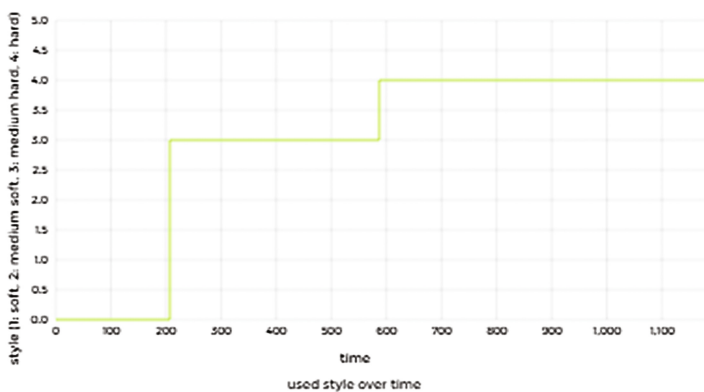


Fig. 7. Post game feedback.

feedback on how the player dealt with conflict situations: what was done vs. what was needed in terms of influencing, per scene. Additionally, the player is pointed to other educational resources for further own leadership competency development.

### 4 Inquiry Based Learning

The instruction how to play this game is inspired by an *inquiry based learning cycle*, which identifies five distinct phases: orientation, conceptualization, investigation, conclusion, and discussion [7]. In the first two phases of this cycle (*orientation* and *conceptualization*) students are asked to formulate hypotheses about a particular research question in need of investigation. During the *investigation* phase students check whether a hypothesis is correct or not by conducting (online) experiments. During the last two phases of the inquiry learning process (*conclusion* and *discussion*), students are linking their hypotheses with the evidence collected during the investigation phase. Students are also reflecting on their learning processes and outcomes, comparing and discussing them with other students. The question in the Mind Matters game is: Which leadership style (in terms of influencing tactics) yield positive or negative results in specific business situations? Students in this case are professionals with a medium business responsibility. During the investigation players are trying out different hard and soft influencing tactics and approaches in order to learn about their effectiveness and impact in different contexts and situations. Conceptually, our *conflict situational model* provides the frame of reference (Fig. 8).

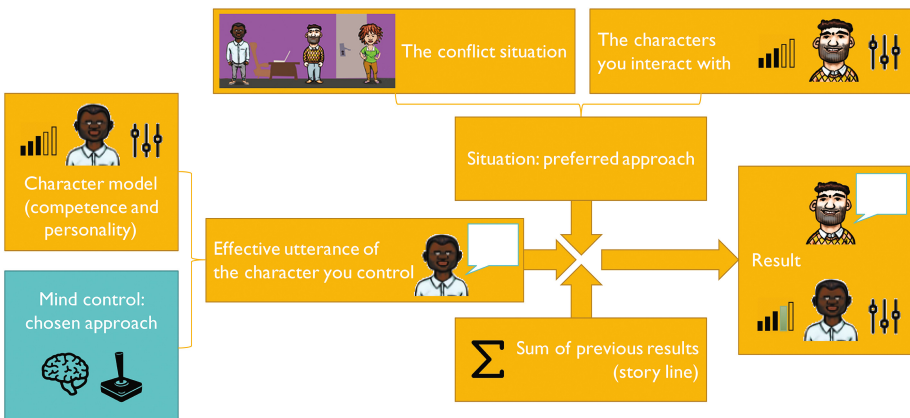


Fig. 8. Conflict situational model.

First, players are encouraged thinking about the influencing tactics (hard and soft), about the conflict situation, the game characters, and how they want to approach the situation. What do you want to achieve or want to avoid? Do you differentiate in who is saying what? Do you take a pro-active or a more reactive approach? Do you take into account the possible implications of decisions? This first phase resembles the orientation and conceptualization phase of the inquiry learning cycle. Secondly, you start investigating in several ways. In first instance you may play the game based on your own insights and frame of reference. You may also play the game focusing on getting a high score on one of the type of KPIs. Finally, in line with the last two phases of the inquire learning cycle, and based on the in-game and post-game feedback you receive, you are encouraged thinking and discussing about how you would explain your results based on the mental image you had initially and your assumptions regarding the factors that influence(d) them. In this way, this new type of learning experience helps you exploring the consequences of different influencing styles and learn from them.

## 5 Conclusion

This (work in progress) paper focused on the Mind Matters game as a game based learning instrument to explore the consequences of influence tactics in several business settings. The game provides a playground for storytelling and offers the possibility exploring various storylines and narrative structures. Influencing key stakeholders is an important leadership competency and our future activities are directed to implement other leadership dimensions as well, such as, perform through cooperation, and engage and develop teams, et cetera. Monitoring and analyzing how users (players, trainees) tell their story during game play will also shed light on the players' dynamic decision making [6] behaviors. These behaviors can be logged, monitored (even predicted) and analyzed post-game for trainee, instructor and organizational feedback purposes [8]. The game is currently running in a multi-national organization and played by a large number of people. In future papers we will report on the game analytics [9] we can derive from these game plays. In particular, we will be looking at influencing strategies [10] employed by large numbers of players. The latter is important, since player tactics are suggested as predictors regarding transferability from in game to out of game leadership behaviors [11].

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# Enhancing Managers' Leadership Capabilities with a Leadership Process Reference Model

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**Abstract.** Geographically dispersed integrated project teams collaborating in virtual environments face many challenges in the successful completion of projects, particularly when the project teams are non-homogenous. Model-based process improvement provides a viable way for organizations to improve the capability of software development teams, including the effectiveness of leaders in charge of integrated teams operating in virtual environments. Evolving a Process Reference Model (PRM) covering this activity has therefore been the subject of an on-going research project at Griffith University. The outcomes of this project may prove useful as a means to improving leadership capability, particularly in relation to complex, multidisciplinary teamed projects conducted in virtual environments. This paper introduces the nature and scope of the Process Reference Model and presents the preliminary findings of the validation phase of the PRM development.

**Keywords:** Process · Process model · Sociotechnical · Organisational behaviour · Leadership · Management

## 1 Introduction

*Leadership is the art of getting someone else to do something you want done because he wants to do it.* Dwight D. Eisenhower [1]. Of the hundreds of quotes about leadership from all walks of life and periods, this quote from a former U.S. President and wartime leader seems to exhibit best, though perhaps not explain, the enduring enigma that is leadership. A manager may use authority to achieve compliance, but a leader finds a way to make the person want to do it.

Leadership has been observed and studied for countless generations, yet interestingly little consensus exists as to what true leadership is. Intense and on-going controversy exists between psychologists, sociologists, historians, political scientists and management researchers on this point. According to Yukl, *No universally accepted definition of leadership has yet been developed* [2]. After thousands of empirical studies performed on leadership over the previous 75 years, no clear and unequivocal understanding has emerged as to how we can distinguish leaders from non-leaders [3].

Conventional wisdom maintains that leadership is an innate ability that natural leaders are born with, and which cannot be effectively learned. Another school of thought, typified by Warren Bennis [4] and Peter Drucker, [5] maintains that leadership can indeed be learned; that in effect, leaders are made rather than born. This is an



underlying assumption of this project, a view supported by Plato who maintained in *The Republic* that the art of ruling (leadership) can be based on scientific principles – it can be learned [6]. The leader (ruler) uses the dialectic method to rationally analyse situations to determine appropriate courses of action with wisdom and understanding. Analysis is applied to produce improvement; Plato’s method is seen to be compatible with the spirit and practice of process improvement.

Meanwhile in the world of technology development, the business of managing complex projects across a variety of disciplines and geographical locations has never been more difficult, given the rising complexity of a global economic environment and the multi-national corporate entities that now inhabit this new world. There would appear to be a clear need to find improved ways of managing this often difficult process.

Accordingly, after a broad review of the literature on leadership generally, and on leadership of virtual and integrated teams, the material has been synthesized into a Process Reference Model (PRM) for leadership using the requirements specified in ISO/IEC 15504-2:2004.

The PRM is currently being subjected to verification in a series of Design Research iterations in which the existence of objective evidence is determined to support the purpose and outcomes of the processes within the PRM.

*Can leadership be adequately described in a Process Reference Model?* A fundamental assumption of this project is that leadership can in fact be adequately described in a process model.

Repenning and Sterman [7] observe a broad movement among “managers, consultants and scholars” to recognize the value of understanding an organizations activities in terms of processes rather than functions. While this tends to confirm the effectiveness of defined processes to solve the various challenges facing organizations, it considers also the limitations, namely the significantly high failure rate of process improvement exercises.

Given this recognition of the efficacy of process, there is no observable reason from Repenning and Sterman [7] to suggest that process modeling could not be applied to leadership. Indeed, Total Quality Management (TQM) emphasises the importance of leadership (along with human resource issues and strategic planning) to achieving success with TQM.

Watts Humphrey [8] demonstrated the importance of leadership in the software development domain, including the importance of managers to learn leadership skills in *Winning with Software*. Humphrey notes that as Director of programming with IBM he supervised 4,000 software professionals across many locations. His first step transforming this extended team from one which had never delivered anything on time to one that did not miss a single commitment was to send 1,000 managers on a one week training course to establish effective management and engineering practices [8].

Commitment to defined process in the software development domain, as typified by Humphrey [8] is reflected more broadly by W. Edwards Deming who is famously quoted as saying “*If you can’t describe what you are doing as a process, you don’t know what you’re doing.*” [9]. If we accept the basic proposition that leadership can be learned rather than only be had through inheritance, then theoretically it can be described as a process, as suggested by Deming.

## 2 Evolution of the Leadership Model

The conceptual model acknowledges the basic distinction between co-located and virtual teams, and the fact that integrated teams can be either. Virtual teams do not have to be integrated but commonly are. Likewise, integrated teams do not have to be distributed, but commonly are. Therefore, the characteristics of successful teams and successful leaders are considered for both co-located and virtual teams, culminating in the characteristics of successful leaders of integrated teams operating in virtual environments. The end of this process of review and synthesis would be a process assessment model (PAM) for successful leaders of integrated teams operating in virtual environments.

The Fig. 1 below illustrates the evolution of the leadership model.

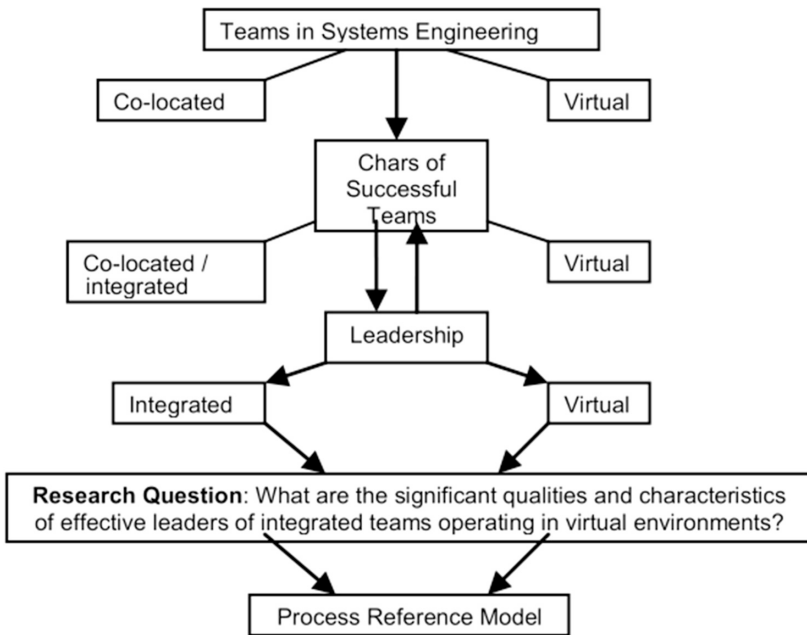


Fig. 1. Conceptual overview

## 3 Using Design Research to Develop the Process Reference Model and Assessment Model

Design Research focuses on the development and performance of (designed) artefacts with the explicit intention of improving the functional performance of the artefact. In this broad sense, the domain of software development process improvement (using Model-based Process Improvement) is one kind of artefact whose improvement is facilitated by the design research approach. Design research is typically applied to categories of artefact including (but not limited to) algorithms, human/computer interfaces,

design methodologies (including process models) and languages. Its application is most notable in the Engineering and Computer Science disciplines, though is not restricted to these and can be found in many disciplines and fields [10]. Such renowned research institutions as MIT’s Media Lab, Stanford’s Centre for Design Research, Carnegie-Mellon’s Software Engineering Institute, Xerox’s PARC and Brunel’s Organization and System Design Centre use the Design Research approach [10].

The Fig. 2 below illustrates how Design Research is applied to the development of the PRM and PAM.

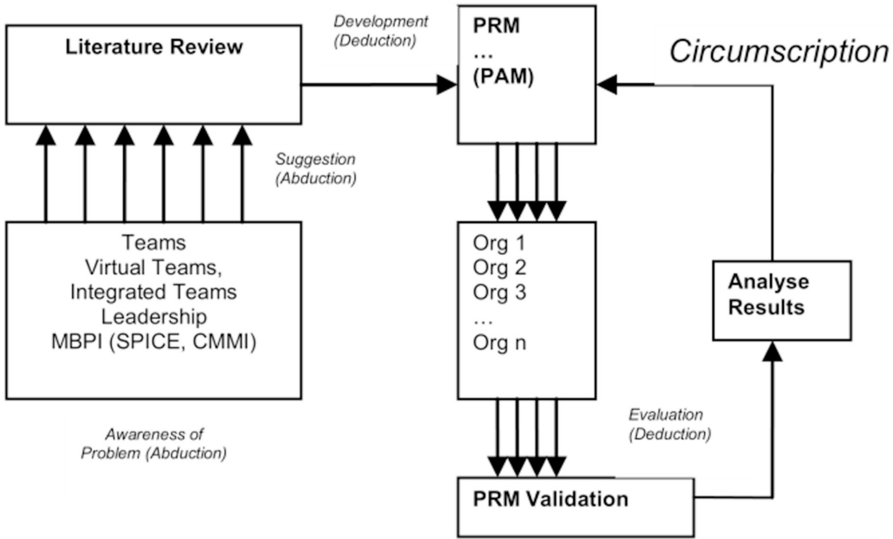


Fig. 2. Using Design Research to develop PRM

#### 4 Model Architecture

The Process Reference Model (PRM) has architecture with three layers. It comprises a foundational layer of generic leadership skills that are required in any situation requiring leadership, and a further two layers comprising leadership skills for integrated teams and virtual teams.

The Fig. 3 below illustrates the model architecture.

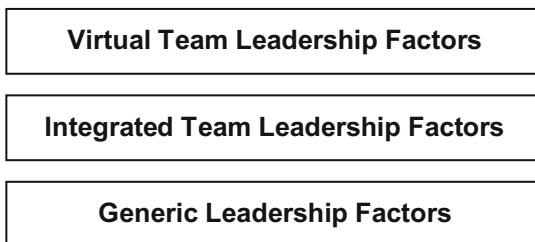


Fig. 3. PRM architecture; high-level functional view

Three factor groups contribute to effective integrated team leadership in a virtual environment:

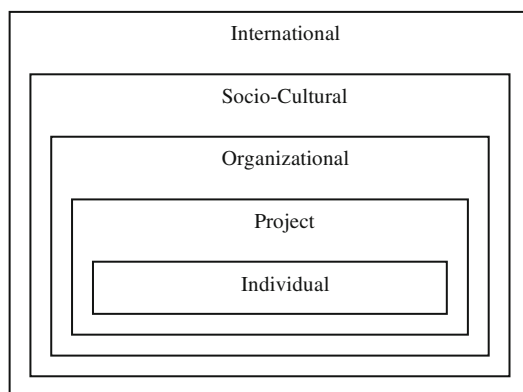
1. *Generic Leadership Skills*. There is a generic set of leadership skills/qualities that will apply in both face-to-face and virtual team environments. This generic set is identified and distilled from the wealth of leadership research over time.
2. *Specific Examples of Practices for Integrated Teams*. The integrated teaming goals and practices of the literature constitute leadership criteria by default in the sense that someone has to give effect to them, and that will be the responsibility of the leader.
3. *Specific Virtual Environment Challenges for Leaders*. The virtual teaming challenges outlined by Bell and Kozlowski will be met by an effective leader. These factors have been hypothesized by Bell and Kozlowski [11] as being specific factors influencing the success of virtual team leaders.

Significantly, this architecture affords a degree of flexibility in how it is applied. When transformed into a Process Assessment Model it could be used to assess leadership capability of integrated teams operating in virtual environments.

This PRM architecture also theoretically allows for the assessment of virtual teams only, and of integrated teams only by using the generic leadership layer plus the relevant virtual or integrated factor layer.

This PRM architecture also could be useable to assess the generic leadership capability of a conventional co-located team that is neither virtual nor integrated.

An alternative way to view the PRM is from an environmental (in contrast to the functional) perspective. Leadership factors apply to the following five environments; Individual, Project, Organizational, Socio-cultural, and International. The environments are nested concentrically, as seen in the Fig. 4 below.



**Fig. 4.** PRM architecture; environmental view

Leadership factors from the PRM could be re-assigned from a functional level to an environmental level. This alternative view (analogous to the way in which the processes can be viewed from a staged or continuous perspective) may conceivably offer greater flexibility in how the PRM is understood and applied, though it must be stressed that doing so here is outside of the scope of this research project, and should be considered a strong possibility for future research.

## 5 Model Content

This paper focuses on the three level functional view of the model (Generic, Integrated and Virtual, as discussed in Sect. 4), leaving the environmental view for possible later treatment.

Each layer has a number of processes, each defined in terms of a purpose and set of outcomes. Future additions, through a PAM, include a list of possible base practices and input and output work-products, which provide objective evidence of performance.

An example of the first process “*Create a Shared Vision*” is shown below (example is shown in Arial font).

### 5.1 Create a Shared Vision (Sample Process)

*Purpose:* to perceive a guiding principle/idea that captures the imagination of members to create a shared vision and inspire them to realize that vision.

*Outcomes:* as a result of the successful implementation of creating a shared vision:

1. The leader perceives and formulates a unified vision of what is to be accomplished, ideally seen as an accomplished fact.
2. The leader develops a strong commitment to the achievement of that vision, based on a sense of rightness and timeliness, such that they have sufficient resilience to overcome goal frustrating events.
3. The leader develops a clear and unambiguous set of objectives or goals that are concrete and achievable.

The process might be further explained with the following:

*Elaboration:* the shared vision is a clear and unambiguous expression of an envisioned future. It is the basis for a common understanding among stakeholders of the aspirations and governing ideals of the team in the context of that desired outcome. It is conditional on being effectively communicated by the leader to the team; the shared vision grounds the team’s governing ideas and principles and allows for appropriate objectives to be derived. Highly effective groups are often convinced they are engaged in important work, sometimes nothing short of being on a “mission from God”. The

work becomes an abiding obsession, a quest that goes well beyond mere employment. This intensely shared vision and sense of purpose endows cohesion and persistence.

The following Tables 1, 2 and 3 list the processes:

**Table 1.** Generic leadership personality factors

1. Generic leadership personality factors
1.1 Create a shared vision
1.2 Communicate shared vision to create optimism
1.3 Display integrity/good character and competence
1.4 Create trust
1.5 Action-oriented
1.6 Accepts responsibility
1.7 Individualized consideration
1.8 Original thinking
1.9 Resilience
1.10 Conceptual ability
1.11 Empathy
1.12 Judgment
1.13 Self-worth & competence
1.14 Rewards desirable performance
1.15 Management-by-exception (passive)

**Table 2.** Integrated team leadership factors

2. Integrated team leadership factors
2.1 Establish the project's work environment
2.2 Establish the project's shared vision
2.3 Establish the integrated team structure
2.4 Allocate requirements to integrated teams
2.5 Establish integrated teams
2.6 Ensure collaboration among interfacing teams
2.7 Establish empowerment mechanisms
2.8 Establish rules and guidelines for integrated teams
2.9 Balance team and home organization responsibilities

**Table 3.** Virtual team leadership factors

3. Virtual team leadership factors
3.1 Recruit required expertise for virtual team
3.2 Provide synchronous, information-rich channels of communication
3.3 Devolve leadership functions to team
3.4 Perform complex tasks in real-time
3.5 Manage team boundaries
3.5 Establish and maintain stable team membership
3.7 Define roles and perform tasks synchronously
3.8 Establish performance management functions to compensate for temporal distribution
3.9 Establish team development practices in response to real-time requirement
3.10 Establish effective self-regulation functions across multiple boundaries
3.11 Establish unique team culture where team spans multiple boundaries
3.12 Establish operating procedures to allow members to regulate their own performance
3.13 Establish effective team development functions in discrete lifecycle projects
3.14 Manage role ambiguity and conflict where members hold multiple roles
3.15 Establish effective team development functions where members hold multiple roles

## 6 Preliminary Results

The project plan for the development of the leadership model calls for between five and eight data collection iterations with organizations operating multi-disciplinary virtual teams. During these iterations a person or persons performing leadership/ management of virtual integrated teams is interviewed to determine the existence of objective evidence (in the form of artefacts or activities) that might validate the process reference model (PRM).

The rationale is that if the purpose/outcome statements of the PRM can be linked to work-products and activities then this will serve to validate the PRM and form the basis of a Process Assessment Model in keeping with ISO/IEC 15504-2:2004.

At the time of writing, four data collection sessions have been performed. A high degree of consistency is observed in the raw data, which point to substantial elements being valid. It is too soon to draw further conclusions. The participant organizations are characterized as high-profile multi-national IT companies, both of whom routinely perform technology development projects involving integrated virtual teams. The managers interviewed expressed their approval of the leadership model in terms of its *scope*, *content*, *aims*, and *approach*. Each of these will be briefly discussed below.

The *scope* was considered to be comprehensive; it appears to cover all that needs to be covered. A preliminary finding suggests that in certain areas, the model could be simplified, with some consolidation of related processes.

The *content* was considered sufficiently detailed to give adequate understanding of the underlying ideas of the processes. Again, some simplification and consolidation of the content appears to be indicated.

The *aims* of the model were considered to be worthy in the sense that being an effective manager/leader of an integrated virtual team is recognized by the participants

as challenging. The stakes can be high, careers sometimes depending on successful outcomes. A leadership model aimed at equipping project managers to be more effective is seen as a worthwhile undertaking.

Finally, the *approach* of the model that takes a practical stance and harmonizes with process assessment methods that the manager/leaders are already somewhat familiar with is considered to be a good approach. "Good" in this sense implies that the manager/leader can see how to apply it in a meaningful way using their existing skill-sets and understanding.

Criticisms mainly concerned there being too much detail in some areas and redundant detail in others; this is an expected result of deliberately building in complexity to the first draft of the model with a view to simplifying it in light of feedback and data analysis. The rationale being that it is better to remove material as a result of refinement, than it is to add material, particularly when the additional material has not been subject to the full scrutiny of the interview participants.

An example of this apparent redundancy is seen in Generic Leadership factor *1.1 Create and communicate a shared vision*, and in the Integrated Teams Leadership factor *2.2 Establish the project's shared vision*. Shared vision appears repeatedly in the general literature on leadership. It also figures prominently in the integrated teaming literature in ways specific to integrated teams. It is arguably not appropriate to omit it from either set of factors. The final disposition is yet to be decided, requiring further data and consideration.

## 7 Conclusion

The goal of achieving synergy in group endeavours is a sometimes elusive one for IT development teams. This research has shown that the development of a process reference model for the purposes of assessing the capability of leadership processes appears to be valid.

The development of such a model has potential benefits for project managers and team leaders from a wide variety of backgrounds.

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# Motivation and Work: A Survey of the Motivational Aspects in Industries

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**Abstract.** Several generations work together in the workplace today, with very different desires, qualifications and experiences. In this scenario, we must increasingly question how to motivate the employees and how to conduct them in order to align their strengths with the company's strategic objectives. The objective of this research was to identify the motivational aspects of the staff, from the point of view of some companies. The survey developed through an electronic questionnaire applied on responsible for Human Resources of 65 industries of Paraíba Valley. The discovered aspects related to the existing and best-known motivational theories, in such a way that it was possible to understand the tendency and the convergence of the companies' motivational thinking to the aspect: recognition of work. It has founded that even today, limited attention given to subjective and intrinsic needs, such as recognition of work, whereas there is emphasis mainly on basic and extrinsic aspects as salary, safety and relative stability. These results, associated with new theoretical studies such as Strengths Based-Development Theory, suggest the need to rethink the current HR management, in a way that is actually possible to offer employees what they expect to grow personally and professionally in subjective levels, internal, in other words, to fulfill the need for self-realization.

**Keywords:** Motivation · Motivational theories · Industrial engineering

## 1 Introduction

Actually, one of the major business challenges is the talent retention. The question is not about only retaining employees in the company through rewards or benefits, but as to be able to count on an unrestricted collaboration of the individuals, which would bring success for the person and for the company, what has been affirmed more than a decade ago [1].

Knowing that the main stimulator of the actions is the motivation, is fundamental understanding what motivate the employees, what demotivate and what techniques for motivation can be effective. It becomes even more challenging when it has realized the diversity of generations that work together, and because of this, the demands are also diverse.

Against this multiplicity, several theories developed to reach ideal levels of employee relations, which gets into the motivational issue. Thereby, the present study aimed to identify the current motivational factors of several companies in a region of Paraíba Valley, checking if they aligned with the motivational thinking and its theoretical studies.

The questions that guided this research: What importance the companies attribute to their employees motivation and how do they motivate them? How are the motivational aspects related to the present and to the already developed Motivation Theories?

## 2 Motivation Theory

Motivation is “the act of motivating; the statement of reasons; initiation process of a conscious and voluntary action” [2]. The word “motivation” derives from the Latin *movere* which means “to move”, designating the idea of action for a certain purpose [3].

The motivation is generate by the wish to meet a need, its provide satisfaction. Therefore, the need generates motivation, which generates satisfaction [3]. By being an internal force, the motivation is personal and intimate; it depends exclusively on each individual. Therefore, on workplace can only be create an environment where people are encouraged to act.

There are several Motivation Theories, divided by Campbell [4] into two groups: Content Theories and Process Theories. The first group is composed of Content Theories that discusses what motivates the human beings, what their needs are and what attitudes lead to satisfaction. Process Theories focus on why people get motivated and what engenders certain behavior, all based on personal perceptions, objectives, expectations, and personal goals. The last group studies the beginning, maintenance and termination of the individual variables in the motivation process, while the Theories of Content only describes these variables [5].

Abraham Maslow concluded that has a hierarchy of human needs that are satisfied according to the generic impulse motivation [6]. Motivation will depend on the lower unsatisfied level that drives the human behavior towards the satisfaction of that level. As soon as it is satisfied, the need goes to the next level, always prevailing the highest provided the lower needs are still fulfilled [4].

Maslow’s five needs (physiological, safety, belonging, esteem and self-actualization) specifically to work [7]. In the lowest level, the authors quote vacation, salary, break for meals, breaks and go to the restroom. If these simple practices are not apply to the employees, they will not get motivated to perform their duties and neither satisfy the needs of the next hierarchy level of good working conditions, stability, retirement plans, health and savings. As the belonging needs in work it is mentioned teamwork, good relationship with co-workers and social integration. If satisfaction of the belonging need is not reached, then it will be difficult to feel the need to be responsible for the outcome, to be recognized, to win prizes, to receive compliments and promotions (esteem needs). Finally, challenging jobs, autonomy and responsibility for decisions add value to work and help employees motivate and develop themselves, professionally and personally.

Generates motivation and satisfaction is the accomplishment of complex needs, while the primary needs would be only a source of dissatisfaction [8]. Therefore, he divided the motivation concept into two factors: Hygienic, which prevent dissatisfaction if properly applied, and Motivator, which promote satisfaction and can be a strong source of motivation.

Hygienic Factors are the minimum conditions an employee must have to meet the basic needs and the safety ones. They are extrinsic, in other words, they are beyond control of the employee such as salary, work conditions, workplace, safety, the companies politics and administration. The Motivator Factors are intrinsic; they depend exclusively on the worker and are relate to job challenges and development feeling. They include achievement, recognition, responsibility and progress, which are the nature of tasks and can lead to real motivation. Their absence does not cause dissatisfaction, but their presence is essential for motivation.

The workers behavior is directly relate to the way managers' deal with them. Thus, he systematized two theories that show how managers' perspectives are of the employee's posture and what kind of posture the manager assumes to motivate them [9]. Theory X presents three basic premises: an ordinary person will avoid working whenever possible; he only knows how to work under pressure to accomplish established goals; and he only wants his own safety. This Theory resumes the Fayol Classical School and Taylor Scientific Management, which believes the best policy of persuasion is through punishments and the motivation factors are rewards, control and threat [6].

On the other hand, Theory Y presents the following assumptions: achieving goals is more closely tie to the rewards associated in itself then the rigid control imposed by Theory X; individuals are creative and seek solutions for the company; they only do what they believe, which make them capable of managing themselves. In this way, managers treat them democratically and give them more autonomy and responsibility to make their own decisions [9].

Vroom creates a theory based not only on individual goals but also on the environment and context in which is insert. Motivation depends on three factors that are consciously quantify, in other words, behavior is a rational choice [5]. From this perspective, this theory developed into a Process Theory to explain how someone guided to achieve a goal, according to the expectations and desires. The factors influence a person's action to achieve his chosen performance. The factor are expectation: perception of his own objectives and the ability to reach them; instrumentality: type of reward acquired by his work, both objective and subjective; valence: the value gave to instrumentality, if the reward is worth his effort.

Alderfer's theory brings a new vision and perspective compared to others. It is the reorganization of Maslow's, although instead of five levels, there are only three proposed. The groups name the theory Existence, Relatedness e Growth (ERG). Existence is the set of Maslow's Physiological and Safety Needs; Relatedness is the Belonging and Esteem; and Growth is the internal need of Esteem and Self-Actualization. The three basic assumptions of this theory are: 1 - the person can be simultaneously motivate by more than one need; 2 - levels are hierarchize but not fixed; 3 - there is something called regression of frustration. It occurs when a more difficult need to be fulfilled is repressed, then the person will seek to increase his satisfaction in a lower level that is easier to be satisfied [5].

Strength is a group of talents, knowledge and techniques in which the person performs a stable and almost-perfect activity. Talents are “naturally recurring thoughts, feelings or behavior patterns”; knowledge is “facts or lessons learned”; and techniques are “procedures to perform an activity”. Strengths Based-Development Theory is relatively new in the business context, since many organizations remain committed to the need of keeping a fully expertise employee, in his strengths and weaknesses. However, there is another way that has been emerging with new studies. Good leaders exert exactly what the organizations exist for: maximizing people’s strengths and minimizing their weaknesses. The leader has to encourage his workers to work in their expertise area and not to focus on developing their weaknesses [10].

Reviews about Strength Based-Development Theory. First, negative effects of weaknesses on one’s and others’ work has been proven and some of them should be improved in order to work be concluded. Furthermore, focusing only on talents possibly generates a false sense of competence. When determining what a talent would be, the person compares his skills with other skills about himself, choosing the “least worst” and does not compare his skills to other’s skills, choosing the “best” ability, the one that is much better than everyone else’s. The third negative point of the theory is that it is much easier and more comfortable to focus on strengths, because it is not a critic and many leaders lack the capacity and courage needed to give a constructive review. Finally, the last point is that the overdevelopment of strengths can become a weakness if not equilibrated. For example, a creative person can become eccentric; a confident, arrogant; and a social, manipulative [11].

Motivation has three classes: 1.0, 2.0 and 3.0. Motivation 1.0 has always existed since it refers to the humans’ instincts and to the initial impulse to satisfy the physiological needs as hungry, thirst and sex in order to survive. Motivation 2.0 emerged in the 20th century along with mass production and production line, when the tasks done in a mechanical and usual way, repeatedly. Based on rewards and punishments named as “carrots and sticks” by Pink, this class motivates employees through “if, then...” giving rewards for well-done job and punishments for out-of-rule behaviors. This type of motivation is subject to bad behaviors addiction, to short-term reasoning (take the shortest way to achieve a goal) and to unethical practices [12].

The market started demanding better and innovator products as the competitiveness increased. To make it happen it was necessary the enrichment of employees’ tasks with more creativity, autonomy and excellence. From the need to stimulate the third impulse Motivation 3.0 emerged, which is intrinsic and ensures 21<sup>st</sup> century companies proper functioning [12]. The stimulated behavior by intrinsic impulses named as Type I, related to an inherent satisfaction of the activity itself and not only about external rewards getting from the activities. People with this kind of attitude have their purpose well aligned to the company’s purpose; they also perform more vigorously, are professionally, and personally realize. They are also the ones to guarantee the success of the company and its insertion in the current competitive market.

In Motivation 3.0, there are three essential elements to achieve autonomy, excellence and purpose. The first one stimulates Type I behavior, in which workers choose what, when, how and with whom they do their work, having the freedom “to create the conditions they had better stimulate creativity and good work quality. The second, excellence, is to become very good at something relevant and to give their own

contribution to the product or company. Excellence determine by the commitment to the activities that cause “flow” that is experiences that generates satisfaction and match with our capabilities, activities neither very easy nor difficult, that fit our limits.

The purpose is the seeking of all human beings for impact, something that is lasting and is greater than they are. The “driving force of purpose” used by companies through targets that use profit, not just seek for it; also through words that stimulate this internal search and practices that gives freedom to adapt and align their personal purpose to that of the company.

The author’s conclusion is that an upgrade from Motivation 2.0 to 3.0 is need, so that motivation of each employee is increased and, consequently, company’s income, as several scientists have already proven.

### 3 Research Methodology

The research applied to companies of Paraíba Valley region. The first step was defining the cities would be involved, taking into account the proximity to Lorena, where Lorena Engineering School/USP is located. Besides that, we chose the ones located in a highway that links São Paulo to Rio de Janeiro, which make this region a suitable place for installation and expansion of several industries. Thus, the research carried out in five cities including Lorena, two towards Lorena-São Paulo and two towards Lorena-Rio de Janeiro.

After this procedure, we determined which industries would respond to the formulated questionnaire. We selected the ones that produce some good, assuming that the definition of industry is an industrial production sector focused on the transformation of raw materials into goods. In each of five city halls, a request made for a list containing name and contact of all established industries in town. For contacts identification a search made in establishment searching websites, as in company’s websites.

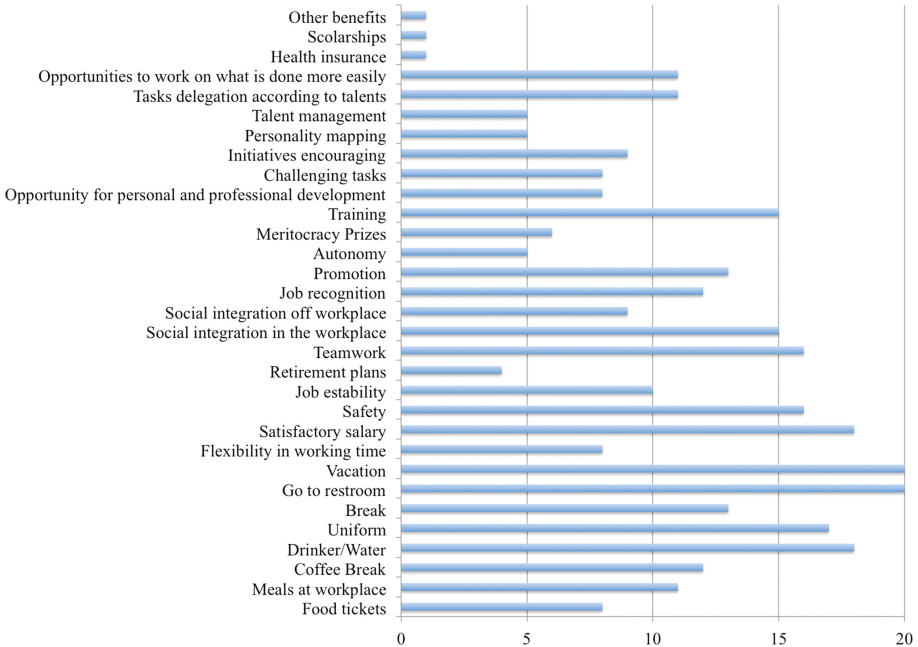
About the data collection questionnaire, the most known Motivation Theories studied. We aimed to collect general information about each company (quantity of employees and segment of industry) and questions that covered more than one theory each so that in the analysis it would be possible to perceive some tendency in the motivation question.

Google Forms created the form and its link was sent via email to the representative of HR section or similar. The responses recorded in a worksheet and the responses control made through “tracking number” that was attached to send email.

### 4 Results

Of the 65 questionnaires, sent only 20 answered and they compiled and highlighted in this study with the following results.

In terms to what is allow or offered to workers, Fig. 1 depicts what we identified. It is possible to realize that as the aspect becomes more complex and subjective, the less supply there is. Therefore, it indicated that industries focus first on the survival and basic needs.

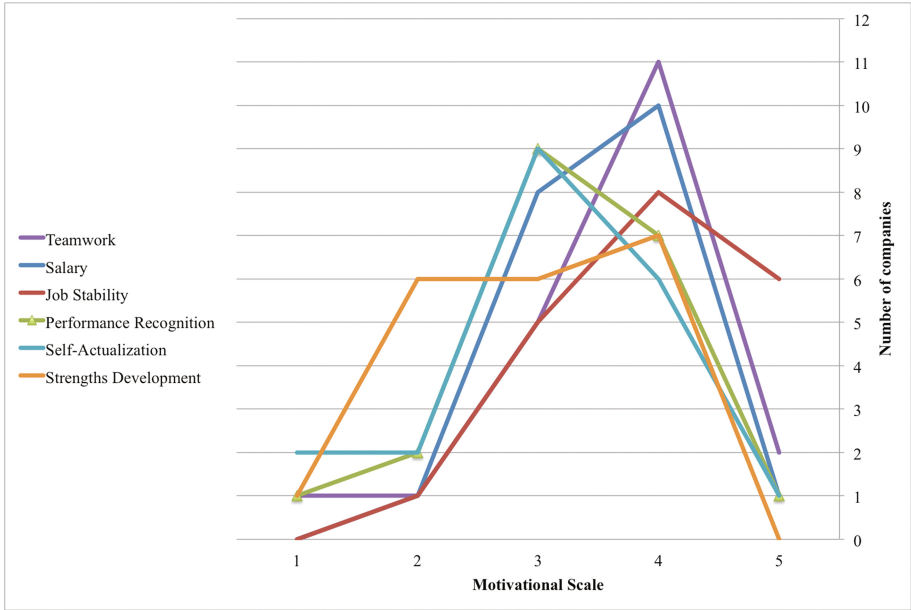


**Fig. 1.** Number of industries that offer or allow some determined aspects

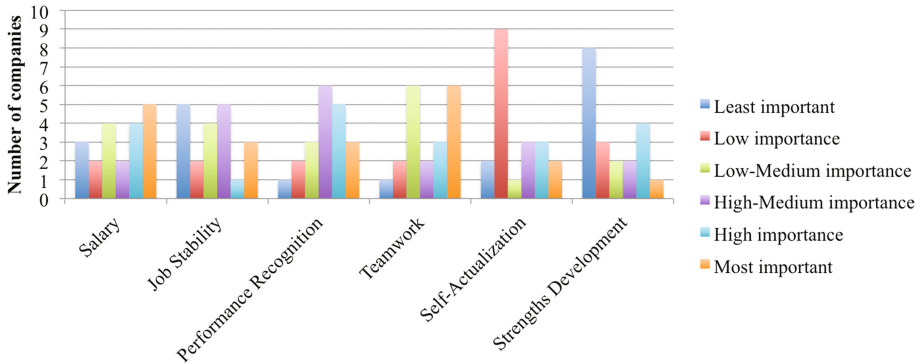
From the HR representatives’ perspective, Fig. 2 shows that six companies think its employees are more motivated with job stability. It followed by teamwork, salary, job recognition and the last, self-actualization; while strengths development relatively equilibrated. Such an occurrence reaffirms, along with others approached questions, that the focus is on the extrinsic aspects (stability, teamwork, salary) and that it would be interesting to motivate in the intrinsic aspects (self-actualization).

Figure 3 shows the importance that given to each aspect by the surveyed companies. Strengths development is the least important for eight industries; for nine of them, self-actualization has low importance. These two aspects match with what the employees are less motivated according to the figure above. It explains the correlation between motivation and the importance attributed to each aspect, in other words, if there is little focus on certain aspect by the company, the less motivated employees will be in that regard. There is a divergence between importance of some aspects, realizing that many companies have different ideas and opinions, but there is still a pattern established as teamwork with high importance; work recognition with high scores only; and strengths development and self-actualization with less importance.

Employees seen to be motivated in Maslow’s basic needs (salary and safety), Herzberg’s Hygienic Factors and Alderfer’s Existence, explained by the focus that industries place on these basic aspects. Hereinafter there is teamwork and recognition, which HR focus found nowadays. Finally, the intrinsic aspects, that are the ones that depend exclusively on the individual and not on the workplace or situations, are the least discussed issues (even if considered relatively important), as described below.



**Fig. 2.** Scale from 1 to 5 of employees motivation about six determined aspects

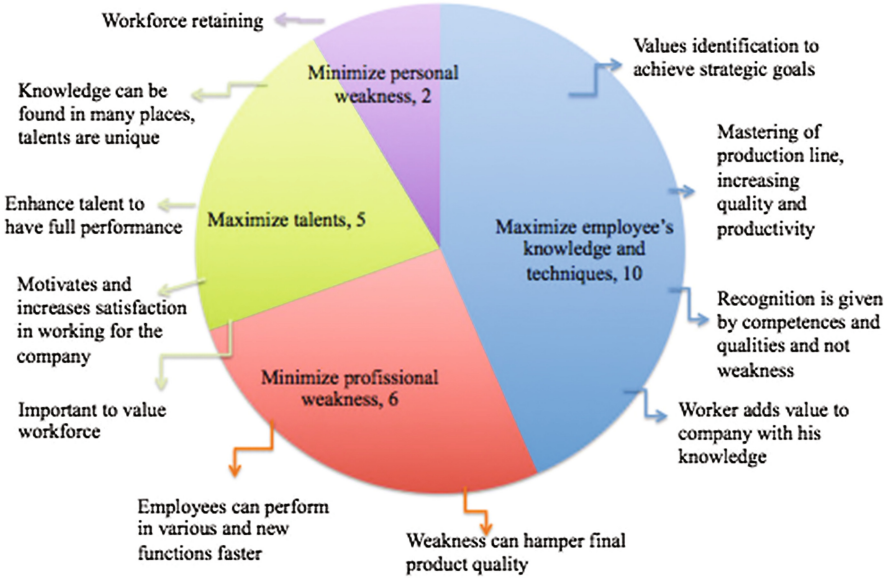


**Fig. 3.** Level of importance attributed to each of six aspects

What shows in Fig. 4 is about the prioritization of: maximization of knowledge and techniques or talents; or minimization of personal attributes or professional weakness.

Eight companies prioritize the minimization because it retains workforce, the employees’ weakness would not hamper the final product quality and they could perform in various functions. On the other hand, fifteen answers related to maximization: ten of techniques and five of talents.





**Fig. 4.** Detailed answer related to the Strengths Based-Development Theory question

The maximization of knowledge and techniques means mastering the production line, adding value to worker’s competences and admitting that qualities are the ones that define someone’s competence.

Meanwhile, the justifications for the priority of maximization of talents are more about recognition earned and motivation risen than the increase of productivity or quality that the improvement of techniques provides. Maximizing talents means that the performance will be full, it increases satisfaction of working in the company, motivates and promotes, all considering that talents are born and unique, differing from knowledge that can be acquire.

Much as the industries recognize the need to look at the intrinsic issues of motivation, such as self-actualization and strengths development, this is not what is practiced (Fig. 3). Maximizing the strengths (techniques + talents) is maximizing techniques that increase productivity and maximizing talents that increase motivation. Together they allow the company to grow more and more internally and financially.

The results converge to and reaffirm Pink’s theory Motivation 3.0: it is highly important to focus on intrinsic motivation, but in fact, it does not happen. The type of motivation is what will ensure the alignment of employee’s purpose with the one of company is, triggering his desire to make the industry progress with his efforts.

The Strengths Based-Development Theory is strongly relate to Excellence, one of the three elements of Motivation 3.0, ensuring high performance for both worker and company. The quest for excellence, that is to be excellent at what you are already good at, guarantees the flow state that satisfies the need within your capacities.

Increasing excellence, meant as developing strengths, is already a proven practice by this study to increase intrinsic motivation, aligned with Strengths Based-Development Theory and Motivation 3.0. There are also other practices to worked out as increasing autonomy and encouraging the search for purpose.

After going through the least complex and extrinsic stages of motivation, explained by all theories already discussed, the next challenge lies in how to align employees' goals with those of the company, to turn them into workers that are more autonomous and to keep them motivated intrinsically.

The solution may be to link the recognition desired by employees with the best ways to recognize them, which includes maximizing the strengths. First, it is need to identify the talents and how to recognize the better way contribute to the strategic goals.

## 5 Conclusions

From an overall perspective, it has been possible to identify that companies are concerned about its employees' motivation and that most of them have policies to increase their satisfaction. They act more on tangible aspects such as salary, safety and stability. Then, they seek to motivate through practices that encourage teamwork. However, they are not so effective in recognizing their employees' work and motivating them intrinsically.

Even though the intrinsic needs receive little attention, which are harder to fulfill, they are accept as fundamental to motivation at work. Several studies such as Strengths Based-Development Theory that reaffirms Excellence of Motivation 3.0 Theory, converge to the common sense that a new HR action line is needed focusing in intrinsic motivation. This internal need reflected as self-actualization, both employees' and company has aligned purpose and strengths development may be the next step in the current challenge about motivation at work.

It is necessary to keep in mind that the motivation that involves the internal aspects of the individual is a leap compared to motivation ruled by recognition, current stage of HR. This progress requires work of both company and worker because the industry only provides the tools for strengths development, for autonomy increment and for purpose pursuit, all three pillar of Motivation 3.0.

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# Taking a Holistic Approach in Training and Educating Knowmads and Daredevils of the 21st Century

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**Abstract.** Our world is changing rapidly. What was mainstream is rapidly being replaced by a new socio-economic order which renders our traditional teaching and learning models outdated and even obsolete. The “Millennial Generation”, who has been exposed to technology and innovation from an early age, has now started higher education programmes at different Universities. Research papers suggest that the Millennial Generation present new characteristics to previous generations, which implies that for this new generation requirements and expectations of the learning environment are different [1–4]. We believe that applying a holistic approach to training and educating in higher education with a strong emphasis on the above mentioned topics may assist universities and academic staff in adapting to the demands of a new generation. In this paper we explore what the impact is of a holistic learning model on the millennial generation.

**Keywords:** Holistic education · Millennial generation · Society 3.0 · Teaching knowmads and daredevils · Education 3.0

## 1 Introduction

At the moment universities face a very different landscape than they did a generation ago. Globalization and the increasingly technology centric economy has impacted the demand for highly skilled and highly knowledgeable professionals. Graduates need to meet the knowledge and skill requirements of the workplace, so there is an increasing focus on the quality of the education that is offered. There is also a growing recognition that participants in today’s economy will work collaboratively, beyond borders, therefore students are taking a more consumer-oriented approach to education, with expectations for a personalized learning experience.

In this paper we take a systemic perspective to unravel what the impact is of a holistic learning model which has been adapted by us, on the so-called millennial generation. First of all we describe the changing landscape which is affecting education fundamentally. In second instance we focus on the main stakeholders of the educational system and especially the ‘customers’, i.e. the students. We then present our holistic

model and its constituent parts. We highlight what the impact is of this approach on different aspects of learning. We then explore the emergence of what is called As coined by van den Hoff [5], Society 3.0 is characterized by digitalization, knowmads and daredevils. In the last section we link our holistic learning model with the transition that is taking place to this new society and defend the argument that our traditional learning models which are in structural terms predominantly based on a Tayloristic approach; are outdated. We also argue that the pedagogical approach and skills and knowledge to be taught should tune into the specific nature and characteristics of this “Millennial Generation”. In our view our holistic model is fit to meet the challenges posed by this generation and the changes in society.

## 2 The Changing Learning Landscape

In the past decade of educational transformation, many perspectives have changed such as the relationship between teachers and students and the information being distributed in the classroom. In the past, the teacher was the major provider of content, and the tools that dominated the classroom were textbooks and chalkboards with a result of a passive student, over-reliant on the teacher. In this sense, teachers gave life to learning for generations of students by designing the learning environments of their classrooms while operating in an environment of scarcity that would make today’s teachers tremble.

As the availability and accessibility of information increase, information is transforming the practice of teaching and the roles of both teacher and student. The complexity of the business landscape has increased demands for continuous learning, with professionals demanding access to learning opportunities any time, any place and anywhere. New technologies enable unprecedented sharing and collaboration between students and teachers, the formation of new learner identities or subjectivities and communities of learning, driving the social aspects of learning to new levels.

Powerful creative tools, interactive textbooks, and a universe of apps and content create endless learning possibilities, all on a device that is extremely easy to use. Students don’t just watch, listen, or read with an iPad; they create, explore, question and challenge. Today’s teaching/ learning apps help to make every learning task engaging and inspiring for both student and teacher: a multimedia presentation, a photo documentary, an interactive eBook with embedded student created video content. The work students need to do becomes the work they want to do. The student learning experience can be culturally, intellectually, socially and practically enhanced if the learning environment is planned and designed to utilize these powerful tools appropriately [6].

No longer do students come to school to watch teachers at work. They come to learn, to find inspiration, to work together, to acquire skills, to build character, to develop into well-rounded individuals. Students are able to watch and learn from embedded videos, images and documents both in the classroom and beyond it. The passive watcher has become an active learner who can explore curriculum content, develop their own media rich content to share with their peers, and explore what is quite literally a world of learning material.

On the other hand, the universities need to respond to the new generation demand of personalized learning. A redefinition of educational outcomes have been

increasingly evident in recent literature from industry and employers, with calls for universities to equip people to operate more flexibly in the societies of the 21<sup>st</sup> century. This includes the flexibility to work across systems; to think critically and creatively; to engage at multiple levels; to develop inter-cultural competence; to propose alternatives; to adapt to changing circumstances and propose alternatives; to develop skills that will support transition to a 'green' economy; and to demonstrate 'moral compass' [7–14]. This type of situated learning presents significant challenges to university teachers about how best to support learning, specifically how to build the appropriate learning relationships for this changing educational technology landscape.

Giving students more responsibility for their own learning has made them more engaged and better prepared in the classroom. This, in turn, is making them better prepared for their future. When educators and educational designers want to create engaging new learning environments, it is worthwhile to reflect on the theoretical conceptions of teaching and learning and make them explicit [15, 16].

### 3 A New Generation

Institutions and academic staff are facing a period in which the role and functionality of universities will be redefined and reshaped to suit the requirements of a varied student population who require greater flexibility and more options than ever before [17].

The Millennial Generation has been characterized in a number of different ways [2, 18, 19]. When it comes to learning, they:

- Try it their way – always looking for better, faster way of doing things
- Prefer graphics before text, reading of excerpts
- Like small and fast processing technology – best when networked
- Want instant gratification and frequent rewards (spot)
- Focus on skill development – not memorization of what they perceive they don't need to know
- Productivity is key – not attendance – so make class worthwhile or they won't come
- Have different critical thinking skills based on their high tech world not thought processing (need help here)
- Rely on teacher to facilitate learning
- Group think and interaction

Regarding changing workplace and managing Millennials Raines [4] describes them as sociable, optimistic, talented, well educated, collaborative, open-minded, influential and achievement oriented.

Millennials exhibit distinct learning preferences identified by Oblinger and Brown [2, 20] such as preferring teamwork, experiential activities, structure, and the use of technology. Email and instant messaging are natural communication and socialization mechanisms for teenagers today. To cater to this group of students' orientation towards teamwork, Howe and Strauss [21] advise institutions to stress friendship and duty to help others; to showcase groups and team skills; and to prepare for rapid growth in mainstream political and community organizations.

They are technologically experienced and their high expectations pose a challenge for educational institutions. “The aging infrastructure and the lecture tradition of colleges and universities may not meet the expectations of students raised on the Internet and interactive games” [17]. Levine and Arafeh [22] also found that students who have had access to computers throughout their primary and secondary schooling have high expectations for ongoing use of technology in their studies.

However, Poindexter [3] argues that whilst “individual innovations like collaborative learning, service learning or the use of technology in teaching are finding their way onto some campuses, a holistic approach that looks at teaching and learning strategies from an integrated perspective may offer the greatest impact”. She advises against adopting only one innovation in isolation, as this can negate desired outcomes, rather, she promotes a holistic approach that uses multiple strategies and takes into account the changing student generation.

Applying a holistic approach to teaching and learning in higher education with a strong emphasis on more learner-centred design [23–26] and the development of a blended learning environments may assist universities and academic staff in adapting to the demands of a new generation and the expectations of earlier generations [27].

## 4 Teaching Knowmads and Daredevils

Education is being re-shaped as a consequence of the societal changes taking place. Students become knowmads. A Knowmad is a nomadic knowledge worker – that is a creative imaginative and innovative person who can work with almost anybody, anytime, and anywhere. Knowmads are nomadic knowledge workers –creative, imaginative, and innovative people who can work with almost anybody, anytime, and anywhere. The jobs associated with 21st century knowledge and innovation workers have become much less specific concerning task and place, but require more value-generative applications of what they know. The office as we know it is gone. Schools and other learning spaces will follow next.

Knowmad Society explores the future of learning, work, and how we relate with each other in a world driven by accelerating change, value networks, and the rise of knowmads. Technologies allow for these workers to work either at a specific place, virtually, or any blended combination. Knowmads constantly reconfigure and re-contextualize their work and learning environments, and greater mobility is creating greater new opportunities.

How do these knowmads acquire knowledge? According to Moravec [28], knowmads have the following characteristics:

1. They leverage personal knowledge
2. They contextually apply what they know
3. They purposefully use new technologies
4. They share what they know
5. They learn, unlearn and adapt new ideas as necessary
6. They learn continuously
7. They are not afraid of failure

Knowmads are extensions of Peter Drucker’s knowledge workers concept, embracing the convergence of accelerating technological change and globalization. In particular, the use of advanced information and communications technologies enable knowmads to work beyond pre-19<sup>th</sup> century notions of nation states, corporate identity, and community identity [29]. Knowmads are also daredevils [5]. People who are taking charge of their lives or taking matters into their own hands in certain situations, without depriving others. Thinking in terms of synergy. Continuously learning. Communicating openly. Acting from their own vision. Hierarchy is not important to them and they steer their lives in the direction they have set out for themselves.

For some, knowmadism is realized through leveraging social media (i.e., Twitter or blogs) that add an additional layer of social and/or professional activities that defy the confinement to particular geographies and operational rules they may have been restricted to as recently as 10 years ago. Knowmads are valued for the personal knowledge that they possess, and this knowledge gives them a competitive advantage [5]. Knowmad Society brings in a futures orientation, projecting not only the future of our workforce, but also examines the social, educational, and political implications for developing human capital that is relevant for the 21st century.

## 5 Education 3.0

In the past there was an emphasis on one-sided transfer of knowledge. Our education system was built on 18th century thinking. Education nowadays is about a dialogue with interaction, a moderator, chairs in a circle, slouching in a couch, and writing ideas on a wall. “At schools we are educating people for professions that will not be around in 5 years’ time, while we have to educate people for occupations that only will come into being in 5 years’ time” [5].

**Table 1.** Educational generations in higher education

Characteristics	Education 3.0
Primary role of professor	Orchestrator of collaborative knowledge creation
Content arrangements	Free/open educational resources created and reused <i>by</i> students across multiple institutions, disciplines, nations, supplemented by original materials created <i>for</i> them
Learning activities	Open, flexible learning activities that focus on creating room for student creativity; social networking outside traditional boundaries of discipline, institution, nation
Institutional arrangements	Loose institutional affiliations and relations; entry of new institutions that provide higher education services; regional and institutional boundaries breakdown
Student behaviour	Active, strong sense of ownership of own education, co-creation of resources and opportunities, active choice
Technology	E-learning driven from the perspective of personal distributed learning environments; consisting of a portfolio of applications

Source: adapted from <http://firstmonday.org/ojs/index.php/fm/article/view/1625/1540#k2>



Questions which become relevant are: What are we teaching, why are we teaching this and for whom (Table 1)?

Students who have grown up with technologies have an information-age mindset [18], therefore demands on academic staff teaching the new millennial generation of students will be many – the requirement to increase their technological skill-base, to design teaching and learning activities to meet the change in students' learning styles and expectations, the need to be able to communicate with students through a range of media, and to interact and provide support 24 h a day, seven days a week.

The mindset of academics is likely to be still influenced by their generation and by the teaching and learning culture and traditions embedded in their institutions [17]. However, Poindexter [3], indicates that innovators are defined by a personality trait and not by age and that innovators can span generations. Therefore, academic developers should not assume that the age of an academic will limit their willingness to be an innovator or experiment with new teaching and learning approaches.

A holistic approach to teaching and learning emphasizes the development of the whole person and can include aspects such as collaborative and cooperative learning, active and service learning, learner-centred, lifelong learning, experiential, interactive and authentic learning, educational technology, internet integration, outcomes based education, knowledge of whole systems, emotional literacy, meta-cognition, multiple intelligences, and learning styles [3, 17, 26]. The focus should be on helping students in learning how to learn, and in applying what they have learned to real life situations. Blended learning approaches include flexible choices in both content and access.

## 6 A Holistic Approach to Learning

Learning has undergone fundamental changes throughout time, so much is clear in our description of this changing landscape. In teaching and learning we have so far however mostly focused on a mono-disciplinary approach which relies on a reductionist worldview – we want to reduce complexity instead of seeking it up. Curricula are developed like a production line according to industrial principles in which students need to build knowledge, skills and experience in a cumulative process which eventually results in a degree. This system was developed on principles of Taylorism and scientific management which go back hundreds of years. In time we have reverted the role of the teacher or lecturer to the student by a more student-centered approach with them taking the driving seat and defining their learning trajectory. The structure wherein this took place however remains intact, while the student population has changed dramatically.

A holistic approach to learning departs from the idea of interconnectedness. It reflects our world. Ramo [30] speaks about “The Age of Network Power” to describe this interconnectedness. According to him networks are replacing institutions and these expanding webs of nodes and connections are becoming entities where youth gather their personal knowledge.

The model which we adapted from Gaia Education [31] is centered around 4 main topics and related subjects:

- (1) The world
  - a. Globalization and Interconnectedness [30]
  - b. Digitalization and Transformation of Consciousness [32, 33]
- (2) Cultural Space
  - a. Building Community and Embracing diversity
  - b. Building inclusive societies through Intercultural Management and Communication [34]
- (3) Economic Order
  - a. Society 3.0: knowmads and prosumers transforming societies and organizations [35]
- (4) Social Arena
  - a. Education, social networks and activism [36]

We briefly explain the main topics in the next sections.

### 6.1 Globalization, Interconnectedness and Digitalization

Education systems worldwide aim to develop students into well-rounded citizens, and help them become creative problem-solvers, independent thinkers and innovators with emphasize on the interconnectedness of social and cultural context to creativity [37–39].

Holistic education challenges the present approach to education and its obsessive focus on standards and testing. Holistic educators see this approach as reflecting a materialist and consumerist culture that has reduced schooling to the training of individuals to compete and consume in the global marketplace [40].

A main element of holistic education is its focus on the interconnectedness of experience and reality. Holistic education attempts to develop a pedagogy that is interconnected and dynamic. It focuses on the relationship between the whole and the part and suggests that teaching and learning approaches need to be rooted in a larger vision. If techniques are isolated and unrelated they can become traditional education tends to be static and fragmented, ultimately promoting alienation and suffering [41].

Within this holistic perspective, the student is positioned as an active, participatory and critical learner who perceives and understands him/ dysfunctional. The holistic vision includes a sense of the whole person who is connected to his or her surrounding context and environment [42].

Networks create the opportunity of concentration and distribution according to Ramo [30]. Social media is however not only a communication platform; it is also a platform that disrupts. We see newspapers being replaced by crowd-sourced news feeds and smart social network feeds. We see Internet platforms like Netflix competing with traditional television networks. Digital currencies like Bitcoin questioning the dominance of central banks. Organizations like Airbnb transforming the hospitality industry. Networks permit us to connect nearly anywhere, and in so doing it gives access to knowledge, media, and information that serve our personal needs to do whatever we want to do. It also re-shapes our identity according to Sherry Turkle [33] who describes vividly not only how social media is transforming our consciousness, but also our notion of our place in the world. We are not mere consumers, we navigate the digital highway and decide and choose as we go along.

## 6.2 Building Inclusive and Diverse Societies

Interconnectedness, necessarily leads to multiculturalism. The digital highway is multicultural par excellence. With the click of a mouse virtual platforms are created which become eco-systems with permeable structures that are built around reciprocity, purpose and solidarity. Borders become irrelevant in this virtual arena, and people from across the globe seek each other out around common interests and a common purpose.

While learning occurs within the individual, it takes place within a social context which makes social interaction central to the learning process [43–46]. Learner-centered planning recognizes the importance of supporting multiple ways of learning, including social learning and virtual discourse. We need to anticipate demand for learning that is more:

- collaborative, with active learning and group work,
- blended, with learning and other activities happening anywhere/anytime, enabled with mobile technology,
- integrated and multidisciplinary,
- immersive, with simulated or real world experiences, and
- hybrid, combining online with face-to-face learning activities, augmented with mixed-reality experiences.

## 6.3 Society 3.0

The world is changing. Gary Hamel [47] speaks about an enormous acceleration of change which marks our society. Change is affecting all layers of society fundamentally. We are moving towards a more collaborative and sharing economy. Organizations are transforming. Individuals are becoming knowmads and prosumers. And finally education is also being re-shaped under influence of all these changes. Connectivity is the ‘buzz’ word underlying what appears to be a paradigm shift. Connectivity creates a form of collective intelligence for sharing and collaboration.

According to a recent research from Forrester in 2006 [48], connectivity is a social trend in which people use technologies to get the things they need from each other, rather than from traditional institutions like corporations, schools or governments. In these networks value is created, knowledge is shared, and innovation takes place.

They become so-called ‘Communities of purpose’- swarms of people with a collective intelligence, where the network becomes a value-creating entity. Social media and other technological developments contribute to the communication and cooperation and products and services are customized to personal needs and situations. In this landscape we see new forms of leadership and so-called daredevils standing up.

## 6.4 Educating Through Social Networks

Educating through social networks does not rely on physical presence, space or location. People connect and follow programs which they choose. A study of social media in teaching by Pearson Learning Solutions found an increased use of blogs, wikis and

podcasts [49]. Many of these social elements are now standard in academic systems. Blackboard, for example, allows users to create a profile that includes an image and brief bio. Canvas, another LMS, integrates outside tools through apps that allow instructors to embed streams from social platforms, such as YouTube and Twitter.

Knowledge is offered through online lectures, video presentations and TED talks and YouTube films. People meet in virtual space and share perspectives while developing knowledge. This is for instance done by choosing a research question, developing research tools and disseminating them through their networks. Students can conduct short video interviews across the globe and take them to their communities and invite respondents to give answers. Collectively a huge database can be built of video interviews with data that can be analyzed and which present a broad spectrum of insights and knowledge. Individual reflection diaries can be kept online after weekly sessions which describes the individual learning trajectory and the virtual exchange process that took place throughout the program. Educating becomes a form of activism, because it is always contextualized and applied in one's community. It serves to change, incubate ideas, encourage start-ups and solve problems.

Communication tools help all participants personalize the learning experience and maintain a presence in online courses. Platform preferences change over time. Today's universities students use a variety of social networks to connect with friends and family, and increasingly with work and school. The benefits of social interaction are also evident at the institutional level. Universities, academic programs, and support service offices (e.g., career centers, libraries) are establishing their own accounts as an alternative way to communicate with a larger audience that can include prospective and current students, as well as alumni and employers.

## 7 Conclusions and Future Research

According to Clark [50] holistic education is a journey for both the educator and the student. For both, the nature of holistic education can change as they each progress through the programme, and draw different experiences from it. The process of holistic education must therefore be flexible and dynamic to accommodate these personal differences and influences and, moreover, differences in the rate of personal progression [51]. Holistic education broadens and deepens the educational process [52]. This not only helps in promoting positive attitudes towards learning but also develops social skills necessary for facing the modern world we live in. Education must take into account socio-cultural changes and challenges. A holistic worldview embraces the wholeness of our humanity, and integrates, rather than isolates, our diverse human possibilities [53]. Nerds, geeks, makers, dreamers and knowmads are the future according to John Moravec [49].

In this paper we have explored how the learning landscape is changing and challenging our pedagogical approaches and the skills and knowledge that we teach learners. Schools are obsessed with managing and measuring while knowledge in Society 3.0 is about creating personal meaning. Knowledge is not a commodity but gains its meaning by contextualizing it and also by the learner who distills a specific meaning to whatever he or she has set as personal goal or objective. Learning is not

solely an individual process, but more than anything collaborative. Through social networks people connect and form connected learning experiences, which force us to re-think time and space for education. Space becomes irrelevant because learners have online and offline encounters which are not restricted in time and space. In terms of content a monodisciplinary, reductionist approach does not meet the demands of our complex world, which is multicultural, globalized, and diverse. Thinking in terms of a holistic approach is multi-disciplinary per se and also takes into account the multi-layered and multi-dimensional character of reality. Taking holism as a starting point in education means that we accept the complexity and use it as a point of entry to try to unravel its constituent elements

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# University Leaders Responsibilities in Carrying New Programs into Practice

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**Abstract.** Responsible leadership is a topic that is still under research. The complexity of the issue requires deeper involvement of researchers. Playing the role of a university leader imposes the duty of being responsible. Leaders should be responsible not only towards the stakeholders of the organization they manage, but also for the expected results of the actions predicted by the institution itself. It is noteworthy that there exists an empirically proved relationship between the quality of school leadership and student achievement. Building a professional community of teachers is the key to improve students' achievements. Results of newly implemented programs should be duly assessed by universities. The conclusions should be then discussed and the feedback should influence future changes in programs. It means that every activity of a responsible university leader should be focused primarily on stakeholders' needs. The article was based on an analysis of the literature.

**Keywords:** Leadership · University · Curriculum · Social responsibility · Management

## 1 Introduction

Responsible leadership is a topic that is still under research. The complexity of the issue requires deeper involvement of researchers. The world of leadership is much more complex, diverse and ultimately contested, than it was assumed. Further research in this area may bring great benefit in investigating responsible leaders' mindsets [1].

Playing the role of a university leader imposes the duty of being responsible. The meaning of that term should be as wide as possible. Leaders should be responsible not only towards stakeholders of the organization they manage, but also for the expected results of the actions predicted by the institution itself.

Understanding or responsible leadership becomes wider nowadays. With their research, N.M. Pless, T. Maak and D.A. Waldman, identified four orientations that leaders may use to demonstrate responsibility and implement corporate social responsibility. This concluded with the creation of different responsible leadership orientations: traditional economist, opportunity seeker, integrator and idealist [2]. Same authors also recognized two main trends in recent developments in management education - globalization and quest for responsible leadership with its implications for management education [3].



Leaders should pay attention to the benefits of the generated social capital. Building trusted relationships with partners leads to responsible change [4]. In a wider context, it is a manifestation of organizational contribution to sustainable future. The network of trusted partners created as a result of those actions builds a beneficial network and facilitates generation of social capital [5]. The creation of social capital is either value-neutral or positively forcing people to do good [6]. It means that even among a variety of opinions, any action heading towards multiplying social capital should be seen as a positive one and awaited by society.

One of the most problematic things would be how to build an organizational environment that combines the benefits of systemic leadership with values-driven organizational practices [7].

It is noteworthy to mention that there exists an empirically proved relationship between the quality of school leadership and student achievement. High expectations for every academic staff member and the quality of programs lead to the narrowing of the gap between the best students and those whose achievements are not that impressive. Building a professional community of teachers is the key to improve students' achievements. Understanding the nature of problems should be achieved through cultivating leadership skills in others. A leader, as well as any teacher, is a long agent [8]. It means that every member of the university society should be responsible for the actions predicted by the leader.

Accountability in higher education becomes much more important due to the rising public pressure to demonstrate their value through accountability measures. The strong focus upon the assessment of student progress and success [9] also raises the requirements for university leaders' qualifications. It is empirically proven that university presidents who completed university education courses felt more prepared to deal with assessment of student learning. Research of university presidents stressed the belief that higher education programs fulfill the needs of assessment and accountability concepts [10].

The most important issue in leading the modern university is to cope with diversity of stakeholders' expectations in relation to market needs. The difficulty in creating new programs should include the realities of the educational industry interconnected with the expectations of the rapidly changing society. A responsible leader should represent a proficiency level in balancing a number of complicated special interest groups.

In the particular example of a higher education institution customer satisfaction might be easily correlated with stakeholders' expectations. Customer satisfaction should be the ultimate goal for every organization, not only an educational one [11]. From that place it is very close to service quality [12].

Results of newly implemented programs should be duly assessed by universities. The conclusions should be then discussed and the feedback should influence future changes in programs. It means that every activity of a responsible university leader university should be focused primarily on stakeholders' needs.

## 2 The Role of a University Leader

A university professor might play a role of a ‘leader located at the zenith of an academic hierarchy, who is therefore expected to offer leadership’ [13]. Apart from this opinion, a university professor may play many roles and be recognized through many identities, but without any suggestion of leadership or management [14].

The concept of management of higher education institutions as a separate problem is not very old. As a highly professional activity it requires from the person holding a managerial position a set of particular skills and a wide knowledge of this area. Želvys said: ‘Educational management as a separate branch of education science started its development only after the Second World War. Hence, management of education can be considered to be a new rapidly developing area of science’ [15].

The difficulty for university professors to become leaders might be caused by the growing division between academic work and management in a higher education institution [16]. The proficiency in academic skills is not directly transferable into managerial abilities.

This situation suggests that a new model of transformative leadership in a university is highly required. The recommended model should combine effective institutional leadership and management of a university in the context of a professional culture of an organization [17].

It is widely known that business ethics provides a lot of examples of leaders’ obligations towards society [18]. Their primary action would be then to lead the organization in a way that considers the long-term interests of all stakeholders [19].

For those who lead a higher education institution it is crucial to value students as well as programs. Based on this knowledge, the development of effective leadership should be provided. In this case ‘effective’ means “comprehensively assessing student-learning outcomes” [20].

What if we analyze the wider definition of stakeholders, which states that it is “any group or individual who can affect or is affected by the corporation” [21]? In that context, stakeholders are not only customers, suppliers, employees, partners, but also competitors. An organization has no moral obligations, so to speak, towards that last group, but they certainly can affect the organization, for example, in terms of loss or gain of the market share [22].

## 3 Quality in Higher Education in a Wider Perspective

Quality is the leading measure for a product of service. In higher education, in particular as it is an environment of a massive influx of students, quality becomes the one and only factor allowing to measure and compare the scientific and market power of a university.

The official definition of quality, in its widest perspective, is, as the American Society of Quality put it, ‘the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs’ [23]. In a more popular understanding, the term of quality might also be understood as “doing the right thing, the right way, the first time and every time”, as proposed by Crosby [24].

The structure of an organization is crucial in creating a high quality of service or product. As individual malfeasance is estimated to account for about 4% of organizational problems, the main role is played by the system which an organization is built on [25].

It means that in a vast majority of cases, it is the system that is responsible for unethical actions, not an individual employee [20]. But we must bear it in mind that every improper performance occurs as an act of an individual agent. In other words, an act is always a presence of choice, not an opportunity. Expanding that thought, the system view of management, specially one like Total Quality Management, ignores the crucial role played by individual choice [26].

TQM does not always lead to the creation of an ethical organization. Its wider perspective allows to diminish the role of an individual vice. It may also cause leaders to oversee the bigger context only. The only way to success is to undertake TQM actions by thoughtful people who understand the need of underpinning of ethical actions and correct the blind spots [27].

The results of an analysis of 145 programs of management from 43 universities and colleges from Taiwan, provided by the Higher Education Evaluation and Accreditation Council, showed that it is possible to point out a group of factors that are responsible for passing or failing program evaluation. On the top of the list were such factors as 'employment counseling and alumni follow-up', 'research outcome and faculty load', and 'coherence between goal feature and curriculum' [28].

#### **4 Diverse Needs of Stakeholders. Creation of Social Capital**

The system of academic research is based on close relations and cooperation between partners in research and between institutions. Creating links of exchange leads science to flourish. Those actions are conducive to development of understanding stakeholders needs.

Social capital, as such, should be widely understood as 'the goodwill that is engendered by the fabric of social relations and that can be mobilized to facilitate action' [29].

Social networks that were established during cooperation of researchers generate social capital by binding all the actors together [30]. Especially in the academic society, where cooperation with competing institutions is perhaps more common, comparing to other sectors of the economy.

Cooperation of this kind is very similar to an exchange of favors, which is the main source from which social capital gets access to economic resources [29]. Some authors go even further and present the view that giving and receiving of favors is a form of cooperative behavior that enhances performance [31, 32].

Taking into consideration the achievements of higher education institutions one should consider the statement by Harry Levinson, who said that 'The purpose of universities is to generate and transmit knowledge. Much of what is generated is knowledge for the sake of knowledge' [33].

The results of a research, conducted on 361 graduate and postgraduate students and 78 faculty members of Islamic State University of Malang [34], Indonesia, indicate a difference in perception of the same program between students and lecturers. Students,

acting as a primary stakeholders, tend to express lower satisfaction. Lecturers, on the other hand, are part of the educational process and perceive themselves quite higher comparing to the students' perception [35].

A comparison of perceptions between external and internal stakeholders might be a useful tool to measure the quality of education in a university. The 'satisfaction gap' between those groups should be precisely observed and duly evaluated to enhance the quality of educational services [35].

## 5 New Projects, New Programs and Leader's Responsibility

Creating a new project or establishment does not require only sufficient foundations and a set of goals to achieve. A proper strategy is necessary as well as a specific group of people who, under due leadership, would be able, together, to reach the required goals.

For ages, the financial performance of any venture has been one of the main measures of success. If an organization can achieve higher financial results adhering to its ethical business practice, it is a presentation of a positive implementation of business ethics into managerial practice.

For many people becoming a student means a chance to open new possibilities to develop their professional career. A study conducted on 280 Australian students in 2013 presented that 'further educational aspirations' were the most important factor for around half of all the respondents. Therefore, the prime motivator was a way to obtain a degree. The second one was the development of skills, which surpassed a chance to gain new experience [36].

When creating any new program or project, leaders must bear it in mind to be in line with guidelines, for example, given by the American Council of Trustees and Alumni (ACTA). In a document 'An Action Plan for Higher Education Trustees' it is suggested that, above all the others, free exchange of ideas should be protected as well as that students have to have an ensured right to be exposed to an appropriate range of disciplines and viewpoints. It also lists skills that graduates should have. They are not only fluency in English and a high ability in mathematics but proficiency in any of students' interest. These achievements should be clearly stated and attested in an institution's diploma, to signify high quality for prospective employers and society. Or more precisely, every program has to have a well-defined core and the value of the course should avoid fulfillment of credit requirements only [37].

As the proliferation of expenditures is a major driver for costs, there should be proper control of the list of courses provided to allow financial planning of next periods.

A research project has brought an interesting finding that if the leader of an institution holds a doctoral degree with a specialization in education, then she or he is better prepared to deal with assessment and accountability of student learning in comparison to university presidents with doctorates from other disciplines of science [37].

## 6 Conclusion

It is a hugely complicated task to act as a university leader. Not only a particular set of skills is required to lead an organization as a whole, but also proper understanding of stakeholders' needs is absolutely relevant. Leaders should be responsible not only towards stakeholders of the organization they manage, but also for the expected results of actions predicted by the institution itself.

The programs provided by university departments should be in line with the university's strategy, its mission and vision. They should also be constructed respecting the requirements of internal and external stakeholder. It is noteworthy that there exists an empirically proven relationship between quality of school leadership and student achievement.

If so, the leader, bearing in mind university development and the good of its stakeholders, should promote new programs that predict the probability of 'student usefulness' with respect to the job market after the course of study.

The necessity to combine the excellence in being a professor of a university with managerial skills needed to lead people poses a major difficulty. In this matter, the creation of social capital might be helpful to gain faster and deeper feedback from different groups of stakeholders.

The recommended model should combine effective institutional leadership and management of a university in the context of professional culture of an organization. On the other hand, universities should be cautious to base their future actions, like new programs, teaching and research, on the stakeholders needs. Simply, to avoid working for themselves, as in an 'ivory tower', an organization separated from the outside world, and from its stakeholders, whose satisfaction should be an ultimate goal for every institution of higher education.

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# **Leadership and Safety Management**



# Modeling the Security Risk Management Process in Higher Education Institutions to Understand, Explain and Improve

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**Abstract.** Security in organizations is no longer just a matter of having locks and alarms; it is more like a question of different dimensions of rules, perceptions and actions. The focus must return to more interpersonal relationships in security issues instead of technically advanced equipment. In facing today's challenges, the focus must be on more interpersonal relationships in security issues than on technically advanced equipment. This also applies to institutions of higher learning. Sixteen security risk managers from Swedish universities and university colleges were interviewed about the dimensions of rules, perceptions and what is actually carried out. The results show that the size of the higher education institution has no significance for the success of good security work. To improve the security risk management process, a modeling started inspired on three levels of culture. Finally this model could support a systematic approach to the security risk management process in higher education.

**Keywords:** Security · Security management · Security risk management · Swedish universities and university colleges · Three levels of culture · Valuing subordinates · Frequent worksite visits · Participative management style · Effective safety communication · MoSFP · MoSRMP

## 1 Introduction

Security in organizations is no longer just a matter of having locks and alarms. "Organizations must identify the threats and risks they may face, and attempt to reduce these to meet the objectives of the organization by detecting vulnerabilities, whether these are people, processes, or technology" [1]. In order to modeling the security risk management process, I used the assumption that security in organizations is more like a question of different dimensions of rules, awareness and actions. "In today's competitive and ever-changing threat environment, there is a need for a more dynamic and proactive security management" [1]. The focus must return to more interpersonal relationships in security issues instead of technically advanced equipment. How can this be carried out on an organizational base?

Let us start with what we must achieve: "Security can be defined as the ability to prepare for, adapt to, withstand, and recover from dangers and crises caused by people's deliberate, intentional, malicious acts, such as terrorism, sabotage, organized crime, or hacking. Security risk management includes assessing and reducing the

likelihood and consequences of possible attacks with various types of risk-reducing measures, for example, through critical infrastructure protection and by building organizational and societal resilience” [2].

Today’s security in higher education institutions includes of a variety of elements, such as protection of intellectual property rights, crisis and disaster management, personal safety, information security, prevention of internal and external crime and fire protection, drawing up contracts with suppliers, and safety when cooperating with the surrounding community. This challenges the way organizations handle risks and threats, and it can be argued that a more holistic view is necessary as well as the involvement of co-workers in the process. What factors are crucial for achieving a high level of security in order to counteract danger, damage, loss or crime? How should security work be conducted in order to enhance the experience of increased security?

For example, the knowledge that is “produced” by academic institutions are sought after and in danger of falling into the wrong hands if not a greater awareness of the risks and threats can be achieved regarding non-proliferation [3]. What is needed is a change of approach and a holistic view that can be generated through systematic security processes. These processes in turn can support security managers and guide them in implementing effective security and risk processes in organizations. Hence, the purpose of this paper is to illustrate the similarities and differences in the conditions and practices at Swedish institutions of higher education regarding security, and based on that, to develop the foundation for a proposed model of systematic security processes in academic organizations.

Industrial security is one the fastest growing branches with technically advanced equipment, the purpose of which is to solve security problems [4]. However, technical solutions are not enough. The human factor is also an important component. In order to come to terms with current and future challenges, this work needs to be supplemented with a more personal commitment to security issues. Each co-worker needs to take greater responsibility in order for the community of co-workers to feel and experience increased security [5]. This can mean changing one’s behaviors and attitudes, which can entail resistance to change. One example of resistance would be the inability to freely come and go to your office during the day because the doors are locked and you have to use your security pass to get into the building. The effect of allowing free entrance during the day would be that the security pass system is only used when it is not needed, that is, evenings and nights.

It is a pedagogical challenge to find tools and methods that can achieve the level of security awareness and compliance necessary among the co-workers in the workplace. This means getting their acceptance and compliance with the relevant security requirements and perhaps even relinquishing their personal integrity in favor of collective security [5]. Fischer, Halibozek and Walters define security as “a stable, relatively predictable environment in which an individual or group may pursue its ends without disruption or harm and without fear of disturbance or injury” [6]. “Staff engagement considers the degree at which employees are responsible, accountable, and occupied with developing the organization’s resilience through their work, and that they understand the links between the organization’s resilience and its long-term success” [1]. Thus, security is the method by which individuals and groups, including organizations, governments and communities can develop their own goals without disruption [6].

The security work therefore becomes the condition or the level that is desired for a nation, organization or individual, and that describes the degree of security.

### 1.1 Systematic Security Work

Systematics is the foundation of security management and is often based on the Plan-Do-Check-Act (PDCA) cycle in practice [1]. What then does “security management” mean? “The security management system needs to use people and resources to achieve and maintain the desired security and, primarily, an organization’s outcomes” [1]. This definition includes an expectation for a desired relationship; an expectation that can be connected to some kind of condition. It is not enough that it is an organization. With a systematic security management process, a good security mindset can be achieved. Such a mindset can also be considered to be some kind of condition, a condition that hopefully will generate security acceptance for the desired security needs by means of good security communication. This requires, however, that there is an acceptance and understanding for security management based on risk management. “Generically, the risk management process can be applied in the security risk management context” [1].

The combination of risk management and security management creates a work approach that promotes a better understanding of how security threats interact on different levels [1]. One success factor when it comes to developing an accepting organizational culture is to establish a creative environment [7]. By emphasizing the importance of acceptance and understanding in educational training, a creative environment can be achieved that promotes the growth of an accepting organizational culture. A creative environment can give birth to a spirit of change, and that the goal will be an accepting, aware and responsive organizational culture.

The organizational culture reflects the perceived value of acting in a certain way that is determined and mutually confirmed by the co-workers. Alvesson describes this as culture shaping the individual, but that individuals also shape the culture. Alvesson also illustrates the difficulty of measuring culture [8]. This definition of organizational culture can also be applied to societal structures, through a common understanding of the fundamental need of security, and if there is an understanding of how this can be achieved. The security culture is part of the organizational culture related to security, and it does not stand alone [9]. Thus, the concept of security culture could also be used in society, if it is based on a mutual agreement of how acceptance can be collectively reached [5].

Organizational culture is best understood as a connected and complex set of meanings, values and guidelines that the members of the organization are not fully aware of [8]. The cultural aspects in an organization thus more generally consist of how co-workers themselves influence and are influenced by attitudes, values, understanding and acceptance. According to Schneider, “Culture signifies patterns of collective beliefs and attitudes that are held by a significant number of people” [10]. Thus, to create a good organizational culture, one needs to add an understanding of the need for security, where acceptance is perhaps the most important element for changing behavior. This relationship can be measured by using questionnaires or interviews, when it most often deals with conscious values and attitudes [9].

A challenge for every professional security co-worker is to persuade the organization to realize that security needs to permeate the entire operation. His or her goal is to get the organization to realize the need for behavioral change and to place security high up on the agenda. Often, however, security becomes a necessary evil that is perceived as cumbersome.

## 2 Method

Sixteen security risk managers or their equivalent from 37 Swedish higher education institutions were interviewed by telephone. Fourteen were from public sector institutions and two from independent providers authorized to carry out research education. The aims of the interviews were to understand and explain how systematic security work is implemented at Swedish universities and university colleges. The security risk managers were asked questions about the dimensions of rules, their perceptions and what is actually done. The interviews consisted of 30 multiple-choice questions. It was possible, to a limited extent, for the interviewer to ask follow-up questions when the respondent indicated that he or she was open to it.

The questions were inspired by the three levels of organizational culture proposed by Schein [11] and Akselsson [9]: artifacts, exposed beliefs and values, basic underlying assumptions. The 30 questions were categorized according to: (1) what is actually done (behavior and acceptance), (2) dimensions of rules (risk control), (3) perceptions (attitudes). The questions were designed to ask the security managers about their experience of success factors and of how security risk management should be performed.

Discourse analysis was used to analyze the interviews. The intent of discourse analysis is not to determine what is true and what is not, but generate a mode to understand and explain [12]. Discourse analysis as a method aims to discover and understand how truths, meanings and beliefs are constructed [13]. A discourse analysis deconstructs beliefs and in so doing, aims to identify how reality is conceived rather than what it is [13]. A discourse analysis generates a kind of image or a vision of what the reality can look like. A Foucault-inspired approach, in the sense that it generates a number of questions, was selected to guide the analysis [14]. In the analysis, the interviewer read the material to examine what the security managers wanted to do in their security work and how they could achieve it. What kinds of images or visions were made?

## 3 Results

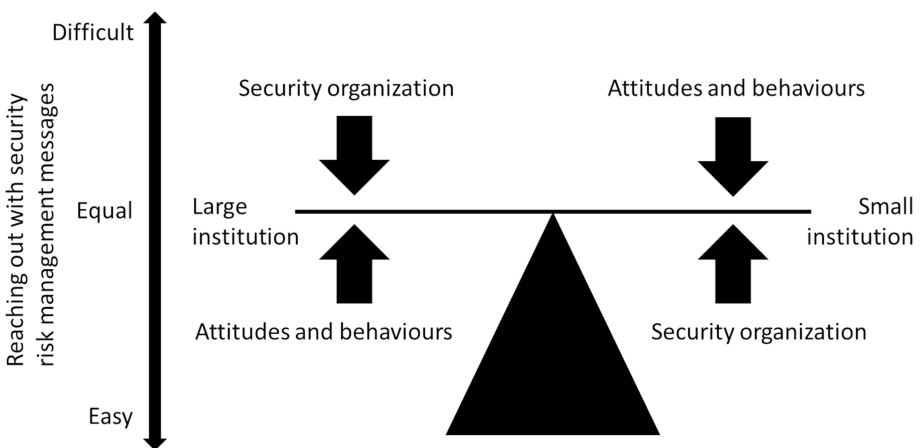
The results are presented in three steps: (1) a description of the similarities and differences in the conditions and work approaches among different Swedish academic institutions, generated by means of discourse analysis; (2) a modeling of success factors; (3) modeling of a systematic security risk management process.

### 3.1 Similarities and Difference in Conditions and Approaches

Three groups of actors are mentioned in the interviews: the security managers, the universities and university colleges management, and all the co-workers in the organization. The interviews indicate that the security managers’ power of initiative, competence and perseverance have a crucial role for success in security work. The security mangers stated that in a number of cases, the university management could improve their involvement by providing a good example. The security mangers also stated that the willingness and commitment of all the other co-workers could be increased by an active security process that would change understanding and behavior. Here, the intentions and willingness are not always on the same level.

The security managers clearly consider themselves to be interested in their work and they gladly carry it out with a high degree of commitment. Their actions are based on their training, experience, willingness and resources. The universities and university colleges management appreciate their work efforts for the most part, while they sometimes feel that the rest of their co-workers’ interest for security work and its implementation is limited.

The Seesaw Model [15] in Fig. 1 illustrates that a large university with a reasonably strong risk governance and organization has similar difficulties in achieving success in increasing security awareness and compliance, as does a small university with an indistinct governance and organization. A large organization has much to control, even if the security organization may have more resources available. These resources can include more staff, a clear security risk policy, a wide network of contacts both inside and outside the university, opportunities for information sharing, and more. A small institution may have fewer people on security, a fuzzy management role (part of the service for the practice of security), an unelaborated security system, etc. This means that both types of organizations may have similar difficulties in reaching out with the security risk management messages.



**Fig. 1.** The difficulty in implementing security measures is the same, whether it concerns a large university with considerable resources, or a small university college with fewer resources.

The security managers stated the actions of the universities and university colleges management should be based on their ability to provide accountability, support and to show commitment. The university management sometimes questioned if certain measures were necessary or not, many times based on economic considerations or simple convenience. The other co-workers' interests are often based on "What's in it for me?" For that reason, their interests can be of a diffuse nature.

The institutions of higher learning that have a more pronounced dimension of rules are characterized by a greater acceptance of security and its demands on operations. This indicates an understanding that a clear and explicit risk management process can result in greater success at all levels when it is thus agreed upon and legitimized. A clear security policy can, in that case, even achieve the necessary backing in the organization. To achieve a systematic security process, it is necessary that the efforts reach out across the entire organization to increase understanding and change the co-workers' behavior. To do this, security managers are faced with a pedagogical challenge to bring about change.

### 3.2 Start the Modeling of the Success Factors Process – MoSFP

Two models were developed to support improvements of security work processes. The first model focuses on how to include success factors in the process. To do so, a number of theories were used that deal with organizational culture and secure organizations.

Smith and Brooks report that, "The involvement of staff awareness is effective management practice and accords with the principles of industrial democracy. Staff is more likely to comply with a policy that they have assisted in formulating, as opposed to a policy that has been imposed" [1]. This approach applies to all human interaction regarding success factors, which are described in theories on self-leadership [16].

Fleming also reports [17] that Mearns et al. found four aspects of supervisor safety management to be important in a safe organization: valuing subordinates, visiting the worksite frequently, a participative style of management, and effective communication [18]. Those aspects are probably needed to use.

**Adding Four Aspects of Supervisor Safety Management.** The four aspects of supervisor safety management can also be used to develop a secure organization:

1. Visiting the worksite frequently [17, 18]. This means being visible in the workplace so that the co-workers feel that they are important in the security process. It is important to be present to show appreciation. This is referred to as "Management by Walking".
2. Effective safety communication [17, 18]. This illustrates the importance of agreeing upon and legitimizing the measures to be implemented. Attempting to do this without creating conditions for communication will have no effect on systematic security work. Communication is also the foundation of the training that every organization has to provide for its co-workers.
3. Participative style of management [17, 18]. This aims to make co-workers and management participants in the process and to achieve a common acceptance for the security measures. Success can never be achieved if everyone does not understand.

An important factor in this context is that there must also be a strong desire to achieve results in a collaborative perspective. Communication and cooperation are the prerequisites for achieving the desired behavior.

4. Valuing subordinates [17, 18]. This is the final building block in that all co-workers are shown appreciation. In this way, they become participants in the process that is needed regarding the factors that are required to achieve a safe and finally a secure organization.

Inspired by Schein [11] and Akselsson [9] in organizational culture and with Mearns et al.'s definition of what characterizes a safe organization [18], I see the potential for changing behavior and for an increased acceptance. By adding components for a safe organization, I want to show the relationship of how the communication between risk management and understanding affects the outcome of behavior as the graphic Model of the Success Factor Process (MoSFP) in Fig. 2. The theories were interpreted and joined together in the graphic Model of the Success Factor Process (MoSFP).

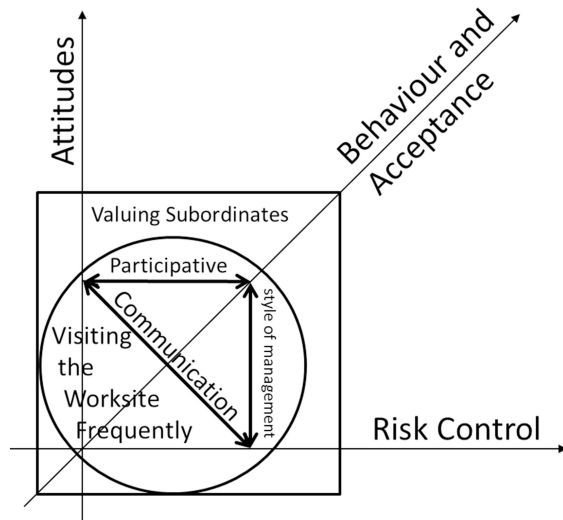


Fig. 2. The graphic Model of the Success Factor Process (MoSFP).

Figure 2 shows that the risk control artifact (such as security policy, BCM documents and other security rules) is an ongoing process that can be illustrated as a time axis. Attitudes can be shown as a value axis, the content of which increases upward as understanding increases. Behavior and acceptance, accordingly, are products of risk control and attitudes. By visiting the worksite frequently, communicating security with a participative style of management and by highly valuing subordinates in the security process, this systematic approach can result in improved compliance and awareness and are illustrated as an increased area of understanding.

The MoSFP can in this way describe the foundation of a systematic security process. The MoSFP offers suggestions of how the success factor process can be illustrated in a

systematic security process. Together with aspects of planning and design, training, implementation and follow up in a PDCA, the model is ready for the next step.

### 3.3 Modeling the Security Risk Management Process – MoSRMP

Smith and Brooks describe four models of frameworks for strategic security management: risk-based, quality assurance, governance security management, and strategic security management [1]. All the inputs, transformations and outcomes of these four frameworks were considered in the construction of the graphic Model of the Security Risk Management Process (MoSRMP) presented here. It also includes an educational and pedagogic level to transmit the contents of the four frameworks. I went on to add a PDCA-inspired loop to the MoSFP and Hale’s description regarding safety: “The culture tools would then more clearly be focusing on the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems” [19].

Altogether, the MoSRMP could support a more systematic approach to the security risk management process. In security training, the educational content can be planned and pedagogically built up using MoSRMP.

Figure 3 illustrates that the loop model is based on four phases: planning and design, training, implementation, and follow up. The process starts with planning and design from the perspective of a participative style of management, where valuing



Fig. 3. The graphic Model of the Security Risk Management Process (MoSRMP).



subordinates is a vital part of the work related to risk control. In the training phase, the primary focus is on changing behavior. Here we need to discuss attitudes, norms, values, beliefs and perceptions. In the implementation phase, a participative style of management is needed to advance the communication of relations to risk. With valuing subordinates, visiting the worksite frequently to follow up on the act and react of risk control and then the loop will go on and on with an increased awareness.

The training results can then be evaluated in relation to the planning method and thus enable one to measure the outcomes regarding the acceptance of the need for security. The parts that are particularly important are during the implementation phase, when the acquired knowledge is put into practice. This should be done with active participation and appreciation of the participants resulting in direct use (“What’s in it for me?”).

## 4 Concluding Discussion

There was a great willingness among the security managers interviewed to achieve a systematic security work process. A certain amount of diversity was seen in the answers because of the different conditions at the individual institutions. This can be explained in part by the interview guide, which was designed to elicit responses based on the respondent’s subjective experience. Different people can interpret such an experience in different ways. This was one of the reasons why the discourse analysis method was chosen when it was not possible to see any clear pattern. More factors than risk management, understanding and behavioral change are needed to succeed in the security management process.

The Model of the Security Risk Management Process enables security managers to establish the conditions for systematic security processes so that all the actors in an organization obtain the same level of security acceptance, awareness and compliance. Because of the different conditions that exist at the various educational institutions, the local circumstances have to be the basis for developing a secure organization. For that reason, the security risk management process in higher education must be performed with a process approach and tools that include more strategy and systematic work to succeed. The MoSFP provides input for the final stage where everything is added together to form a whole. The modeling of the illustrated processes is a suggestion of a tool to use in pedagogical management, a tool for maintaining the systematics in the security management process. The model is not complete, but is still in the theoretical stage and requires validation in practice.

### 4.1 Future Research

The Model for Security Risk Management Process (MoSRMP) will be implemented in upcoming training efforts and studied based on action research and by applying theories of learning organizations [20]. The aim of the forthcoming study is to elucidate if MoSRMP can be used to generate understanding and behavior for security and acceptance of security in a systematic security process.

The following questions are of interest: Can the MoSRMP promote a basic understanding of security, behavior for security, and acceptance of security that then can be used to independently solve future security problems in the participating organization? What parameters are most important for success? What additional measures are needed? What is required in that case to go forward?

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# Applying Decision Analysis to Program Management and Leadership Issues at the U.S. Veterans Health Administration

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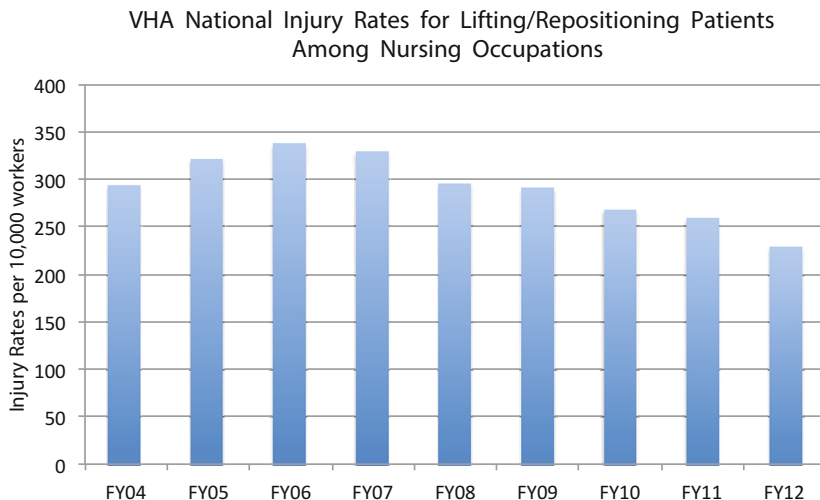
**Abstract.** The Veterans Health Administration (VHA) has long been a leader in developing and applying safe patient handling methods and equipment to reduce caregiver injuries and patient complications. Following a very successful initial program, the VHA faced the challenges of determining if additional efforts were needed and, if so, what form they should take, what it would cost, and the benefits to justify additional investment. By applying Decision Analysis, the VHA was able to create a detailed and compelling new program recommendation and justify the cost. The potential benefits are on the order of \$2 billion per year, which constitute a 4% reduction in the approximately \$50 billion annual expenditures at the VHA.

**Keywords:** Decision analysis · Safe patient handling · Strategy development · Risk analysis · Health care

## 1 Introduction

The physical demands of nursing, especially from assisting, moving, and lifting patients have long been known to result in musculoskeletal injuries. These injuries tend to build over time, with smaller strains leading to more serious injuries and, in some cases, inability to perform critical nursing tasks. Efforts over the last thirty years to reduce these injuries through training in body mechanics and proper lifting techniques and elimination of “weaker” staff failed to improve outcomes.

Beginning approximately seventeen years ago, the U.S. Veterans Health Administration (VHA) and, specifically, the VHA’s Tampa Patient Safety Center of Inquiry developed a program using specialized equipment (slings, portable and overhead lifting equipment, etc.) to help caregivers mobilize patients [1]. Following successful initial program results, the VHA issued in 2008 an Executive Decision Memo (EDM) [2, 3] providing \$205 million to fund safe patient handling initiatives at VHA medical centers. These funds were supplemented with monies provided by the individual VHA medical centers. As shown in Fig. 1, implementation of this program produced a marked reduction in musculoskeletal injuries in nursing occupations from lifting or repositioning patients. The EDM was followed in 2010 by an Executive Directive expanding the program to all patient care areas in the VHA, but did not provide additional funding to do so.



**Fig. 1.** Reduction in musculoskeletal injuries among nursing occupations at VHA medical centers from lifting or repositioning patients following implementation of a safe patient handling program with funding individual medical centers and from the 2008 Executive Decision Memo.

## 2 Program Management and Leadership Challenges

When incremental funding under the EDM ended, it was up to individual VHA facilities to continue or expand safe patient handling programs. Capital expenditures were required for purchase of equipment. In particular, lifts attached to tracks installed in ceilings (“ceiling lifts”) are particularly helpful for mobilizing patients in high acuity, cramped areas (such as intensive care units) but are expensive to purchase and install, often requiring structural retrofits. Ongoing expenses include consumable items (slings, slide sheets, etc.), training, and program management personnel.

Once incremental funding from VHA headquarters ended, budget-constrained facilities had to allocate limited available funds among all competing programs, including safe patient handling. It was difficult to obtain funding for new purchases and equipment maintenance. Program management personnel were stretched, often needing to handle very large or multiple facilities. VHA personnel were concerned that hard-won gains in patient and nurse safety were being eroded by budget pressure.

In addition to funding challenges in maintaining the existing program, the VHA faced a fundamental question: where to go next with the program? The VHA was the recognized leader in safe patient handling, so there was no generally accepted progression to follow in continuing the program.

Lastly, personnel changes at VHA headquarters had left the safe patient handling program without a strong, senior-level advocate. The VHA is the largest integrated health care system in the U.S., providing care at 168 VA Medical Centers and 1,053 outpatient sites of varying complexity and serving 8.9 million Veterans every year. Among the many priorities facing the VHA, it was hard to argue that, following a very successful initial program, safe patient handling should remain a top priority.

VHA personnel became aware of the successful application of Decision Analysis to safe patient handling in general [4] and at Stanford University Medical Center in particular [5]. They decided to pursue the application of Decision Analysis to meeting safe patient handling program management and leadership challenges at the VHA.

### 3 Decision Analysis

Decision Analysis is a better way of making high-quality decisions in uncertain or complex situations [6–8]. As illustrated in Fig. 2, decision analysis works by structuring the interchange between the two thinking modes we are all equipped with [9]: our intuitive, fast thinking and logical, deliberative slow thinking.

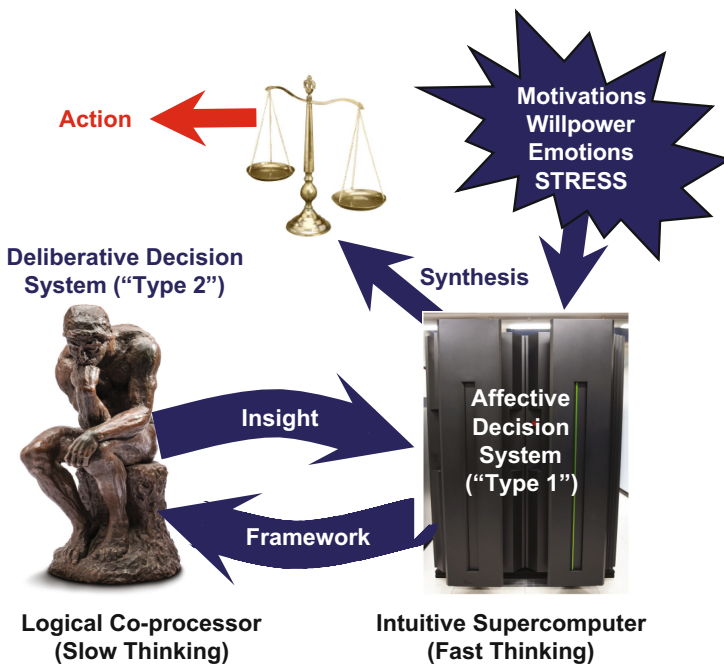
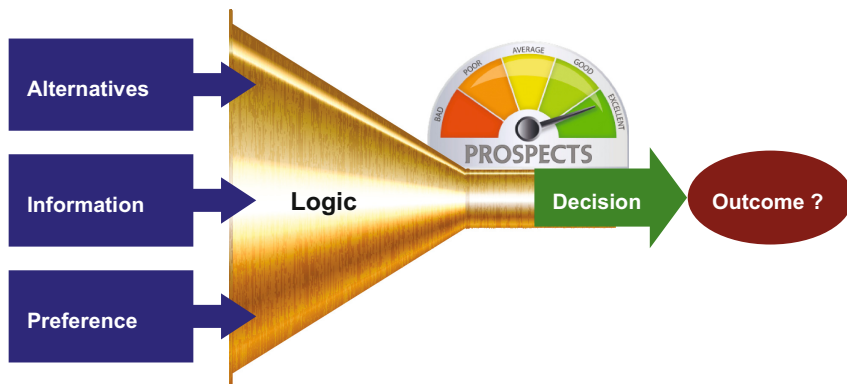


Fig. 2. Decision analysis frames the interchange between intuition and logic to create a compelling rationale for which alternative is best and why.

Our intuition furnishes the framework for the decision: the alternatives, information, and preferences. We use logic to formulate these into a quantitative model. Analysis on the model provides insight as to which alternative is best and why.

People typically make decisions with heavy reliance on intuition. Unfortunately, intuition all too predictably and repeatedly leads us astray [9]. Hence the need for a formal approach to integrate effectively the two modes of thinking. These elements of good decision and their integration are illustrated in Fig. 3.



**Fig. 3.** The elements of a good decision integrate intuitive and logical thinking.

Making a good decision maximizes your prospects of a good outcome, but doesn't guarantee it—although people commonly evaluate whether a decision was good or bad based on the outcome. From a decision analytic approach, we say that a decision was good if all the elements of the decision stand up well to scrutiny *at the time the decision is made*. All looks clear in hindsight; making good decisions with opaque future prospects is a far more difficult challenge. Decision analysis meets this challenge so well that it is standard and required in high-risk, capital-intensive industries, such as drug development and oil and gas exploration [10].

#### **4 Alternatives, Information and Preferences for Safe Patient Handling at the VHA**

Decision Analysis employs a number of tools to structure the elements of a good decision and the interchange between intuitive and logical thinking. The VHA project started by employing several of these tools to structure the alternatives.

First, we created a decision hierarchy to sort the possible decisions into three categories of Policy Decisions (taken as given), Strategic Decision (which need to be made now), and Tactical Decisions (which are important, but can be made later). The decision hierarchy for safe patient handling at the VHA appears in Fig. 4.

For each strategic decision identified, there were a number of specific decisions required, as shown in Fig. 5.

To develop alternative strategies, we developed a Strategy Table. In a strategy table, each decision heads a column and alternatives for that decision are listed underneath. We identify comprehensive strategy definitions by making one or more choices in each column. Reading the selections across the columns specifies the strategy. For convenience, the first column lists a short name for each strategy and color-coded boxes show the selections.

Defining the strategies for safe patient handling at the VHA was a complex process, requiring a number of workshops with participants from across the U.S. The final

### Decision Hierarchy for VHA Safe Patient Handling

**Policy Decisions**  
--take as given

- An Executive Decision Memo (EDM) has been issued, but funding has been exhausted
- There is currently no headquarters funding for safe patient handling
- Additional efforts would be required to finish implementing the EDM
- The Executive Directive potentially covers all areas where patients are handled

**Strategic Decisions**  
--to be made now

- Additional funding (if any)
- Scope of program
- Equipment
- Personnel
- Policies
- Communications
- Data acquisition

**Tactical Decisions**  
--important, but can be decided later

- Order of rollout
- Vendor selection
- Design of additional research (needs and equipment)

**Fig. 4.** The decision hierarchy for safe patient handling at the VHA sorts the possible decisions into three categories.

Scope of Program	Facilities
	Special Needs Populations
Equipment	Additional Equipment
	Supply Chain
	Engineering / Facilities Management
Personnel	FTE Staff
	Training
	Leadership Support
Policies	Compliance
	SPH Performance & Measures
	Training Materials
Communications	Communications Out
	Patient Involvement
	Web-based Communications
	Communications In
Data Acquisition	Surveys

**Fig. 5.** General and specific strategy decisions for safe patient handling at the VHA.



Candidate Strategies	Scope of Program	
	Facilities	Special Needs Populations
Status Quo	Status Quo: focus on VA Medical Centers	SQ: no specialized Programs; research on SCI patient handling needs
Finish Implementing EDM, expand program to cover other areas within facility not originally included and include bariatrics	Add bariatrics and areas not included in EDM to go facility-wide	Add Bariatric Program Add Falls Prevention Program Add Wound Care Program
Fully Executive Implement Directive	Fully Implement Directive Add Rehab Facilities, Primary Care Centers, CBOC's, Home based Health, Assisted Living Facilities, Domiciliaries Ensure sustainability of PL Program Funding for Future Growth	Add Research to further define patient population needs and impact on quality of Patient Care

**Fig. 6.** The first three columns of the strategy table show strategy themes in the first column, followed by selections for the scope of program decisions.

strategy table was equally complex, comprising a 17-column table with pages of explanatory footnotes. For brevity, only the first three columns are shown in Fig. 6.

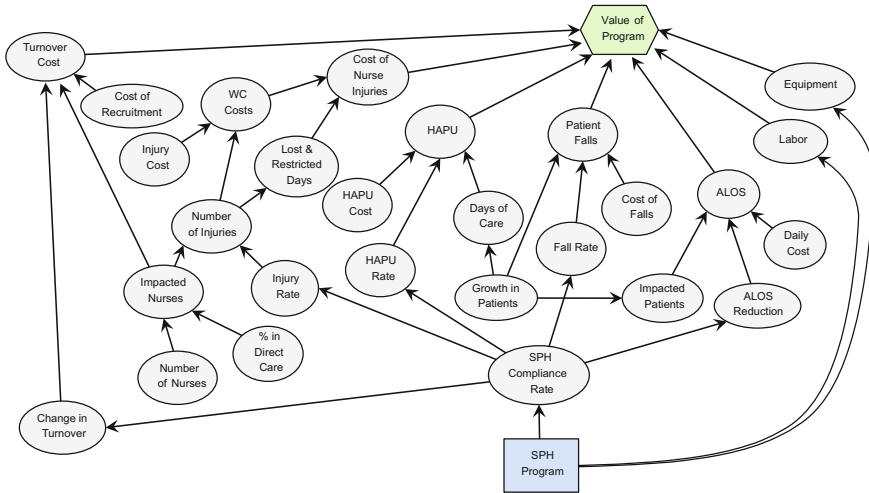
We developed three alternative strategies: Status Quo (no new efforts), Finish implementing the Executive Decision Memo (EDM) with some expansion, and fully implement the Executive Directive. For the latter two strategies, we calculated the cost to implement them without specifying how much funding (if any) VHA headquarters would provide.

In contrast to many other decision-making methodologies, in Decision Analysis we identify and evaluate the “do nothing” or Status Quo alternative. Deciding to do nothing is also a decision. Quantifying the effects of the Status Quo often furnish an important baseline for quantifying the incremental costs and benefits of doing something, as in this case.

Once the strategies have been defined, we need to structure the risks relevant to the value of each strategy. For this purpose, we use a Relevance Diagram in which decisions are specified in boxes, value by a hexagon, uncertainties by ovals, and arrows show what is relevant to what, as shown for this project in Fig. 7.

The Relevance Diagram is part of the information for a good decision. We also gathered all relevant historical data for each uncertainty and assessed the uncertain future prospects for how each uncertain factor could be impacted by choice of strategy. For this process, a key distinction in Decision Analysis is the use of subjective, Bayesian probabilities to capture a person or persons’ best judgment as to how things might turn out.

For the VHA, assessing the uncertainties was likewise an intensive process in which we gathered a team of approximately thirty VHA experts for a series of all-day



**Fig. 7.** The Relevance Diagram for safe patient handling at the VHA shows the relationships between the strategy definitions, the uncertainties, and the value of each alternative strategy.

workshops in which we reviewed the available data and assessed the uncertainties. The final uncertainty assessments covered approximately sixty variables.

A key insight which emerged from the assessments was that we needed to consider the potential strategy impacts in terms of the compliance rate: the proportion that safe patient mobilization equipment and methods should be and were actually used. We could then think about the compliance rate achievable in each strategy and the possible effects from a given compliance rate. These assessments are shown in Fig. 8.

Care Area	Current Conditions	Status Quo (at end of 5 years)	Finish EDM (3-5 years to max)	Finish Directive (3-5 years to max)
CLC (nursing home)	40-95%	5-50%	60-95%	70-95%
Critical Care	25-80%	5-60%	60-85%	80-95%
Inpatient non-critical	5-70%	5-30%	25-80%	70-90%

**Fig. 8.** Assessed ranges of uncertainty for safe patient handling compliance at the VHA.

This key insight allow the assembled experts to think carefully about program impacts at 0% and 100% compliance rates for key factors, as shown in Fig. 9. Actual impact for any intermediate result could be estimated by interpolation.

As the assessments are made, they are incorporated into a quantitative model, often programmed in Excel. For analysis, the model must include means of switching between alternatives and assessed values so that any scenario can be calculated for any alternative. In this case, we showed strategy values as the incremental value over the

Uncertainty	10% chance actual will be lower than	50/50 chance actual will be above or below	10% chance actual will be greater than	Notes
Injury rate at 0% compliance	60	70	80	Per 1000 FTE in patient care
Injury rate at 100% compliance	15	20	25	Per 1000 FTE
Reduction in injury severity at 100% compliance	40%	60%	80%	
Non-reported injury costs relative to reported costs	0.2x	1x	3x	Multiplier on reported injuries
Average cost per injury, medical	\$3,000	\$5,000	\$7,000	Stanford data
Average cost per injury, compensation to worker	\$2,000	\$4,000	\$6,000	Stanford data
Average lost & restricted duty days per injury	15	41	58	Stanford data

**Fig. 9.** Part of the Bayesian assessments for the VHA.

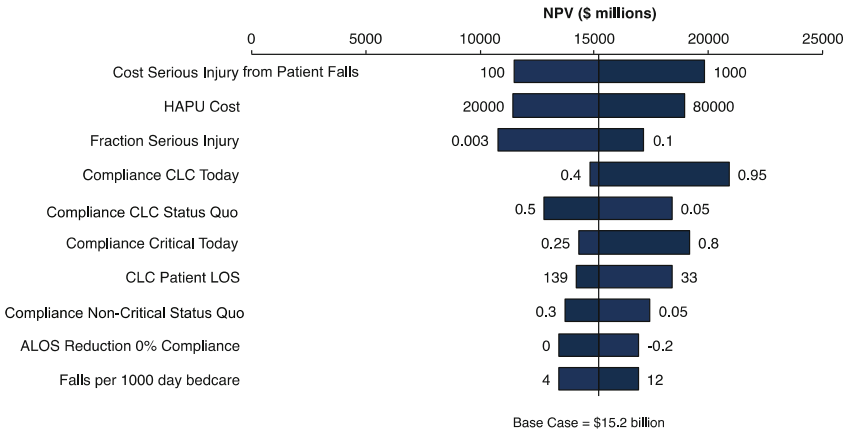
Status Quo alternative. The incremental value of the Status Quo alternative is then zero by definition.

Year-by-year values are summarized by a net present value, in this case over a 10-year period. The discount rate captures the preference for time value of money. A risk tolerance describes an exponential utility function and captures the risk preference [6–8]. For this analysis, we used risk-neutral results because possible values, although large, are small relative to the size and means of the U.S. Government.

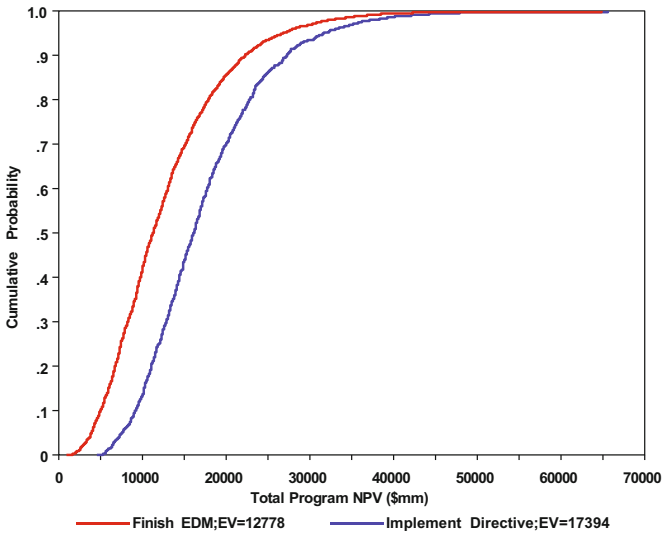
## 5 Analysis

While building the model, the analyst typically ensures that scenario switching works and that results in various scenarios make sense. The next step in debugging and analysis is to run and plot the values for a particular alternative with each uncertainty set one at a time to its low and high values. This is called deterministic sensitivity analysis. Plotting the variation as bars arranged from largest to smallest yields the characteristic “tornado graph,” as shown in Fig. 10 for the most important uncertainties for the fully implement Executive Directive alternative. (The complete chart displayed results for all sixty uncertainties.)

Typically, the most important uncertainties account for more than 90% of the value risk. These uncertainties for each alternative go into a decision tree which calculates all possible scenario values for each strategy. The strategy values are then summarized in a cumulative probability distribution as shown in Fig. 11.



**Fig. 10.** Tornado chart for the most important uncertainties for the incremental value of fully implementing the Executive Directive over the Status Quo.



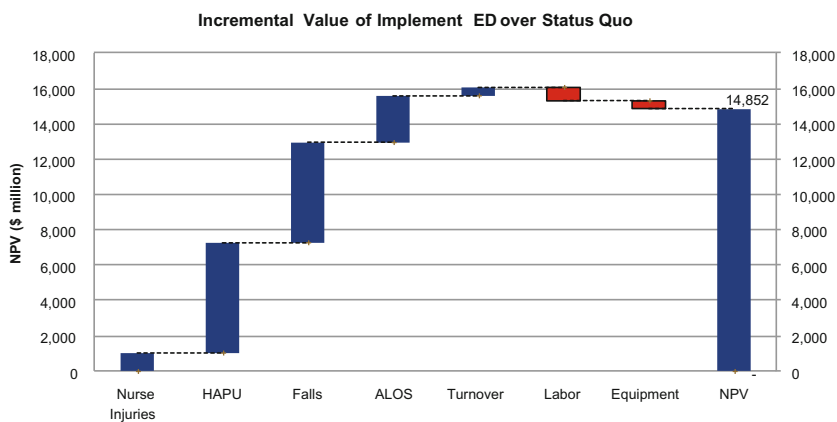
**Fig. 11.** Cumulative probability distributions for the incremental net present value of each alternative over the Status Quo.

## 6 Insights and Conclusions

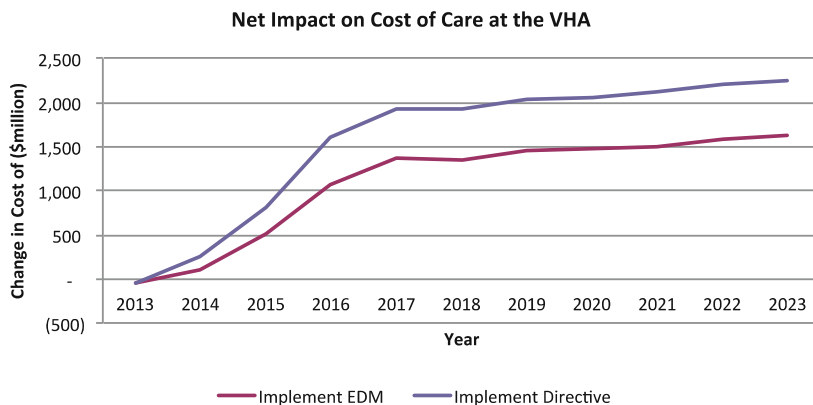
As analysis is completed and we’re satisfied that the results make sense and can be explained (both in terms of the rationale for the inputs and how they flow to the results), the task becomes how communicating the insights and recommendations to the decision makers.

One major insight flowed from the compliance rate assessments in Fig. 8: there was tremendous uncertainty about how widespread the current utilization of safe patient handling equipment and methods was, but that utilization was expected to drop off in the coming years without further support. As was already beginning to become evident in the data reviewed at the time, there was a real danger that existing progress would be seriously eroded. This effect stemmed from factors like program leaders being stretched thin, equipment not being maintained as functional (including batteries charged, etc.), slings not being available to accomplish lifts, etc.

On the other hand, a new program could dramatically increase program utilization and narrow the uncertainty (a risk reduction). This could reduce nurse injuries, hospital-acquired pressure ulcers (HAPU), patient falls and associated injuries, average length of stay (ALOS), and nurse turnover. The incremental benefits in each of these



**Fig. 12.** Waterfall chart for sources of incremental value and cost for fully implementing the Executive Directive (ED) over the Status Quo.

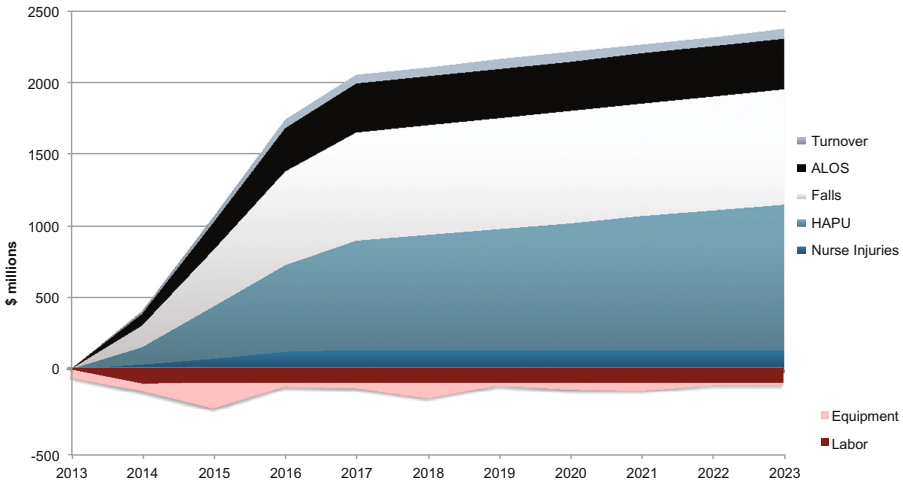


**Fig. 13.** Base case net annual impact on costs at the VHA for either fully implementing the Directive or the Executive Decision Memo (EDM).

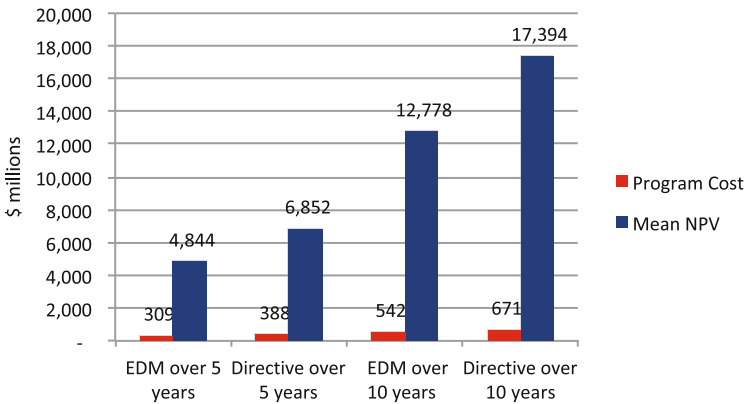
measures, the associated additional labor and equipment cost, and how they add up to a base case net present value (uncertainty not considered) is shown in Fig. 12.

As shown in Fig. 13, the annual impact on the overall cost of care at the VHA could be on the order of \$2 billion per year. With an annual VHA budget in 2013 of \$53 billion, this initiative could reduce the overall cost of care at the VHA by about 4% while increasing the quality of care.

Taking a closer look at the preferred alternative of fully implementing the Directive, Fig. 14 shows the annual base case incremental net benefits and the cost of implementation.



**Fig. 14.** Base case change in the annual cost of care and the cost of implementation for fully implementing the Executive Directive over the Status Quo.



**Fig. 15.** Mean incremental benefits and program costs for both alternatives over five- and ten-year time frames.

Although these base case results are useful for showing year-by-year results and detailed breakdowns, we also need to consider overall prospects with the uncertainty. These are shown in Fig. 11, but we sometimes show the mean net present values in simpler form. Figure 15 shows the mean incremental values and program costs for both fully implementing the Executive Decision Memo (EDM) and fully implementing the Directive over both five- and ten-year time frames.

This study took some time to complete, mainly due to the time to gather data and schedule the necessary all-day workshops. The results were presented at a dramatic 5 pm Friday meeting at the VHA Central Office on K Street in Washington, D.C.—the only time all the senior decision-makers were available.

The results were clear and startling. There was a path forward and much more could be done, even though the VHA was already the recognized leader in safe patient handling. The costs were minimal relative to the benefits. And the potential benefits were staggering. The results were taken into the complex decision-making and prioritization process at VHA. A new program would not be easy to sell, but if offered the prospect of systemic and significant improvements across the entire VHA.

**Acknowledgments.** The author would like to acknowledge the efforts of the many dedicated and hardworking personnel at the VHA who made this work possible.

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# Leadership and the Role of Information for Innovation, Security and Knowledge Based Management

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**Abstract.** Information management is an important factor for organizations - as important as people, capital, and technology. Research results presented in this article based on an exploratory study done by the authors in the frame of the research project at the South-West University “Neofit Rilski”, Blagoevgrad, Bulgaria in 2016 give reason to assume that creativity of managing processes is reflected not only in the ability of leaders to implement innovative situational approaches, but subordinate knowledge for the application of such approaches. We assume that the management of information becomes creative management only when it is based on relevant knowledge. The entire lifecycle of information - its existence, methods of collection, classification, storage, distribution, use, etc. contains the potential for creativity and innovation serves as a knowledge tool. We argue that leadership and knowledge based management are incompatible with the uncertainty of any kind.

**Keywords:** Leadership · Knowledge based management · Information uncertainty

## 1 Introduction

The role of knowledge in society grows unprecedented. Knowledge and human capital are the most important resources in our modern times. Not by chance in the European program for smart, sustainable and inclusive growth (Europe strategy 2020)<sup>1</sup> there is a requirement for 40% higher education among the young people. Knowledge is the foundation of creative people and innovative processes in each unit – organizational-management, product, strategic, ideological, and so on. This suggests their permanent development. Innovation is knowing padded<sup>2</sup> on every level. It is filled

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<sup>1</sup> Europe 2020 strategy for smart, sustainable and inclusive growth (‘Europe 2020 strategy’).

<sup>2</sup> A vision of the digital world in 2030. Central paradigm: from “Mass Collaboration” to “Knowing Society” <https://www.eifonline.org/digitalworld2030.html>.



with meaning and content not only when organizations define problems in knowing innovative way, but when an organization, actively develops new knowledge to solve them [1]. Knowing innovation in governance is based and could be directed in several directions: in recognizing the new in emerging knowledge; in comparing the pros and cons of the new elements in previously existing processes and practices; analysis of possible applications and their effects; - in creating innovative conceptual frameworks and their components; in the preparation and persuading the human capital; in approbation of innovative implementations; in analyzing the effectiveness of innovative implementations; in positioning or reject the innovative approaches. For performance of all these stages undoubtedly awareness is the foundation, but innovation can insist that only when people's awareness has turned into a creative resource-analytical, counterfactual, prognostic, creative, managerial and extreme in such a "carrier" that facilitates the creation of more and more knowledge and their sharing and implementation. "Whilst knowledge management does involve information management, beyond that it has two distinctive tasks: to facilitate the creation of new knowledge and to manage the way people share and apply it [2].

## 2 Methods

To highlight the state leadership and the attitude of the leaders on the role of information for innovation, security and knowledge based management, we have made exploratory research among 40 leaders of middle and high level in Bulgaria's capital city – Sofia in November 2016 in the frame of a research project at the South-West University "Neofit Rilski". The research was conducted via online survey with leaders who responded from a pre-prepared list. We received replies from 22 leaders of middle management level and 16 leaders from the highest executive level - representatives of industry and services. To make a comparison, we used the results from a similar study of the Bulgarian branch of the International consulting company for direct selection Stanton Chase among business leaders of local and international companies<sup>3</sup>. In the study of Stanton Chase more than 180 senior managers were involved. The majority of them (18.8%) were representatives of the industrial sector, followed by the sector of consumer goods and services (18.3%), representatives of professional services (11.8%) and the financial sector (11.3%), 9.1% were of telecommunications sector and, and another 6.5% of the pharmaceutical sector. More than half of the respondents have managerial experience between 6 and 15 years and were between 41 and 50 years of age.

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<sup>3</sup> See: What new skills companies seek personnel. In: Pariteni. <http://www.pariteni.bg/?tid=40&oid=204763> (2017).

### 3 Results

#### 3.1 Positive Aspects

Knowing management is actually based on awareness in all of the stages, but extends beyond it and grew into an innovative approach for effective positioning and development of organizational units. Findings of the exploratory study show that there is a higher self-assessment for managing of information by the leaders of high-level management, and relatively balanced assessment at mid-level leaders. Approximately 70% for the former and 60% for the latter.

This high evaluation refers to these few qualities that they possess a high degree:

- in their ability to select what is really new from the latest knowledge;
- to analyze the possible applications and effects;
- to be innovative, to persuade contractors.

Both categories of respondents appreciated high knowledge based management and the role of knowledge in modern management - 87.4% of the leaders of high level and 89.7% of the leaders of middle level.

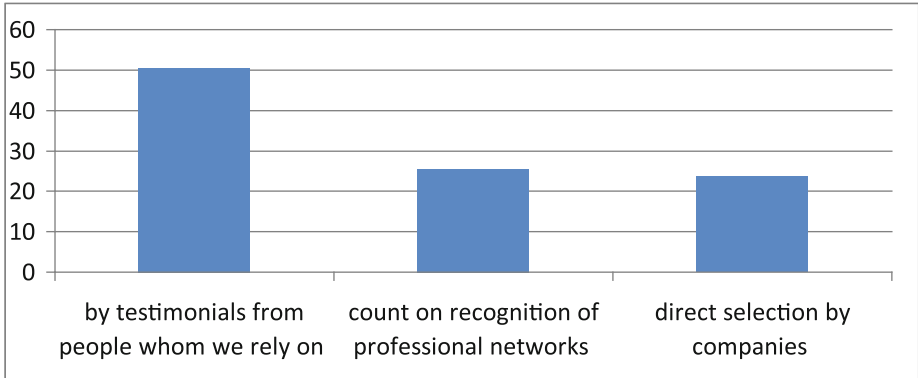
The results are almost identical in presenting the vision for the development of management of information. Creativity and flexibility in the use of knowledge management are dimensions which prevail in high-level executives and managers from the middle level. There is a relative match in the creative principles of maintaining stability and improving the position of the organizations. Managers of middle level attach greater importance to creative approaches to inclusion and assessment of people in the tasks. Managers of high level in contrast, rely on the creativity of mid-level managers and the other workers. In the open question, which seeks to describe possible ways to facilitate the managing of the data reveals some variety in the responses. The summaries we made on directions for facilitating the management of information are as follows:

- *at high level managers:* motivated employees - 84%; innovative and creative persons - 83,2%; technological educated people - 83%; individuals develop skills for handling datasets, including large datasets (Big data) - 82,1%.
- *at middle level managers:* to trust them more - 82%; to delegate them more power - 71.8%; to provide them with autonomy - 69%.

In close connection with the vision of the respondents to the further development of management are the views of the respondents on the policies which should be developed for existing and future practices.

In high-level managers the policies and relevant practices related to seeking and finding qualified personnel that should have: creative potential - 87%; ability to work in a team - 86.6%; innovative thinking - 86%; loyalty 82.9%; striving for permanent awareness and self-education - 80.2%.

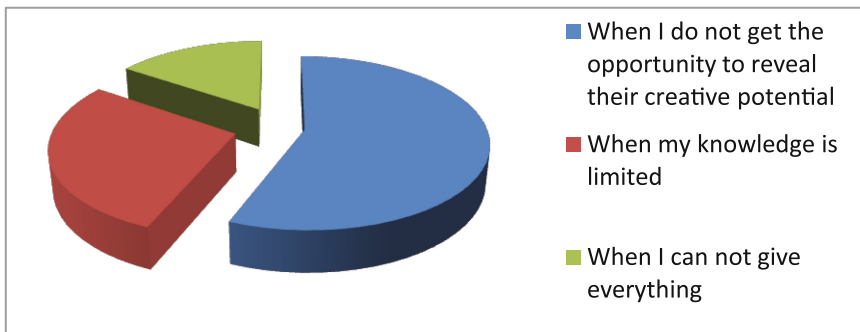
Not accidentally, the question “How do you usually pick your subordinates” managers of high-level answered (Fig. 1):



**Fig. 1.** How do you usually pick your subordinates

Managers of middle level believe that to rely on good policies and practices managers of high level must possess and continuously develop: greater awareness - 88.4%; creativity - 88%; strategic thinking 87%; ability to delegate work to the right people - 84.07%; communication skills 84.03%; diplomacy - 80.52%; flair to the new - 79%;- humor 67%; proper recruitment - 66.7%; skills for valuing one’s subordinates - 54%.

Not accidentally the question: “When do you want to change your employer” the responses of the middle level managers are (Fig. 2):



**Fig. 2.** When do you want to change your employer?

- When I do not get the opportunity to reveal their creative potential - 56%;
- When my knowledge is limited - 30%;
- When I cannot give everything - 14%.

Overall creative approaches to information management and innovative thinking are shared with similar values of both categories of respondents. Creativity is an output as a key dimension in almost all the answers of both types of respondents. Both categories of respondents raise the knowledge cult. Its role in the successful

management, leaders of high-level advocate the idea that “if government is not based on a continuous exchange of knowledge, it cannot count on success”. Indicative are the results of the study of Stanton Chase Bulgaria by the end of 2016, in which over 180 senior managers gave their answers.

In their approach to seeking new and successful talent managers in Bulgaria mainly used:

- recommendations and references - 72.6%;
- their personal and professional network - 65.6%;
- partner for direct selection - 36%.

“It turns out that companies are looking predominantly for innovative and creative leaders who have the qualities to lead the organization to change and success. Technological innovation, digital marketing, IT Security, efficiency production principles (LEAN), and process of large data sets (Big data) are among the new areas of expertise needed by companies today in Bulgaria” – considered Darina Peneva, Executive Director of Stanton Chase International Bulgaria. According to Peneva, there is more and more need of professionals in areas such as technological innovation, digital marketing, sales, and IT security.

Leading factors which would make top executives to change their current employer are: responsibilities without delegated powers - 71.8%; level of autonomy and independence - 69%; self-directed learning and self-education are listed first by the respondents - 81% as a basic tool for personal development, followed by leadership development - 63.2% and trainings - 61.1%.

On the question: “Which are the essential qualities and skills required by managers?” the survey obtained similar results. The answers include: strategic thinking - 87.04%; financial literacy - 66.67%; general technical literacy 66.67%; knowledge of best practices - 50.93%; skills negotiation 50% 44; project management - 43.52%; culture of work in a corporate environment - 37.04%; communication skills - 24.07%; knowledge of European law - 24.07%; resistance to stress - 16.67%; diplomacy 10.12%; presentation skills 7.41%.

### 3.2 Negative Aspects

The main problems which result from the exploratory research are the questions corresponding to the terms “information uncertainty” and “trust in the information.”

Lack of trust in information is shared mostly by middle managers. 52% of them say that they have problems in this regard. Frequent change of information was also noted as a deficiency in information management by managers of high level.

Over 50% of middle managers say that there are intrusive feelings of “information overload” among staff.

In similar size (49%) is the feeling of mid-level managers for repeatedly disseminating the same or similar information.

Managers at a high level report higher percentage of frustration with regard to the organization of “records of history” of the corporate memory itself, as well as to the existing standards for distribution and publication of information.

## 4 Discussion

Information management is an important factor for organizations – as important as people, capital, and technology. Information, and especially modern information, requires a special management approach. The establishment of appropriate policies in making management decisions is increasingly associated with a demand for effective tools for information management. This determines the need for recognition improving the management and use of information as a strategic resource and value for organizations. Relevant understanding of how and what information should be collected, how to use and share, for standardization and for responsibility for its preservation are prerequisites for capitalizing on the value of information and the creation of new knowledge. We need leaders who take action to optimize their investment in information through creation of planning and management of information. A common mechanism for management of information which is the basis of this process would create a culture of comprehensive management of information flows. This would allow more efficient positioning of organizations in the surrounding competitive environment and improving their interaction with customers and business. Today the management of information by the leaders not only includes planning, directing and controlling all information resources of organizations to meet the overall objectives and provide programs and services, but a creativity of these processes. The management of information is a possibility for leaders to creative management. Otherwise the management of information is a creative management, based on knowledge. The entire lifecycle of information is positioned in new leadership management knowledge, presupposes security and innovation.

The main problem which has resulted from the survey is “information uncertainty”. Some of them are: lack of trust in knowledge; information is often replaced; difficulties of storing electronic documents and files; intrusive feelings of “information overload” among staff; repeated dissemination of the same or similar information; insufficiently organizing recordings of “history”, and loss of corporate memory; inconsistent standards for distribution and publication of information.

Both leaders highlighted the importance of people, communication technology and knowledge to innovative approaches for efficient management, regardless of occupied positions. In this triad the importance of individual factors varies depending on their degree of availability and awareness. Without underestimating the least other factors, knowledge has increasingly more dynamic role in organizing people and technology for effective functioning of organizational units [3, 4].

In the era of globalization, digitization and knowledge are not only given once, but on the contrary. Their dynamism hampers their traceability and values structuring. Therefore peculiar type of management skills available knowledge as well as their completion is a key element in a government relying on knowledge. It is this ability which gives rise to the display a new type of leadership - leadership 3.0. If traditional management, which focuses primarily on people for innovation could be defined as management 1.0 and 2.0 - management combining the importance of people and technology, 3.0. is a combination of all these components. In this combination of key importance is the ability of leaders preemptively “juggle” with the knowledge and

apply innovative management organizations, according to the circumstances. Management 3.0. is the modern type of knowledge based management. Therefore the management of information flows is an important factor for organizations - as important, as appropriate to the work of people, capital, and technology.

Modern knowledge requires specific management practices. Increasingly looking for effective ways to build relevant situational policies for knowledge management to facilitate decision-making, maximizing the value and benefits of knowledge. For innovation can insist that only when people's awareness has turned into a creative resource-analytical, comparative, prognostic, creative, managerial and extreme in such a "carrier" which facilitates the creation of more and more knowledge sharing and in their implementation. Knowing management<sup>4</sup> is actually based on knowledge but extends beyond it and grew into innovative approaches for effective positioning and development of organizational units.

To successfully apply innovative approaches and to function successfully one organizational unit should provide several requirements: any activity which results in an information product; to optimize the classification of the same information products on various criteria - theme, policies, approaches, decisions, best practices, satisfaction of customers; to catalog information products cross criterion measures; to carry out analysis of classified information products and explicate new knowledge of this analytical basis; to analyze and disseminate among the artists emerging new knowledge to serve as expert suggestions and relevant solutions for strategic planning and so on. The creation of bases of knowledge with mono-line and crosscriterion measures would assist the implementation of innovative approaches to analyzing and establishing a knowing constructs to be used for strategic planning.

These opportunities, in turn, would allow several developments: the use of created knowledge for adequate endeavors; satisfaction of obtaining new knowledge; self managing of knowledge; application of the best approaches to specific initiatives; using of stored data for multivariate solutions; planning process to be based on improving the tested practices; commitment to motivating opportunities to participate in innovative implementations; successful situational practices. Fiol (1996) argued that the potential of organizations to generate innovation outcomes is dependent on the previous accumulation of knowledge that they have absorbed [5].

Situational specifying the information to be collected, its classification, use and sharing is a key for dynamic advanced processes requiring the application of flexible innovative approaches [6–8]. On the other hand, ways of storing information, its classification and codification are also knowing determined prerequisites for capitalizing on the value of information and the creation of new knowledge. Creativity in the creation of mechanisms for information management means creating a culture of comprehensive management information processes. One such culture of knowledge management would enable more efficient functioning of organizations in the dynamic competitive environment.

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<sup>4</sup> See: What Place for Europe. A vision of the digital world in 2030. Central paradigm: from "Mass Collaboration" to "Knowing Society" <https://www.eifonline.org/digitalworld2030.html>.

## 5 Conclusion

Knowledge based management is an opportunity for leaders to manage far better processes in organizations and make full use of the potential of middle level managers and personnel. At the same time an opportunity to assist the successful combination of factors is management 3.0.

Research results give reason to assume that creativity of managing processes is reflected not only in the ability of leaders to implement innovative situational approaches, but subordinate knowledge for the application of such approaches. Otherwise information management becomes creative management only when it is based on relevant knowledge.

The entire lifecycle of information – its existence, methods of collection, classification, storage, distribution, use, etc. – contains the potential for creativity and innovation serves as a knowledge tool. Leadership and knowledge based management are incompatible with uncertainty of any kind.

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# Workplace Stress Assessment Among Managers of Textile Industries at Developing Countries: A Case Study from Pakistan

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**Abstract.** Textile Industry is the principal manufacturing Industry of Pakistan and has great standing in worldwide businesses. This sector provide employment to around 15 million people. Because of socio-technical complication of working frameworks alongside abnormal state of desires, workplace stress management has turned into a zone of profound concern where textile segment is no exemption. The goal of the present work is to assess the level of perceived stress amongst managers of textile sector organizations. In the study, Sheldon Cohen's '10' items PSS, 'Perceived Stress Scale' was used to collect data from managers belonging to different areas of textile organizations. Around 48% of the subjects were found under high level of stress. Organizations, therefore, are obliged to affluence the circumstances in an attempt to take utmost advantage of their human resource by confirming their well-being at all echelons.

**Keywords:** Workplace stress assessment · Perceived stress · Textile sector · Managers

## 1 Introduction

Manufacturing sector is the major sector in Pakistan and amongst, textile industry is the biggest. It undertakes to be a fundamental player in state's economy. The sector gives nine and half percent in the GDP and makes occupation available to around thirty percent of 49 million personnel in the country. With around 52% of the total export, it holds onto being backbone of country's exports. Moreover, textile sector declares to be the main employment generating sector in the structured and big industrial domain. In Asia, Pakistan is at number eight amongst prime exporters of textiles and clothing; fourth largest cotton producer, around 12 mln bails/year; and at number three in Asia as far as spinning capacity is concerned where China is at number one and India at two. Its contribution in the world's total spinning capacity is 5% [1].

For textile organizations, like lot of other commercial organizations, competitiveness is amongst major challenges. So as to encounter it: furtherance in quality and production; and ideal utilization of the resources are among pivotal elements. The emphasis of top management in the direction of increasing quality and production,



placed a massive pressure on the employees that ultimately origins job stress and it is become an emblematic concern as dominance of the situation is growing progressively. It is the prime source of above 50% of all malaises, conversely, figuring it out has not been deeply contemplated yet. Objective of the present work is to discover plausible explanations behind the workplace stress. Examination of the literature, on the topic, revealed that stress exists and is inescapable; nevertheless treatable.

Appropriate utility of human resources is critical to achieve the maximum for the organizations. Henceforth, wellness of HR is a concern for the stake holders: companies; states and nations where 'workplace stress' is a remarkable subject for those worrying about the wellness of their human resources. Resolving stress interrelated affairs is vital, as man is a basic constituent manipulating implementations and protection of every item belonging to the entities; and items include assets, revenues, profits, values and images of the organization etc. Steadfastness of the human resources is strongly coupled through workplace stress [2, 3].

Copious research work is done on workplace stress wherever major emphasis is seen in sports, medical services, and employment in a broad-spectrum besides some segments alike teaching where educators have been noticed experiencing extreme stress [4-6]. Workplace stress is understood as a real wellness matter for employers as well as employees. Tense working situations results in adverse effects such as stomach trouble, nervousness, "cerebral pain", besides "cardiovascular" ailment [7]. It impacts entire functioning of entities, henceforth correct contemplation must be given for its culmination [3]. Despite that, causes, effects and possible intervening and controlling essentials of the "stressor-strain" connection haven't yet been clearly seen, like so, it is elementary to make an attempt for value-added comprehension of the process of workplace stress [8].

Weak individuals are more vulnerable to stress and same is true for those at workplace. It is found that every year, around 91.5 million week days are vanished because of stress-related infirmity [9], henceforth it is a notable hurdle in reaching organizational execution [10]. Negative impacts result in: lessened efficacy, abridged capacity to accomplish, declined zeal, extended inflexibility of conception, nonexistence of compassion for organization and mates, and exhausted commitment [11].

Organizational changes, often, steers to stress and boosts impairment/ailment. Instances of such changes may be: downscaling, implementation of novel paraphernalia, and innovation [12]. Pitiabile societal environs, deficiency of backing as of associates as well as superiors and dearth of family amiable approaches, and unreasonable deadlines are deemed as stressors [5] besides nonexistence of self-rule, weak interpersonal communication and dangerous corporeal settings [9, 11, 13]. Furthermore, stress arose when statutory disputes bias organizational adoptions instead of accomplishment. For professionals and qualified workforce, shop floor politics may be spiteful [14, 15]. Functioning in a vast, unindustrialized and inflexible group, where personnel have less authority on making their choices, may results in dangerous level of stress. Totalitarian administration stylishness of the bosses: fetches great staff renewal rate; high truancy; and scarcity of zeal amongst subordinates. For in-house auditors, absence of persuasive inward communication, outrageous formality, and seemingly incessant filing has been established extraordinarily upsetting [6, 14-17].

## 2 Method

Extensive collections of archives outlined as printed/unprinted reports and papers on workplace stress have been studied, particularly, perceived stress by individuals at work in order to make theoretical base and elaborate investigation procedure. Since the study aimed at investigating stress levels of employees working at middle and lower management levels, a stress measuring instrument was to be designed or chosen. For the purpose, Sheldon Cohens's PSS, 'Perceived Stress Scale' [18], was selected. Most of the wide spread state of the art literature has used PSS in such examinations. There are three versions of PSS: PSS-4, a 4 items' scale; PSS-10, a 10 items' scale; and PSS-14, a 14 items' scale. Amongst, PSS-10 is used in the present study as it is not only a validated stress measuring instrument, besides it covers all the psychometric features while matched with PSS-14 and also squatter the instrument thusly consumes not as much of time of the respondent. Feedback from the subjects was obtained using a questionnaire compromised of PSS-10 and demographic information; and thereafter analysis was made of the information retrieved.

### 2.1 Participants

A total of 125 personals were arbitrarily designated for information gathering. The employees working at managerial levels, in four main zones, explicitly: weaving/spinning; socks manufacturing; clothing and home textiles, qualified to participate in study. They were going to four diverse organizations relating to each zone. Personals, irrespective of gender but functioning as managers qualified to be subject of the study. As point of the research was to ascertain perceived stress levels amongst managers of textile industry, so lower and middle management personals were taken in this. They were additionally separated into two groups: managers; and supervisors/foremen. All of them were from diverse units of the establishments.

### 2.2 Survey

In order to achieve the destination: data, for the present cross-sectional research, was collected through an opinion poll which was composed of 10 items of Cohen's PSS and some variables relating to demography of the participants. They were like: years of work; position; salary; marital status; gender, and department. Before running the survey, equipped experts informed each participant: purpose of the research work, the body of the survey and manner of its accomplishment. By way of the subjects were giving feedback on the surveys, the experts were accessible to reply the queries. In addition, each survey was promptly checked for omitted figures and participants were requested to provide information. In order to minimize information disposition as well as to assure that they will not cover inopportune information, each form was nameless. The subjects were gladdened that the material will be used only for study drives, in addition feedback forms will not be unveiled toward organizations.

### 2.3 Instrument

Better accuracy in the degree of individual's perceived stress can be ascertained by means of a variety of scales which are framed to amount levels of individual's perceived stress. PSS, Perceived Stress Scale, is one of them. It is a classical stress measuring instrument. The scale, after it's developed in 1983, has been a widespread select for researchers to comprehend how diverse circumstances shake one's stress perception. In the present study, the perceived stress in the employees was measured by means of a questionnaire, primarily based on one of the versions of PSS, i.e., Sheldon Cohen's PSS-10 [18]. Some of the items relating to demography of the population were added. Altogether there were 18 variables that enclosed employees' below areas: perceived stress level, gender, marital status, position in the hierarchy, salary, and department in the organization, name of organization and size of the organization. In the PSS portion of the questionnaire, participants were to answer diverse questions of Likert-type scale (5 point), employed for every variable. Points ranged 0 to 4, where 0 indicates no stress and 4 indicates high stress: 4\_ always, 3\_ often, 2\_ Sometimes, 1\_ Seldom, and 0\_ Never, contingent on the prerequisites of the study. The questions in this gage were with reference to one's sentiments and opinions through the course of past month. In every item, it was questioned to specify how often the employee sensed or contemplated a particular way'. Even though a number of the interrogations are alike yet there are variations among them and one must handle every question as a distinct item; and answering fairly fast is the best choice. To be exact, don't go to calculate the numerals when one sensed a specific state; instead designate the choice that appears alike a rational estimation. Articulations were similar to, "In the last month, how often have you felt that you were unable to control the important things in your life?" The respondents were to select any digit of the measure in line with ones' response.

### 2.4 Statistical Procedures

In order to measure individuals' perceived stress level, descriptive analysis, of the data collected was deployed for the factual examination using the SPSS 23.0 [19].

## 3 Results and Discussion

The conformation of the sample corresponds to the whole population, namely, managers of textile sector organizations. All in all one hundred and twenty five employees, all of them working on managerial positions, filled the surveys. They were both: male and female employees; and were relating to diverse departments of four different organizations. Demographics are placed in Table 1 while Perceived Stress Scale Results in Table 2 and PSS-10 Scores results in Table 3. Demographics table shows that around 89% participants of the study are male employees while percentage of female employees among them is just 11.2%. Proportion of the male and female participants in the sample is in accordance with proportion in the population. Figures about Marital Status shows almost an equal number of married and single participants; statistics pertinent to the functioning areas of the subjects demonstrates that a good

**Table 1.** Demographics of survey participants

		Frequency	Percent
Gender	Male	111	88.8
	Female	14	11.2
	Total	125	100
Marital Status	Married	62	49.6
	Single	63	50.4
	Total	125	100
Department	HR	12	9.6
	Finance	9	7.2
	Marketing	26	20.8
	Technical	74	59.2
	Admin	4	3.2
	Total	125	100
Experience	Less than 5 years	60	48
	5–10 years	39	31.2
	11–15 years	14	11.2
	Above 15 years	12	9.6
	Total	125	100
Position	Supervisor	32	25.6
	Manager	89	71.2
	Executive	4	3.2
	Total	125	100
Salary	Less than 20 K	18	14.4
	20K–50 K	76	60.8
	50K–100 K	23	18.4
	Above 100 K	8	6.4
	Total	125	100

number of employees belongs to technical department which is the true representation as technical department is the major functioning area in any manufacturing organization. As the sample is composed of managers so it includes all levels, viz., lower; middle; and top. Majority in middle level illustrate that in certain departments, e.g., HR, Finance and Marketing, more employees have their place in middle management level. 1<sup>st</sup> row under salary section represents the least salary slot and presence of quite a few number of employees in this category shows that these employees belong to lower level and have less experience.

The PSS, perceived stress scale, questionnaire outcomes of the overall sample are placed in Table 2. It shows numbers and percentages of responses for each point on likert-5 scale against each item of PSS-10. Items 4, 5, 7, and 8 are positive questions so they have been reversed in their weights for the purpose of score calculations: Never = 4; Seldom = 3; Sometimes = 2; Often = 1; and Always = 0 whereas for all others it is like: Never = 0; Seldom = 1; Sometimes = 2; Often = 3; and Always = 4.

**Table 2.** Perceived stress scale results (N = 125)

	Never N (%)	Seldom N (%)	Sometimes N (%)	Often N (%)	Always N (%)	Overall response score mean (SD)
“1. How often have you been upset because of something that happened unexpectedly?”	4 (3.2)	40 (32.0)	55 (44.0)	19 (15.2)	7 (5.6)	1.88 (0.9)
“2. How often have you felt that you were unable to control the important things in your life?”	16 (12.8)	39 (31.2)	54 (43.2)	13 (10.4)	3 (2.4)	1.58 (0.9)
“3. How often have you felt nervous and “stressed”?”	8 (6.4)	36 (28.8)	61 (48.8)	16 (12.8)	4 (3.2)	1.78 (0.9)
“4. *How often have you felt confident about your ability to handle your personal problems?”	0 (0.0)	43 (34.4)	49 (39.2)	22 (17.6)	11 (8.8)	1.00 (0.9)
“5. *How often have you felt that things were going your way?”	9 (7.2)	55 (44.0)	49 (39.2)	7 (5.6)	5 (4.0)	1.55 (0.9)
“6. How often have you found that you could not cope with all the things that you had to do?”	18 (14.4)	42 (33.6)	43 (34.4)	18 (14.4)	4 (3.2)	1.58 (1.0)
“7. *How often have you been able to control irritations in your life?”	15 (12.0)	50 (40.0)	38 (30.4)	18 (14.4)	4 (3.2)	1.57 (0.986)
“8. *How often have you felt that you were on top of things?”	8 (6.4)	67 (53.6)	31 (24.8)	14 (11.2)	5 (4.0)	1.53 (0.9)
“9. How often have you been angered because of things that happened that were outside of your control?”	10 (8.0)	36 (28.8)	48 (38.4)	24 (19.2)	7 (5.6)	1.85 (1.0)
“10. How often have you felt difficulties were piling up so high that you could not overcome them?”	14 (11.2)	44 (35.2)	45 (36.0)	16 (12.8)	6 (4.8)	1.648 (1.002)

Items 1, 9 and 3 have higher mean values with standard deviations 1 or about. Mean values are: i.e., 1.88, 1.85 and 1.77 respectively and the items are: “How often have you been upset because of something that happened unexpectedly?”, “How often have you been angered because of things that happened that were outside of your control?”, and “How often have you felt nervous and “stressed”?”. In a similar study made on ‘Doctor of Pharmacy’ students, these values are: 1.91, 1.86, and 2.92 [20]. The values are higher than retrieved in the present study and appropriately corresponds to the mean perceived stress scores (resulted in that study) for male and female subjects, i.e., 16.1

**Table 3.** Perceived stress scale scores

Descriptive statistics				
Gender		N	Mean	Standard deviation
Male	PSS score	111	15.65	4.19
Female	PSS score	14	18.64	5.34
Overall	PSS score	125	15.98	4.41

and 19.6 in that order as compared to 15.65 and 18.64 of present study, for male and female subjects, respectively. The difference is because of diversification of populations under investigation. The former is a student’s group whereas current is the working class, i.e., employees group. Each group have diversity in there certain demographics; work conditions; earnings/financing; work demands; work-life balance and coping skills/abilities; etc.

Overall PSS Score mean is 15.98 while it is 15.65 and 18.64 in case of male and female employees respectively, see Table 2a. Using the PSS-10: the same instrument used in the present study, Cohen and Janicki-Deverts testified mental stress in overall populace [21], where mean of the male participants was similar to the results of present study, i.e., 15.52 vs. 15.65, respectively. Though, female participants in Cohen’s work testified a lesser score as compared to that of the current study, viz., 16.14 vs. 18.64, respectively.

Table 4, demonstrates numbers and percentages of employees with respect to different levels of perceived stress among employees. Levels are: No Stress; Low Stress; Moderate Stress; Severe Stress; and Dangerous Stress. In the later calculations, No Stress and Low Stress are combined together to represent ‘Not Stressful’ while the remaining: Moderate; Severe; and Dangerous altogether to represent ‘Stressful’. It is the point of concern that only 17 (14%) are in the category of ‘Not Stressful’ whereas a

**Table 4.** PSS-10 score results: number of employees with respect to perceived stress levels

	Number of employees	Percent
<i>Perceived stress level</i>		
No stress	4	3.2
Low stress	13	10.4
Moderate stress	39	31.2
Severe	50	40
Dangerous	19	15.2
Total	125	100
<i>Employees category with respect to stress</i>		
Not stressful	17	13.6
Stressful	108	86.4
Total	125	100

**Table 5.** PSS-10 score results: statistics of stressful employees

Statistics of stressful employees		
Level	Number	Percent
Moderate stress	39	36.1
Severe stress	50	46.3
Dangerous stress	19	17.6

vast majority, i.e., around 86% are stressful and within this sort, overall 50% are in severe level of stress versus 36% which are in moderate level of stress.

Amongst stressful employees, still, a big number belongs to severe and dangerous categories of stress as a whole, specifically 64% is composed of 46% in severe level of stress and 18% in dangerous, see Table 5; percentage of employees having moderate level of stress is 36. Table 6, displays numbers and percentages of 'Stressful' versus 'Not Stressful' subjects in 4 different scenarios: male single; male married; female single and female married. In this regard, descriptive analysis of the information collected does not show any difference in perceived stress levels of married and single employees, for both the cases, male or female. It is evident from statistics that there is not much difference in the percentages of stressful employees on the basis of their marital status, i.e., married or single. Likewise, in case male and female participants the same holds true, rather their percentages is equal.

Statistics of department wise employees' categories with respect to stress, indicate remarkable difference in stress perception among employees. As shown in Table 7, 95% employees of 'Technical Department' while 89% of 'Finance Department' followed by 77% of 'Marketing Department' are stressful. Nevertheless, 58% employees of 'HR Department' are stressful. It clearly shows that pressure is on Technical; Finance and Marketing departments. On technical, the pressure is of early compliance as well as of quality and on marketing it is not only for more orders but also for on time

**Table 6.** PSS-10 score results: marital status \* Employees Category with respect to stress \* Gender

Marital status * Employees category with respect to Stress * Gender cross tabulation					
Gender	Employees category with respect to stress				
			Not stressful	Stressful	Total
Male	Marital status	Married	7 (13%)	49 (88%)	56 (100%)
		Single	8 (15%)	47 (85%)	55 (100%)
	Total		15 (14%)	96 (86%)	111 (100%)
Female	Marital status	Married	1 (17%)	5 (83%)	6 (100%)
		Single	1 (13%)	7 (88%)	8 (100%)
	Total		2 (14%)	12 (86%)	14 (100%)
Total	Marital status	Married	8 (13%)	54 (87%)	62 (100%)
		Single	9 (14%)	54 (86%)	63 (100%)
	Total		17 (14%)	108 (86%)	125 (100%)

**Table 7.** PSS-10 score results. department wise employees' category with respect to stress

Department * employees category with respect to stress cross tabulation				
		Employees category with respect to stress		Total
		Not stressful	Stressful	
Department	HR	5 (42%)	7 (58%)	12 (100%)
	Finance	1 (11%)	8 (89%)	9 (100%)
	Marketing	6 (23%)	20 (77%)	26 (100%)
	Technical	4 (5%)	70 (95%)	74 (100%)
	Admin	1 (25%)	3 (75%)	4 (100%)
Total		17 (14%)	108 (86%)	125 (100%)

shipments of qualified items. The situation is very harmful for the managers working in these departments as well as a big obstacle in accomplishment of organizational goals and warrants implementation of stress management interventions. Ahmad et al., working for causes of workplace stress, identified factors of stress among this group as: work and family correlation, corporeal operational settings, management backing to the personnel, trainings and progression chances to the personnel, boss-subordinate relationship and knowledge of work pre-requisites, and characteristics of work [22]. It would be better to consider these factors while designing interventions framework.

#### 4 Conclusions

Present article was aimed to assess levels of perceived stress amongst managers of textile sector organizations. The measurable examination uncovered that around 89% subjects are stressful, though level of their perceived stress is different. Amongst stressful group: 36% are in moderate level of stress; 46% are in severe level of stress and 18% in dangerous level of stress. Analysis did not reveal marked difference in perceived stress levels of married and single participants and same is true in the case of male and female participants. However the results, as far as department wise demography is concerned, are otherwise. Percentages of stressful employees is much more in case of technical department; then is the finance department followed by marketing department. In HR department, there is not a big difference among number of 'Stressful' and 'Not Stressful' participants. It is ascertained that majority of the stressful participants belong to technical department which is the backbone of textile sector organizations. The state of affairs is very alarming and needs interventions. Findings of the study strengthen the need to devise interventions strategies, successful implementation of which will not only enhance organizational performance but also protect human resources from impacts of stress.



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# **Organization Development: Learning, Capacity Building and Social Innovation**

# Effects of Occupational Health and Safety Assessment Series (OHSAS) Standard: A Study on Core Competencies Building and Organizational Learning

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**Abstract.** Promoting the human factor of every organization is an important component that needs to be continuously up held to build employee competencies. Ultimately, this strengthens the competitiveness and sustainability of the operations within the organization. The aim of this paper is to investigate the effects of occupational health and safety management system (OHSAS 18001-2007) and learning in organizations to building its core competencies. This case study was carried out by the Evolute web based research tool in four factories between May and August 2015. Results indicated that, the acquisition of OHSAS 18001:2007 standard improves employee work output as well as increases knowledge capacity. Thus, an appreciable level of occupational health and safety management system, practice and environment has positive employee effect and that, organizational learning can be facilitated by top management commitment and leadership. However, the need for an increase in tacit knowledge disbursement among employees was realized needed.

**Keywords:** Occupational health and safety · Safety culture · Organizational learning · Knowledge management · Knowledge creation and core competences building

## 1 Introduction

Innovations in technology are rapidly changing market trends. Thus, the ability of organizations to thrive on a competitive market largely depends on how much and at what pace it learns [1]. This is achievable with much emphasis on the human factor. The focus of this study is the work environment, organizational culture and knowledge creation; all of which are essential ingredients for an effective safety system within the heat treatment industry. Essentially, the research investigates employee health and

safety after the acquisition of OHSAS 18001-2007 by the case company. The case company has decades of experience in heat treatment and hot isostatic pressing (HIP). Additionally, it is accredited with the standards, OHSAS 18001-2007 *Occupational Health and Safety Assessment series*, ISO 1400:2004 *environmental standard* and *quality management standard ISO9001: 2000*.

Generally, organizations aim to satisfy customer preferences, needs and wants. To enhance this, organizations' knowledge base ought to be constantly updated. The consequence of dynamic method of learning in all organizations is to meet customer satisfaction and desire, which promotes sustainability [2]. Organizations learn through tacit knowledge disbursement, interactions and training. Therefore, during the study, data was collected using the serpentine questionnaire that analyzes these concepts. These questions were answered based on worker perception of indicators of organizational learning and safety ontology to determine the level of interaction that promotes tacit and explicit knowledge sharing. Knowing that organizational progress relies on worker competence that enhances his potential, these issues require the needed attention and encouragement [3].

The conceptual framework of this paper is derived from theories that promote occupational health and organizational learning. When these theories are realized in practice as an organizational culture, the climate of safety and learning would definitely be raised. Consequently, consideration was given for the enforcement of OH&S, safety culture, safety climate, knowledge creation, knowledge management and organizational learning. In addition, the concept of safety standard has been implemented. All these are mandatory in the OHSAS 18001-2007 document. Besides, the four processes of knowledge conversion being; *Socialization, Externalization, Combination* and *Internalization (SECI)* [4] has been employed to investigate the interaction that promotes knowledge disbursement. These concepts are embedded in the questionnaire as part of the survey. The nature and procedure of heat treatment is such that employees are inevitably exposed to health hazards. However, the premises can be made safe and workers would be protected by the installation of an active and robust safety control mechanisms.

## 2 The OHSAS 18001: 2007 Standard

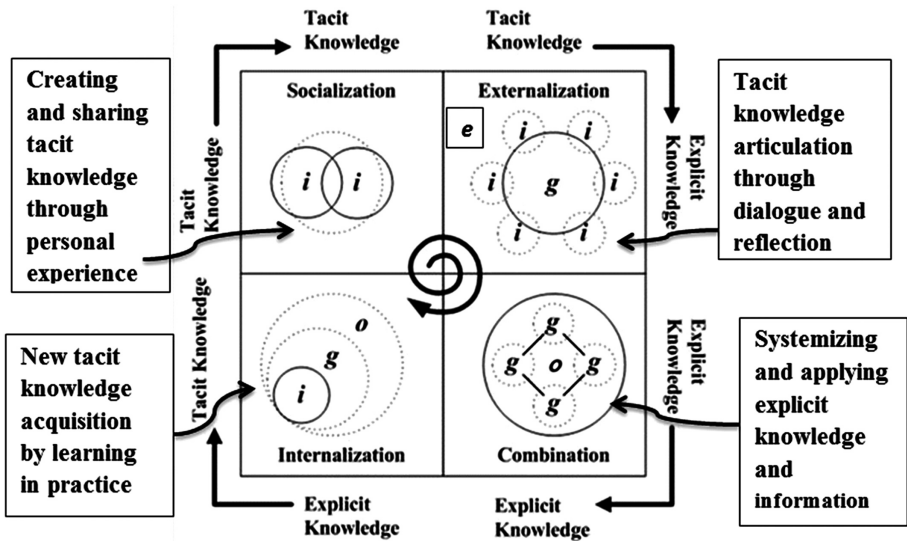
Occupational health and safety management system (OHSAS) 18001-2007 is an occupational health and safety standard. OHSAS is designed such that it can be integrated with Environmental Management Systems (EMS) present in the International Organization for Standardization (ISO14001). Additionally, OHSAS can be embedded with quality management standard (ISO 9001) to expedite the facilitation of a comprehensive management system [5]. The OHSAS document seeks for continuous improvement of both the management and conditions of health and safety within the workplace. Furthermore, under the OHSAS agreement, the control of safety and health environment (SHE) is wholly under the supervision of top management [6].

Despite these benefits, OHSAS 18001 is limited in addressing issues such as employees' conditions of service, safety of products and prevention of product damage and security. However, OHSAS offers flexibility to incorporate organization's

management system to ensure compliance to the requirements of OHSAS 18001 standards. These limitations coupled with other organizational demands including supply chain network has led to calls for a more comprehensive standard by the International Labor Organization (ILO) and other international standards. Thus, a more comprehensive occupational health and safety standard known as the British Standard Institution (BSI) ISO45001 is due to be launched hopefully in 2017. The blueprint for the BSI ISO45001 is the OHSAS18001, which automatically incorporates quality and environmental management systems to the module. The new BSI standard emphasis on risk management, continuous improvement and performance indications [7]. In Finland, the Finnish Accreditation Service (FINAS) in collaboration with Bureau Veritas Certification Finland oversee supervision and regulation of the OHSAS standard.

### 3 Knowledge Creation Process

The three elements embodied in the knowledge creation processes are; (a) Tacit and explicit awareness conversion to create the SECI knowledge spiral. (b) The place of knowledge creation known in Japanese as ‘Ba’. (c) Knowledge assets, being the inputs, outputs and mediators of the knowledge creation process [4]. These 3 elements are built into the SECI model in Fig. 1 below. Figure 1 displays an increase in both tacit and explicit knowledge through the transformation process [8].



KEY: *i* = individual, *g* = Group, *o* = Organization, *e* = Environment

Fig. 1. SECI knowledge creation spiral (Nonaka and Takeuchi 1995)

Knowledge conversion is the interaction of explicit knowledge and tacit knowledge from which organizations are able to create knowledge. The process of knowledge creation in brief is that through socialization (interaction) of workers, the individual knowledge (tacit) is disbursed in the group. When this distributable group knowledge is documented, it is termed combination. A formidable expertise and new knowledge is constantly created in the organization and that is the desired goal. Further clarification of the spiral can be obtained by the definitions of SECI factors:

- *Socialization*: The process of converting individual's (i) tacit (inarticulate) knowledge to others primarily by interaction.
- *Externalization*: Knowledge transformed from tacit to explicit (clearly defined concept) is termed externalization.
- *Internalization*: In this process, explicit knowledge is adapted and converted into tacit knowledge.
- *Combination*: This is defined as the gathering process of new (fresh) and existing explicit knowledge of individuals into a system of knowledge.

Nonaka further explains that this conversion process is not static but dynamic and evolutionary between tacit and explicit knowledge.

Knowledge conversion is the interaction of explicit knowledge and tacit knowledge that enables organizations to create knowledge accordingly [8].

### 3.1 Organizational Learning

Organizational learning is the creation, transferring and the development of the knowledge base of an organization. It concerns learning from experiences within as well as outside the organization to build a framework that increases its knowledge base [9]. King explains that Organizational Learning is the way and manner in which an organization can progressively utilize its acquired knowledge [10]. In view of these, individuals in an organization can and should be involved in the requisite knowledge acquisition, disbursement and utilization. Peter Senge's five disciplines of the culture of a learning organization outlined in the *Fifth Discipline* explains that each division of the organization contributes to the progress or otherwise of the organization [11]. Below are listed some of the benefits of implementing Organizational Learning.

- (a) An enabling environment for future leaders emerges throughout all stages of the organization and thereby provides an automatic leadership succession plan.
- (b) Workers become adaptive to changes as they become more flexible while new ideas are encouraged and cherished.
- (c) Satisfaction of employees raises as they become more knowledgeable in the operations, strategies and dealings of the organization. Organizational learning, therefore, raises worker's integrity [11].

From the aforementioned, it becomes imperative for every organization to inculcate a culture and structure of learning with training within its workforce. As the organization seeks to be successful in this age of fast technological innovations coupled with changing market trends, failure to learn would be catastrophic to its growth and

survival. Implementing an organizational learning concept in an institution cannot be achieving by just the stroke of a pen. It needs to be built into the entire organizational culture with a solid safety culture.

### 3.2 Knowledge Management

Knowledge management has existed for decades now and is currently gaining much popularity due to its usefulness in organizations. The management of knowledge as can be referred, is the coordination process of an organizations knowledge assets which creates value to meet its strategic requirements [12]. By this process, the right knowledge is given to the right people at the right time for the right purpose while sharing to enhance organizational performance [13]. Hence the company's knowledge creation, learning processes and sharing is enhanced [14]. King explains that although Knowledge Management is human dependent, relevant modern information and communication technology methods should be used to support it [15]. Additionally, Knowledge Management needs to be used to empower an organization by cultivating its organizational know-how with external sources to create the relevant explicit knowledge of employees as illustrated in Fig. 2 below.

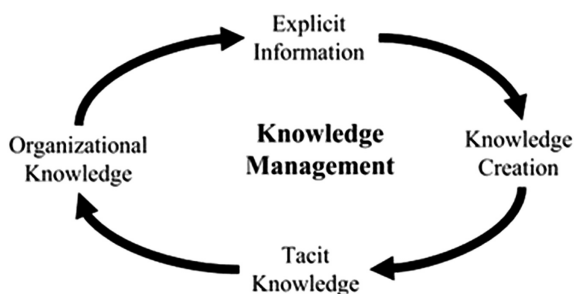


Fig. 2. Knowledge management model

### 3.3 Serpentine Research Tool

Serpentine 2.0 of the Evolute research tool is an Internet-based questionnaire was used to collect research data and for analysis. Serpentine is designed to reveal the safety culture, safety climate and the management of safety in an organization. It also reveals the level of knowledge management and organization learning within a company. Serpentine consists of 17 features embedded in the 51-item questionnaire [16].

### 3.4 Data Collection

The Evolute research tool evolved from Peter Senge's principles of creative tension [11] with further development on the principles of holistic concept of man, circles of mind metaphor and positive metaphors [17]. Based on this principle, Evolute can

analyze current reality to a perceived future goal of issues under scrutiny. Serpentine, therefore, captures and reveals present and perceived desired future levels of safety, environmental and availability of personal protective equipment (PPE) with organizational knowledge creation and collaboration [16]. Through this process of fuzzy logic questions, respondents can relate the illusory and vague nature of their perception without numerical conversion scales [18]. Thus, the perceived organizational levels of safety and learning through the questionnaire are obtain.

### 4 Project Company

The case company is experienced in improving properties of metal and alloys by heat treatment and hot isostatic pressing (HIP). The company’s clients include automobile, aerospace, defense, power generation, construction and medical industries. Currently, it has factories in 24 countries with 190 operational plants. In Finland, it has been in operations since the early 70s and currently operates in 4 locations. This research was concentrated in all the 4 Finnish plants. The company has wide international recognition in these expert areas, and all its Finnish plants are accredited with ISO 9001:2000, ISO 14001:2004 and OHSAS 18001:2007 certifications.

### 5 Results

Results of the analyses are presented as total employee combined current (c) and target (t) levels of the eight categorized states in Figs. 3 and 4. Figures 5 and 6, likewise, display the overall combined current (c) and combined target (t) levels of the 17 features under investigation. Table 1 gives the detailed statistical values of Figs. 3, 4, 5 and 6. The columns “Median\_c” and “Median\_t” represents the combined current median and targeted median values respectively. Analyzing the combined results under the categories yields the SECI knowledge creation patterns in Figs. 3, 4, 5 and 6. Typically, Fig. 3 is the categorized *current* state while Fig. 4 is the categorized *targeted* state.

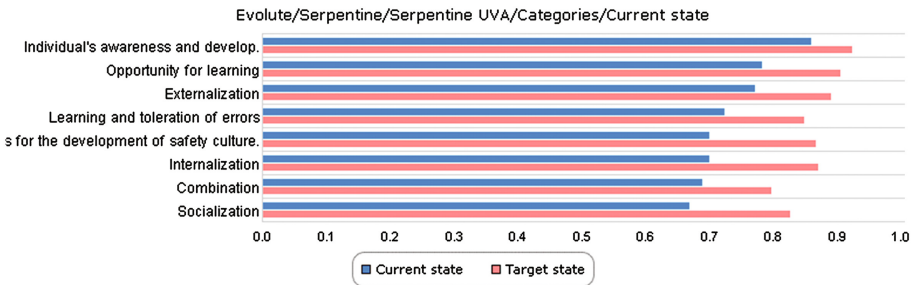


Fig. 3. Categorized *current* state (evolute generated)



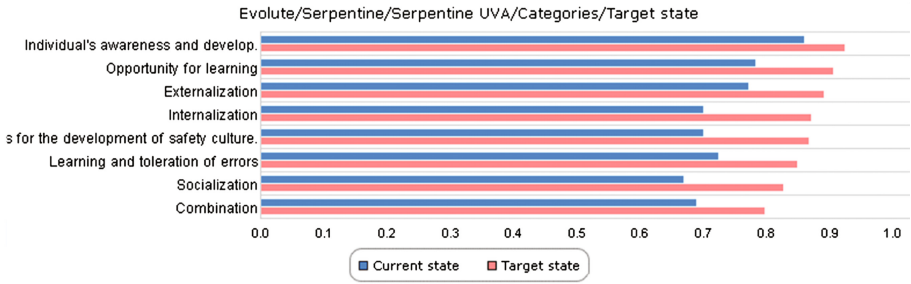


Fig. 4. Categorized targeted state (evolute generated)

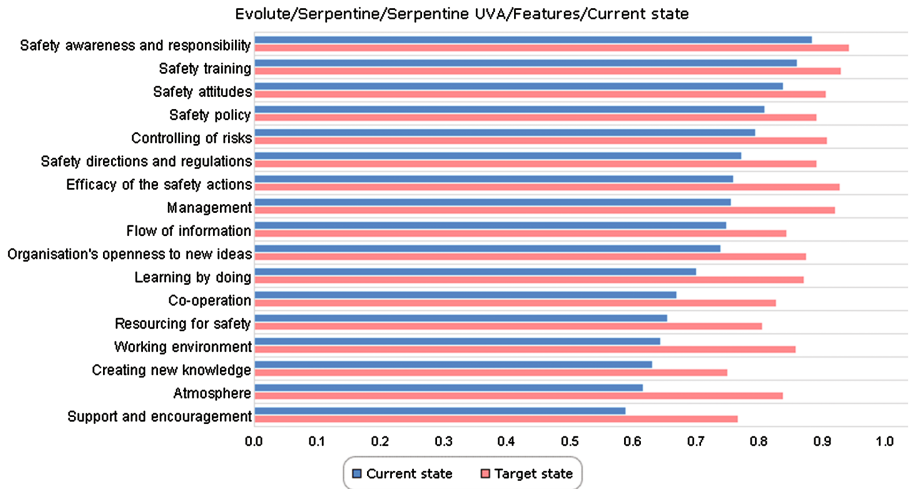


Fig. 5. Current state of features sorted in descending order (evolute generated)

Starting from *safety training* through all the concepts under investigation to *controlling of risks* of Table 1, respective values of 0.5 to 0.45 were obtained. Therefore, numeric values of the concepts; *flow of information*, *working environment*, *safety attitudes* and *safety climate* levels are equally visible. Other occupational employee concepts like *Individual awareness and responsibility*, *cooperation among staff* (seen in *socialization/internalization*) with *learning and tolerance of errors* are likewise statistically and pictorially presented. The low values of standard deviation obtained for both the current states, and the targeted states represented an appreciable correlation in individual perceptions. This implies the existence of a significant level of reliability, which is a true representation of the prevailing situation. *Safety awareness and responsibility* in the current state (c) have the highest value as indicated in both Table 1 and Fig. 5. It means that employees possess a good level of awareness of safety-related issues and take responsibility of safe working environments. In as much as safety awareness and responsibility have the highest ranking, there is still the need to be

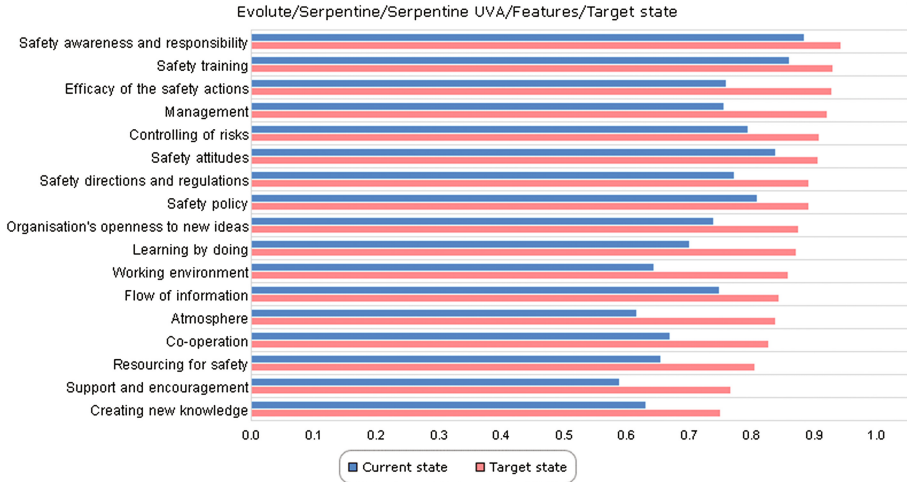


Fig. 6. Desired targeted state of the 17 concepts (evolute generated)

Table 1. Statistical results (generated by the evolute research tool)

Class name	Median_c current	Median_t target	Average _c current	Average _t target
Safety training	0.5	0.5	0.86	0.93
Safety directions/reg.	0.39	0.5	0.77	0.89
Learning by doing	0.39	0.5	0.7	0.87
Co-operation	0.37	0.49	0.67	0.83
Work environment	0.37	0.48	0.64	0.86
Management	0.41	0.5	0.75	0.92
Support and encouragement	0.33	0.38	0.59	0.77
Safety policy	0.44	0.48	0.81	0.89
Openness to new ideas	0.38	0.5	0.74	0.88
Atmosphere	0.34	0.46	0.62	0.84
Efficiency of safety actions	0.36	0.5	0.76	0.93
Resource for safety	0.38	0.48	0.66	0.81
Safety aware./ responsibility	0.5	0.5	0.88	0.94
Safety attitudes	0.41	0.5	0.84	0.90
Creating new knowledge	0.37	0.37	0.63	0.75
Flow of information	0.37	0.5	0.75	0.84
Controlling of risks	0.45	0.5	0.79	0.91

encouraged as room for improvement abounds considering the difference between the current and targeted values [19].

Results also proved that accurate and active documentation methods instituted in an organization would eventually empower health and safety management mechanisms. Furthermore, such reports and records enable executive management to analyze incidences and near misses that has the potential to cause serious injuries or even fatalities [19]. Even though total correlated results show positive values above average, due to the company's zero percent tolerance for injuries and fatalities these positive values should be stressed to improve continuously as the OHSAS standard demands.

In both figures, blue bars represent current individual categories while red bars represent targeted desire of the same categories of respondents' combined conception. Likewise, the differences reveal the *creative tension* allowance that exists for improvement.

From both Figs. 3 and 4, *Individual awareness and development* obtained the highest point. Least in ranking is *Socialization* under the *current* state. This comparative lack of socialization as examined under the theories of *knowledge creation* needs to be rectified. *Socialization* is necessary to promote organizational tacit knowledge disbursement [8]. Generally, results of the *categories* from the eight concepts of Figs. 3 and 4 look promising. Howbeit, because both *socialization* and *combination* lies at the bottom of the *categorized current* and *targeted states* respectively, strategic management decisions and programs is required to correct the individualistic attitudes that prevail in the company. This is important to ensure the company's sustenance of its competitive advantage. In principle, the growing lack of *socialization and combination* amongst employees could consequently results in the decrease of employee competence [20].

## 5.1 Current State of Features

Results of the *feature* represent all the 17 concepts as shown in Figs. 5 and 6. Obtained results of the current levels (blue bars) of knowledge-creation and safety culture are arranged in descending order in Fig. 6. Highest feature is *Safety awareness and responsibility* with an average value of 88.3% and the lowest current state being *support and encouragement* at an average of 58.8%. It is imperative that management address these features with the least values of human competencies and work environment accordingly as suggested for the *categorized states* of Figs. 3 and 4. Values in Fig. 5 are comparable to the desired *target* of each feature in Fig. 6 [19].

The desired objectives of each feature in the target state of Fig. 6 are demonstrated in descending order in red. The highest value here are safety awareness and responsibility. However, values with the lowest desire for improvement are seen to be *Creating new knowledge* followed by *support for encouragement*. Implications are that respondents do not see much need for knowledge creation improvement as compared to the high-ranking concepts. This could be particularly troubling since the fortunes of any organization rest on supporting and encouraging new ideas [21]. Likewise, the combined values of Figs. 5 and 6 explain the proactive vision of SECI *knowledge creation* concept and *organizational learning* under OH&S analysis. This is necessary

since success lies on ability to establish a proactive plan rather than a reactive correction as the saying goes; - *prevention is better than cure*.

## 5.2 Limitations

The scope of this research was limited to only the heat treatment industry and therefore, findings are equally within the discipline. However, some suggestions are applicable to most high-risk organizations where organizational learning and safety issues remain paramount [19].

## 6 Conclusion

The importance a rigorous occupational health and safety standard along with the requisite know-how of employees in the prospects of a heat treatment factory has been investigated, analyzed and discussed in this research. Substantially, it has been discovered at least in the case company that since the introduction of the OHSAS standard, a high degree of safety and progress of work schedules has been achieved. This is evident in the reduction of the rate of absenteeism due to injuries and occupational related illnesses. The company's image has been lifted in high esteem. Employee job satisfaction has equally been raised. Evaluation of findings by the knowledge creation spiral has revealed that under such circumstances, companies' progress and chances of survival during operational turbulence increases. However, the spiral embedded in the questionnaire identified a lack of *socialization* and *collaboration* among employee. Additionally, creating new knowledge ranked least in all the explored organizational concepts. In as much as *support and encouragement* is targeted the lowest, it is particularly worrying as it limits the organization's future potentials. In that, organizational culture in relation to disbursement of tacit knowledge through interaction is equally lacking. Relating the collated results, one can also see a lack of the required creative tension in such vital issues. Most essentially, management of the case company has received these findings and is hoped to be putting measures in place to rectify the above shortcomings and anomalies. Therefore, this research concludes with findings based on the research questions and collated results. Furthermore, it emphasizes on specific areas that require management commitment to promote the desired and targeted OH&S conditions and knowledge creation towards competencies building for the required productivity outcome [19].

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# Designing an FR-Soft-Skill Measurement System to Be Used in Adult- or Higher Education

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**Abstract.** The environment of the 21st century adult and tertiary education has changed at several places. The obstacles of information flow have disappeared and the educational environment has been virtualized. At the same time, the learning habits of students have also changed radically. These changes should be followed by tertiary and adult education as well. By accepting these phenomena workers of tertiary and adult education have to face a lot of fresh challenges. It is very important for them to adjust to the trends mentioned above. Even those people who are not certified teachers need information, pedagogical and psychological knowledge to be able to find their way in the pedagogy of adult and tertiary education.

**Keywords:** Tertiary education · FR-Soft-Skill measurement system · F-R test

## 1 Introduction

When graduates from the technical higher education apply for work they are assessed in multi level selection procedures (Mészáros 2014). These assessments are aimed at the soft-skill competences. It is generally experienced that engineering students are less successful in those tests.

In 2013 a web based graphic quick test was developed by which the students can get an immediate feedback about their 40 competences and the relations of their positions. The test gives them a quazi real picture about which competences need to be developed or which ones are already developed (Baróti 2016).

The soft-skill measurement system is used at Széchenyi István University to assess graduate engineering students. Our future aim is to create engineering competence profiles and identify the entrepreneurs' need with this measurement system. The real differences between the needs of the entrepreneur sphere and the competences of the graduates can be shown as a result to reconsider the concept of engineering education and the development of education system. Finally, we hope that it can affect on the output requirements too.

We assume that this assessment can help the students consciously prepare not only for the specific vocational employment but their own personal development and they can acquire professional knowledge besides getting the applied knowledge (Csíkszentmihályi 1998).

Our other goal is to assess more university majors with my colleagues in large –scale study context and also to integrate the students personality development and soft-skill competence rising into the higher education especially the engineering education.

## 2 Short Introduction of FR-Soft Skills Measurement System

It is difficult to measure and concretize the so called Soft-Skills personal and beyond work range since it leads us from the `hard' vocational knowledge specific rational requirement-system to a sort of irrational and subjective area. This area is a `soft' range of the personality in related to interpersonal features. Here the orientation is not linear and logical process of interdependence of cause- causality but sometimes unexpected “horse jumps”. Its disciplines span the areas of psychology, human resource development and pedagogy.

It is like the relation of the above and underwater part of a floating iceberg: the visible part represents the one- eighth which represents the hard skills while the underwater part, seven-eighth represents the soft skills that is always suspected as not visible. To be able to orientate here a subjective space distribution is needed. Similarly, as the great founders of profession e.g.: Freud and Jung did. Both of them lives meant like light strikes into the darkness in this field. The Freud’s distribution is even the basis in psychology today: (Ego-self, Superego, Id-instinc- self), Jung’s personal dimensions (Jung 1923): are the basis of the most up-to-date measurement system: the MBTI (MBTI types 2012). This is the deepest elaborate system which can be used to support student and professors’ life skills in the university.

### 2.1 FR-Soft-Skills Measurement System

The theoretical basis of the development of Soft-Skills measurement system is Fritz Riemann’s book: “The basic forms of fear” (Riemann 1989). There are 4 basic needs in human life and each need goes hand in hand with a fear. These personal traits are described from the healthy to constrict to disease. The present measurement system focuses on the healthy person (Rogers 2014). During our life we experience one of our need’s transitional dominancy. This is inevitable in personal development. By avoiding this there can be the risk in critical situation that we are not able to emphasize and validate our interests. We know that the spiritual health is not a static notion but a state of mind which is about the harmony of the healthy adult personality. There are break points, wounds and many positive and negative experiences in every human life. More of which or lack of which can intensify one another fear mainly in critical situations and imbalance the personality. In long term it can shake our inner spiritual world.

The 4 basic needs forming opposing pairs can be represented as an axis placed at right angles to each other. On the 2 points of the horizontal axis one of the 2 opposite

needs is a K-type the other one is the H-type, while the opposites on the vertical axis are S-type and D-type. The features of the types are detailed next.

Specific situation develops if during the personality development one or another need becomes dominant and it defies the personality. It deeply affects the stability of the personality. In this case the only balance for the person is what bears the dominance of one need. The dominant need affects the entire personality perhaps distorts and narrows it so only unstable balance can be formed in this way, causing unstable inner security. I hope the measurement system can filter these extreme personality traits and give an overall picture about the stability of the personality and the features to a given personality traits from which I made a list with altogether 40 competences, skills and abilities. Other complex competences are based on these basic skills such as conflict management, complex thinking, openness, learning ability, self knowledge and the need for self development, self efficiency etc. These can be manifested in the well balanced interplay of the features of a given personality trait.

The FR-Soft-Skill survey in general name can be found in annex 1.

There are 10 attitude statements to each personality trait so altogether 40. The evaluation is on the scale from 0 to 4 with aggregated scoring.

### 3 F-R Test

To identify personal orientation a great help would be the so called F-R quick test that we developed. Here are its basic principles and how it works.

#### 3.1 The Form of Quick Test

According to the use of the test the basic data of it can be 2 types:

**Participants of adult learning**

Area of expertise:	Position:
Sex:	Age:
School:	Email address:

**Day time students:**

Major:	Term:
Sex:	Age:
Code:	Email address:

You will find 4 groups of questions! Please assess yourself on a 4 point scale, 0-4!  
 0 –“totally not”; 4 –“typically true for me, or I think so” – means.

Please, fill it in spontaneously, quickly with the power of the first thought not the desired one. Focus on your real feelings!



line	S - Questionnaire	Point
1	I prefer accomplish my tasks alone by myself.	
2	I strive for maximum performance.	
3	I can enforce my will in most cases.	
4	Before making decision I like to see the logical chains of things, cause-causality relations.	
5	Success is important to me.	
6	Working with others I like to limit the functions clearly.	
7	I give up something very hard	
8	I try to make the best of things.	
9	Certainly, I take responsibility for my things.	
10	I take my counter opinion in difficult situation.	
	Sum	

line	D - Questionnaire	Point
1	I am open.	
2	Generally, I can adapt well.	
3	I maximally pay attention to my surroundings.	
4	I am interested in what other people think and feel.	
5	I can accept other people's feelings.	
6	I like to work with others.	
7	I like to help to others.	
8	I avoid conflicts if it is possible.	
9	I easily trust in others.	
10	Generally, I can easily build relationships.	
	Sum	

Line	K - Questionnaire	Point
1	I like to think over my things to plan in advance.	
2	I like if things are in order.	
3	I do my tasks with high duty of care and precision.	
4	If things do not go as they were planned bothers me.	
5	I am not keen on unexpected things.	
6	I meet the deadlines and dates.	
7	I carefully pay attention to the details.	
8	The predictability is important in corporation with others.	
9	I like to do my tasks in a usual way.	
10	I bear my and other's mistake hard.	
	Sum	

Line	H - Questionnaire	Point
1	I do not tolerate well those routine tasks that need high precision.	
2	I do not like if everyone has to work according to the schedule.	
3	I like challenges.	
4	I like spontaneous things.	
5	I like to come up solutions with new ways, perspectives.	
6	I believe a genius can get through chaos.	
7	I like to come up with new ideas.	
8	Something new happens is important to me.	
9	I gladly change the rules.	
10	I do not like limits in my freedom.	
	Sum	

### 4 The Evaluation and Graphical Representation of the Test

The fundamental directions can be defined in 2-dimension, space and time, coordinate system.

- The 2 end points on the time axis are permanence and change. The 2 extreme points on the space axis are distance and proximity.
- The time and space axis form that tension which is created by the polarity of opposite basic needs in our psyche.

We can determine the shifts from the equilibrium if we apply the given point on the offset of the coordinate system. The farther is our centre of orientation from the centre, that means the shift from the equilibrium, the more likely it is to identify the basic characteristics and behaviour kinds of the given type. Our dominant basic needs and basic characteristics of personality type impact with the other man’s opposite orientation and attitude or harmonise with the similar attitude. Inasmuch we are aware of it that it can always have teaching and developing affect also give us support and protection or it can result confrontation. There are no clear types with only one basic orientation in every personality, the basic characteristics are mixed. But an orientation always appears as stressing the fear basic need. None of the orientation is good or bad. All of them have under developed, melowed-matured and over developed basic needs. Our over developed abilities can be a problem e.g.: our strive for safety arouses a kind of desire for control and check that stiffens and makes the personality inelastic. It is difficult to determine our orientation exactly (Fig. 1).

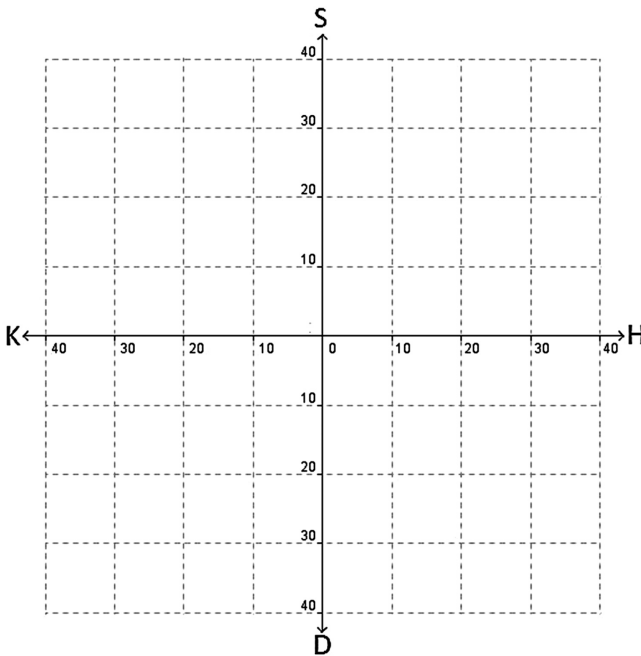


Fig. 1. The applied coordinate system to F-R test (source: own design)

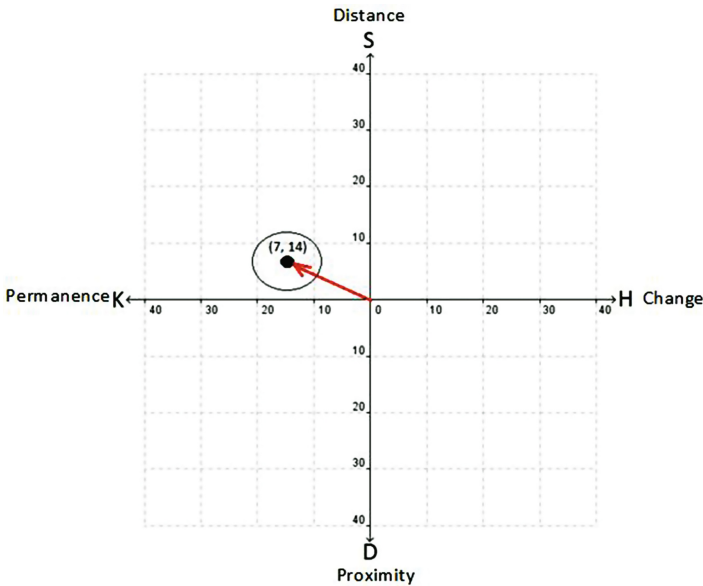
For instance, in relation to distance-proximity 70–30% is the point where we put ourselves or in the time axis e.g.: 45–55% should be my attitude point. This shows the stability and gravity of the personality. The area around this point is where our basic characteristics and operation mode can be identified.

<b>Space axis (proximity – distance)</b>
X coordinate value = S Questionnaire Sum – D Questionnaire Sum (It should be measured which questionnaire sum score is more.)
<b>Time axis (change – permanence)</b>
Y coordinate value = H Questionnaire Sum – K Questionnaire Sum (It should be measured which questionnaire sum score is more.)

**First example:** According to the test the values are the following.

- S = 35
- D = 28
- H = 22
- K = 36

The graphical representation of this case: (Fig. 2)



**Fig. 2.** The first example’s graphic representation of gravitational points. (source: own design)

There can also be shift only on one axis, so one orientation is distinguished in the personality.

**Second example:** According to the test the values are the following.

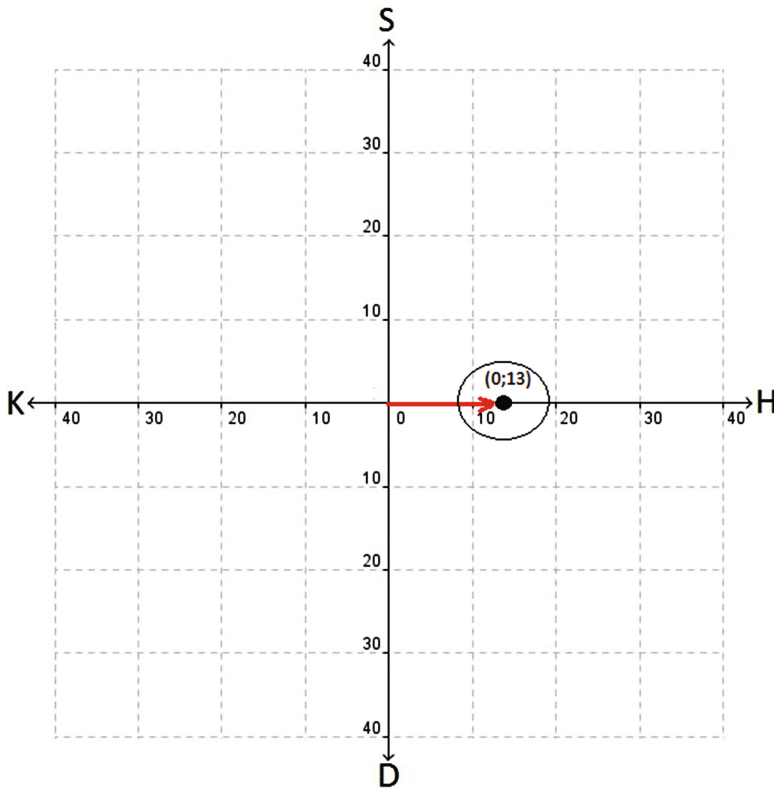
$$S = 32$$

$$D = 32$$

$$H = 35$$

$$K = 22$$

Graphical representation of this: (Fig. 3)



**Fig. 3.** The second example’s graphic representation of gravitational points. (source: own design)

The 4 basic attitudes emerge in personal’s private life but also in learning and working situation. According to the basic tendencies there are strengths and weaknesses.

In a world of work mainly at industries the fundamental requirements are independence, taking responsibility, reliability precision, keeping personal distance and

following law and order. This is certainly the strengths of distance and permanence types. If we work in social work area, which involves helping and teaching jobs, than the fundamental requirements are the ability for empathy, making confidential relations, tolerance of change, flexibility, emotional intelligence. But there needs stamina and endurance, predictability, so the opposite orientation appears as a requirements of basic characteristic. For example as an engineer the vital characteristics are:

- Precision, predictability, compliance, striving for security which are the basic characteristics of permanence orientation.
- Ability of logical, clear, rational thinking based on cause -causality, objectivity and the individual performance which are the basic characteristics of distance orientation.
- Ability of testing new ideas, taking risks, innovation which are the basic characteristics of change orientation.
- Meeting others, successful networking, effective cooperation, in case we wish to realise our ideas, which are the basic characteristics of proximity orientation.

We are the most successful in our private life, in learning, at work if we can keep the strengths of our basic orientation and develop other basic characteristics which belong to the other orientations into our competences and use our abilities flexibly in every area. We can recognise in which areas we are weaker and we can learn and integrate other basic characteristics by cooperation. This typology can be used well in every day life, getting in touch with business customers, surveying the needs and motivation, choosing the right communication, conflict management, mediation, at law, personal development, and pedagogy. It gives good orientation to characterize a group, to understand dynamics, observe own study group and it can be suitable to create an educational method.

## 5 Description of Types

### 5.1 Description of S-TYPE

**The Name of the Personality Trait:**Schizoid personality – Tendency for distance keeping.

**Requirement:**Individuality, the need to become single unrepeatable personality.

**Need:**Autonomous personality, the need to become independent is dominant.

**Fear of:**Devotion, dissolution from, losing from the self and dependency.

**Short Description:**The distance orientated people seem to be objective cool and distance keeper. They are capable of high degree of autonomy and taking responsibility. They prefer work alone. The cooperation is necessary so they strive to position this to let everyone have his or her own defined task to feel they after all work individually. Together with a partner or colleagues in their free time means disaster.

The sunny side of their lives is that they can sharply observe and think objectively-critically. They are independent, with the ability of being separate and saying no. In conflict situation they know exactly what they want and they can express it clearly. It is not a problem for them if they should represent an unpopular position. For them at work life is about to focus on the subject, the task and to make the right decision.

The schizoid personality keeps his or her autonomy; independence queasily but tends to make his or her relationships impersonal and eccentrically separate from others.

The anxiety can be fossilized from the human proximity as it threatens with losing the self. Great distance need to be kept as the intimacy is frightening for them. Social interactions are tiring and it is needed to defend against bonding.

They often behave rudely, cynically, sarcastically, aggressively in conflict situation and it easily makes them unpopular.

#### **S-TYPE personality traits in key words**

- need for independence
- performance orientation
- success orientation
- methodical, structural
- improved intellectual abilities
- high degree of rational thinking
- confrontation ability
- objectivity
- take responsibility
- task orientation, purposefulness
- steadiness
- self confidence

## **5.2 Description of D-TYPE**

**The Name of the Personality Trait:**Depressoid personality tendency to proximity.

**Requirement:**They need to be able to private opening to develop contact creating ability towards the world and people. They need to make exchange contact with the outer world too.

**Need:**Demand on proximity and close personal contact.

**Fear of:**Being alone and unprotected, isolation, independence.

**Short Description:**Those people who have high tendency for proximity are good at making contacts, well balanced, understandable, and acceptable. In their work the good atmosphere and harmonic relations are important. The sunny side of these people is that they are empathic with other people's situation and think more of the others than themselves. They are friendly, cordials, open hearted, and conciliators. They give and enjoy confidence and easily get close to others by knowing how to get on with others. They are able to sacrifice to feel belonged to somebody. Always being hugged and hugging is the paradise for them so they can do anything to achieve this and thrive of this opportunity. Emotionally they are extremely colourful, sensitive and attentive partners. However, when they are alone they become grey, colourless and vulnerable.

For the depressive personality man the proximity and the independence of another person can seem to be dangerous and can result the resurrection fear of loss.

Their dark side is that they avoid the tension and the confrontations. They are not willing to say no or they cannot do. They often overshadow their needs. It is difficult for them to distance themselves from others and express anger and aggressiveness.

**D-TYPE personality traits in key words**

- openness and trust in others
- high degree of adaptability
- high emotional intelligence (EQ)
- empathy
- operational skill
- relation oriented
- helpfulness
- creating harmonious atmosphere
- loyalty
- tolerance

**5.3 Description of K-Type**

**The Name of the Personality Trait:**Compulsive personality – Tendency to permanence.

**Requirement:**They pursuit of durability, settle in a world of changes.

**Need:**Thrive for security, the routine and the need for permanence dominates.

**Fear of:**Change, as transiency and uncertainty.

**Short Description:**The permanence-oriented people loves everything is organized, they are scrupulous and structured. They are perfect time managers; they bear the tasks, deadlines in mind and hand. They are good at organizing always punctual and reliable. The permanent man can easily keep everything in order and expect it from others. Eventually, the order is half of success. They have a well-thought out record system. They appreciate lists, planning and most prefer record everything in black or white. On the other hand, they are sceptical about every change, novelty and things that are not seen in advance. They tend to be conservative, dogmatic and stick to principles. Partly, they tend to dominate and control others. They seem to be meticulous and too fair to others. They look for permanence and disrelish every change. The permanence is after all. They surround themselves with rituals. They only buy durable items and cannot leave them. Throwing away a pair of leaky shoes reminds them of death and transience so they could end up storing huge amount of junk however; they are precise and love the order. Everything has its own place. If mess is perceived and if things are not at that place they elicit fear and anger.

**K-TYPE personality traits in key words**

- thrive for stability and alertness
- reliability
- precision, accuracy
- high monotony tolerance
- endurance, stamina
- compliance with dates
- order, structure formation
- tolerance of rules
- organised

- adherence to the known familiar things
- reliability

#### 5.4 Description of H-TYPE

**The Name of the Personality Trait:**Hysteriod personality Tendency to change Requirement: They need to be able to change, to give up the known, familiar, comfortable and traditional and to be able to move forward and progress.

**Need:**Need for change, diverse colourful lifestyle, creativity and freedom.

**Fear of:**Stability, necessities, definitive, losing the freedom.

**Short Description:**It is important for them that their activity should be creative, imaginative and flexible. Their workplace seems to be chaotic, their diary seems to be confusing but it does not matter for them as a genius can see through chaos. These 'change men' bring some colour to the grey working days with their spontaneity and vivid personality. They can be enthusiastic and love risk, novelty that differs from traditional. They live and let live. They are fun and charming. They come up with new solution to problems. On the other hand they avoid obligations, rules, regulations and laws. If it is about consequence they always find the loopholes. They are less reliable and easily neglect order and accuracy. They flirt with their bad habits. They are partly whimsical and easily become depressed but seek acknowledgment.

They are enchanted by the new. Every novelty keeps them on move and makes them feel excited and energized. They search for the change and adventure. They adore fashion, if they can afford they change their wardrobe and also their friends and acquaintances annually. Their relationships are superficial, because they are afraid of bonds as it limits their freedom. They often move house, change workplace, they travel if they can afford if not they just loiter not to be bound to anyone and feel monotony. They are resourceful, inventive and colourful in happenings, but during the grey working days, they can be tense and unpredictable.

##### **H-TYPE personality traits in key words**

- creativity
- flexibility
- stress tolerance
- problem recognition
- new approach to a problem
- developing and innovative ability
- need for freedom
- change tolerance
- brevity and risk taking
- curiosity
- humour

## 6 Summary and Future Orientation

The long term result of the research is to coordinate the internal university need (Making a European Area of Lifelong Learning a Reality' (Brussels, COM 2001) with the external entrepreneurship need. Moreover, meet and establish the conscious future



quality requirements of the development base of the human resource of the Research Centre of Vehicle Industry. The development has single value. It does not take into consideration the human factor, on which it is based on by aiming at achieving high quality professional goal. Other effect of this is the development of present educational system and strategy. The employees with extensive knowledge are preferably employed by big companies as these individuals can be quickly and easily prepared and retrained for the continuous needs of the economic word. Another existing result of the research is to stimulate the mutual thinking of the professors to support and develop the students. The courses of the development can diverge and be multi-viewed by integrating the high quality professorial and students' individual initiatives with the structural ones. Such as: a standardised integral culture assessment was carried out or the Teacher Training Centre's long years' work to support methodological improvement in curriculum development and in professorial trainings. Moreover the professional knowledge and experience of the professors teaching at the Faculty of Economics and dealing with human resource management and development of student's skills, and those who assess and develop the students, using other measurement systems. The range of optional subjects that develop soft-skills competences can be broaden and recommended with individual professorial methods and developments in own subjects or offering other high quality opportunities available at the university (Education and training 2010 2010).

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# Communicative Skills and the Training of the Collaborative Operator

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**Abstract.** The management of communication in organizations depends on well-defined policies on the flow of information. However, communicational tools and procedures may not achieve the desired goals if there is no operator collaboration. The objective of this paper is to analyze the communicative behavior of operators of a Water Treatment Plant. Problems in the flow of information can result in abnormalities in operation and compromise product quality. The method that characterizes this research is the case study, and for the documentary analysis the communication records between the shifts of the operators were made available. Data were analyzed in a descriptive-interpretive manner with a predominantly qualitative approach. The results suggest that the organization has operators with different communicative behaviors, and reveals a great discrepancy in the quantity and quality of the information regarding the operational routine. They highlight the need for training in communicative skills and improvement of the event reporting tool.

**Keywords:** Organizational communication · Communicative skills · Training

## 1 Introduction

In the complexity of organizations, although sophisticated methods and techniques for risk management can be used, human resource performance directly affects the outcome of any process. Recent studies [1–5] discuss organizational communication in the perspective of complexity. In this paradigm, the informational model where the organization sends messages to passive subjects has been overcome, and communication then seeks new directions and theories that “illuminate scientific debate and professional practice”. In this debate, the authors raise some relevant questions that need to be considered, such as: resources and practices designed for a period of certainty and stability that do not fit in this actuality of deep transformations; the “physical machine” man ignoring the biological and psychological man; the approximation of the administrative sciences to the humanities; and the role of the leader and his ability to communicate to engage and motivate the team or resolve conflicts.

With respect to the resources and communicative practices adopted by the organization, communication tools and skills need to be rethought periodically, since communication is a vital tool for anticipating problems and controlling impacts. As for the three dimensions of a man, physical, psychological and biological, the discussion becomes much more complex, with broad implications and a high degree of subjectivity. It is important here to motivate the operator to report an abnormality, his judgments about the need to report the event, the implications of this report or the damage to his image. The culture of guilt rooted in our organizations can contribute to the omission of information that, if provided, could avoid material and human losses. With regard to the approximation of the administrative sciences of human beings, we can emphasize here the inseparable nature of this relation. The new management needs to reconcile these dimensions, valuing the different perspectives of the different fields of knowledge. Psychology, Social Sciences (Anthropology of Organizations) and Linguistics offer theoretical contributions with implications in the productive practice that collaborate to improve the performance of the man in the work place. The last issue that was relevant to the discussion about organizational communication in the previous paragraph was about the role of leadership. The immediate boss is often the main source of information and the workers' contact with the higher spheres. Therefore, this manager has the attribution to communicate and listen to his subordinates aiming, as affirmed [3], "to obtain the respect and the adhesion of its team". According to [4], the leader needs to possess the skills necessary to socialize communication goals, including communication as social interaction, sharing of meanings, meanings and actions, as a learning opportunity, and as a tool to assist senior management in decision making.

In the opinion of [8], the performance of technical capacity is negatively affected by the scarcity of communicative skills, because communication problems may reflect on the quality of services. According to these authors, technical abilities and communicative abilities have similar importance to the operation. In view of the above, it is understood the need not only for empowering communication tools, but also for discussing relational skills and communication skills that are fundamental to the performance of job assignments. The communicative behavior of the operator manages interpersonal relationships and involves interpersonal communication, social skills, and communication skills. According to [6, 7], interpersonal communication motivates and influences behaviors. Social skills collaborate to resolve conflicts, coordinate work and seek to minimize future problems, as communication skills choose communicative behaviors to meet the objectives of interpersonal communication.

The objective of this work is to analyze the communicative behavior of 5 operators of a Water Treatment Station located in the northeastern of Brazil regarding interpersonal communication, interpersonal skills and communication skills. For this analysis, the written records of the operators in their shift book were studied in a period of 215 consecutive days. The work [11] held this Water Treatment Plant (WTP) pointed to two major problems that pose a risk to public health: the chlorination system and the shortage. The disinfection system is precarious, it has recurrent abnormalities, and the few fragmented data recorded in the current shift book do not contribute to continuous monitoring of residual chlorine content in water. Frequent supply suspensions and continuous rationing contribute to the storage of water in inadequate containers and the search for alternative sources. The water can arrive presenting a residual chlorine

content equal to zero in more distant points due to the proliferation of bacteria in the warm and humid piping that stays for days inactive. Many problems are derived from the WTP structure, limited and with old pipes. However, the monitoring of the processes and the preventive monitoring of equipment and the quality of the product leaving the WTP could reduce the number of stops or distribution of water unfit for consumption.

## 2 Methodological Procedures

In this case study, interviews were conducted with the management of the WTP unit and with the operations coordinator for data collection regarding training, organization contextualization and for operational routine knowledge. In a second moment, we conducted interviews with operators regarding operational routine and communicative practices. The records of the operators in the shift book of a period of 215 consecutive days for documentary research were made available by the organization. Each day consists of 4 shifts of 6 h. Shifts are not fixed, operators take turns in the morning, afternoon and evening. Finally, we analyzed the communicative behavior of the 5 operators regarding the communication of routine events, interpersonal communication, interpersonal skills and communication skills described in [8] based on written records of the operators.

## 3 The Communicative Behavior of ETA Operators

As stated by [11] the American Petroleum Institute, through the API Standard 770, presents a Management Guide for Reducing Human Errors, that is, the API 770 presents some techniques that collaborate to understand the basic causes of human errors and points out suggestions for improving human performance in industrial processes with the increase in Human Reliability Analysis (HRA). Among these suggestions there is the concern with communication and interpretation of records. According to this standard, human errors are likely to occur if there is a breakdown in communication. The risk of degradation of human performance related to the operator's discourse may be in the omissions or delays in providing answers, in the incorrect process of information, in the rejection of information conflicting with our diagnosis or decision, and in ignoring minor information. Also, according to the Standard, probable situations of error may be related to inadequate feedback, lack of clear communication, absence of records and the fact that there is no discussion at the end of the shift. The API 770 also suggests that the instruments used in the shift are structured in a checklist format, allowing the operator to pass on the task events. Such instruments would replace open procedures of narrative typology that do not aid memory.

According to the management of the organization, there is no discussion about the importance of the communication of operational routine in the training of operators, but only technical training related to the water treatment process. There is no computer available to the operator, the processes are all manual and the communication between

shifts occurs through an open occurrence book. There is also no discussion at the turn of the day about the occurrences of the operational routine.

Of the 775 records of the operators analyzed, 1,136 specifically technical information was extracted. The 5 operators were named Operator 01, Operator 02, Operator 03, Operator 04 and Operator 05. The graph below illustrates the amount of information registered by the operator during the shift (Fig. 1).

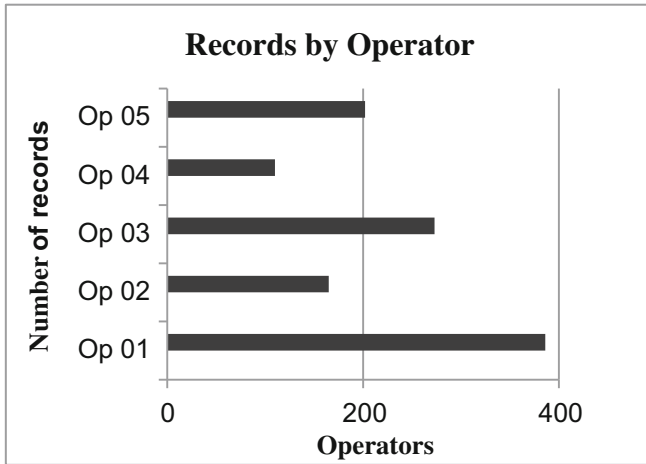


Fig. 1. Records per operator, according to the WTP shift book.

Operator 01, in his 164 worked shifts, recorded 34% of the information contained in the shift book, Operator 02 worked 163 shifts and was responsible for 14% of the recorded data, Operator 03 complied with 191 shifts and recorded 24% of the data information. Operator 04 is the one who passes a smaller number of data about routine events to the next shift in this period: with 154 worked shifts, he is the author of 10% of the information passed on to the next shift. Operator 05 worked fewer shifts, a total of 103, recording 18% of the information found in the shift book.

Table 1 below shows the contributions of the operators to the flow of technical information from the operational routine. This information allows the coordination of operations to visualize the state of the plant and its history, so it is important data for future planning and decision making.

According to the survey of the information recorded in the shift book in Table 1 above, Operator 01 contributes with the 19 verified items. In this period, operators more frequently reported the state of the reservoirs, the consumption of chemicals and the partial stops. The data on the reservoirs indicate their levels and which districts are being woven. Partial stops are frequent, because the city lives in constant turnaround, that is, at no moment the whole city is being supplied. The variation in the raw water that arrives at the ETA requires more or less quantity of chemicals, being this the third most registered information.

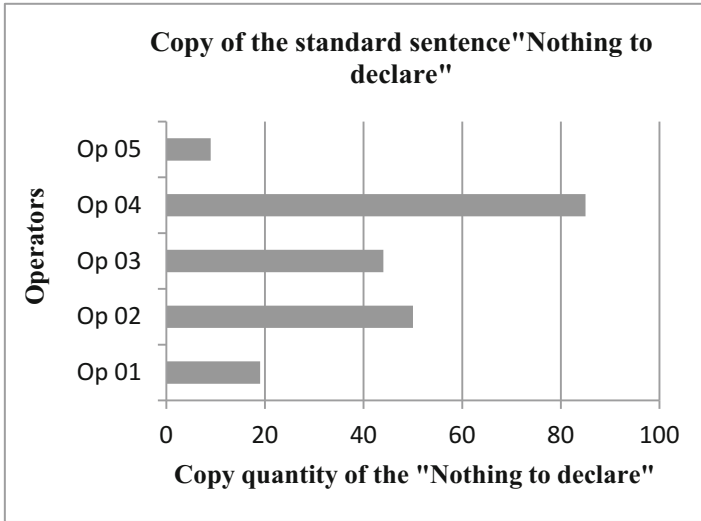
**Table 1.** Types of information recorded on the shift by operators.

Type of Information	Op01 (%)	Op02 (%)	Op03 (%)	Op04 (%)	Op05 (%)
Consumption of chemicals	41	4	29	1	25
Defect in pumps	34	33	33	0	0
Defect in registry	47	18	17	0	18
Difficulty performing task	100	0	0	0	0
Chemical stocks	50	0	0	50	0
Plumbing blowout	30	0	32	8	30
<i>Repair feedback</i>	52	13	9	13	13
Filter cleaning	29	0	14	43	14
Equipment maintenance	72	9	17	2	0
Partial stop	22	19	32	16	11
Total stop	58	27	0	0	15
Problem in the chlorination system	44	16	9	19	12
Problem with chlorine content	66	6	0	0	28
Problems with sulfate	50	0	25	25	0
Procedures to be followed	84	0	16	0	0
Reservoir status	25	21	23	12	19
Chlorine cylinder Exchange	50	0	0	0	50
Chlorine leakage	100	0	0	0	0
Water flow	62	12	25	0	0

The absence of some information that is considered essential for the continuity of the task is a cause for concern. Two important information that does not appear in the records are: the reservoir level 01 (R01); And the voltage, current and start-up level of the pump from recirculation 05 (R05). R01 supplies the ETA chlorination system, and a very low level would stop the water disinfection process. As for the R05 pump, voltage, current and starting time can indicate abnormalities that represent a risk of short circuit, motor burn, overheating, autotransformer firing and malfunctions on the control panel. Other information that appeared sporadically in the operator’s records were the washes of the filters (7 times in 775 records) and the monitoring of the chlorine content in the water. This residual chlorine analysis must be verified by the operator every two hours, according to Decree n° 2.914 of the Ministry of Health, but this monitoring is little recorded.

Another fact of this check is troubling: when there is nothing to communicate about the routine at the time of shift change, ETA operators copy the default phrase “I turn the shift to operator X in the same way I was delivered” in the book. The frequency of this registration varies from operator to operator, and Fig. 2 below illustrates the amount of this recurrence in the operators’ records.

Operator 01 copies the default phrase in 11% of the records themselves in the period, Operator 02 repeats by 31% and Operator 03 in 23% of their annotations. From the records of Operator 04, in 56% of his texts in the period one can find the affirmation that there is no observation to be made on the worked shift. The lowest incidence is



**Fig. 2.** Copy of the standard sentence in the records themselves.

found in Operator 05 texts: 8% of your records repeat the default phrase. The concern in this case is the omission of information that may compromise water quality surveillance, processes and distribution.

### 3.1 Interpersonal Communication and Social Skills

In [8], interpersonal communication is defined as the ability to establish and maintain interpersonal relationships. It is the capacity to interact socially in a productive and satisfactory way, generating empathy, managing conflicts and encouraging positive behaviors. In the records of the ETA operators it is possible to observe the existence of conflicts of social order, conflicts between operators and conflicts with the coordination of operations. Some elements explained in the text allow this interpretation. Two of these situations are observable in the text of Operator 04. The first is difficult communication with the operations coordinator, translated into unsuccessful attempts because the telephone is switched off. The second situation in the text of the same operator is the disagreement of warning suffered. Operators sometimes diverge and disagree with what was recorded by the worker on the previous shift.

Social skills can be defined as a set of behaviors appropriate to each situation in a climate of mutual respect and cooperation. Such skills enable the individual to cope with stress and risk situations by coordinating work and managing conflicts. It is possible to find in the operators' book the explicit textual elements where criticisms are made of the decisions taken by the chiefs, but, on the other hand, there are also texts in support of the same heads for the intention and attempt to improve the chlorination system.

### 3.2 Communication Skills

Although communicative skills involve verbal, nonverbal and written languages, in this study we limit ourselves to written ability. The analysis of operator records suggests that Operator 01 can be considered compromised with the communication of operational routine events. He is in charge of reviewing the guidelines and procedures coming from operations and maintenance management. Their records are more detailed, with more information, and present hypotheses regarding possible causes of the abnormalities in the operation. He is responsible for 50% of the feedbacks recorded. Operator 02 does not detail his records very much, 31% of his texts are the copy of the standard phrase of “Nothing to declare”. He is concerned to justify who authorized him to perform procedures and make decisions. Operator 03 presents a large gap in writing. Of its 191 records, 54 problems are identified in the linguistic structure, but it is the second in number of information and contributions regarding the operation. Operator 04 offers a low number of information to the occurrence book, 56% of its records being the copy of the “Nothing to declare” standard. Operator 05 has less time in the organization, is the least who records the copy of the “Nothing to de-clarify” pattern on the shift, and accounts for 18% of the information contained in the book.

## 4 The Training of the Collaborative Operator

The WTP operator in question does not receive any training regarding organizational communication. The training provided by the organization contemplates only technical aspects of water treatment. Although interpersonal communication, social skills and communication skills should be the subject of training and continuous learning, these issues are not included in the training of the organization in question. The training of coordinators and managers is also exclusively technical. The technical training needs to be complemented with themes such as: notions of organizational communication; Styles and influences of communicators; The balance of interpersonal relationships; Communicative responsibility; Communication as a tool for risk management; Written skills training to reduce failures and errors; Appropriate behaviors using verbal and non-verbal languages; Discussions on the analysis of communication tools in the organization; And self-assessment as a communicator; among others. On the other hand, it is worth mentioning that training and empowering instruments for shift communication may not have an effect if the operator is not motivated, willing to collaborate, and feeling an important part of the organization.

## 5 Conclusions

This work aimed to analyze the communicative behavior of operators of a Water Treatment Station located in the northeastern region of Brazil. The analysis of operators' written records reveals that there is a discrepancy in the quality and quantity of the data provided by the operator. The study shows that important information about the operational routine does not appear in written texts. Although it is possible to verify language differences in the records, this factor does not influence the passage of



information. It is possible to identify differences in communication skills, in this case written communication. However, also interpersonal communication and social skills should be the target of training.

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# Simulation and Surface Response Methodology for Simultaneous Optimization of Response Variables: Case Study in a Warehousing Process

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**Abstract.** The purpose of this paper is to present an applicable approach for simultaneous optimization of response variables in a warehouse process. Through simulation and the Response Surface Methodology, supported by information and communication technologies. The methodology applied to this problem considers the design of a simulation model, defined by discrete events to represent real-life activities in a warehouse process; this will allow to simulate different alternatives, in order to collect the results of the response variables. In addition, the Response Surface Methodology is applied to analyze the effects of the factors, and to define an empirical model able to appropriately describe the behavior of a multivariate system. A prediction model was established empirically through a case study; this scenario showed that the simultaneous optimization of the response variables is plausible.

**Keywords:** Simulation model · Response Surface Methodology · Response variables · Simultaneous optimization

## 1 Introduction

Warehousing plays an important role in the supply chain management. Therefore, the managing of this process is vital for organizations to compete in today's globalized environment [1]. Since warehousing is expensive, it represents between 2 and 5% of the cost of sales, it has become an important topic for improvement purposes within corporations [2]. Although the administration and the operational practices have evolved considerably with the introduction of sophisticated technologies, there is always speculation in organizations regarding the strategy that needs to be adapted in order to achieve maximum efficiency, while at the same time reducing costs involved in this process [3]. The achievement of economical, technical and organizational goals

requires optimized operational processes in a warehouse; consequently, the objective is to achieve maximum operations capacity of warehousing activities with the lowest amount of resources [4]. Hence, a basic challenge for warehouse management is allocating the right number of people and equipment to produce quality work; as well as defining an optimal warehouse layout to meet the space requirements. The warehouse process starts with receiving and shipping, here dock doors availability is a key factor [3]. Thus, different scientific disciplines have focused on the development of mathematical methods for industrial optimization purposes, among which is the operations research discipline [4]. Different techniques integrate this discipline, such as stochastic and statistical models; simulation, which is a powerful tool to compare alternatives for decision-making and due to its stochastic nature. An effective comparison for optimization processes should consider application of statistical techniques for better analysis [5]. The following sections of this article are organized as follows. Section 2 discusses the importance of the warehouse process in today's business environment, and optimization techniques for this process. Section 3 describes the simulation model methodology propose by Hoover and Perry applied in this research. Section 4 focuses on the study case, as well as showing the results achieved with the application of the simulation method and the Response Surface Methodology (RSM). These techniques are implemented using the ARENA software to design the simulation model that represents the actual warehouse process, together with the Minitab software to perform the statistical analysis. Finally, the conclusions of this research are drawn in Sect. 5, the investigation shows how the information and communication technologies facilitate the application of these techniques, in order to define the mathematical models to predict the parameters of the factors to achieve the simultaneous optimization of two response variables in a warehousing scenario.

## 2 Literature Review

The warehouse process presents a great opportunity for continuous improvement, due to the high cost it represents. Straube et al. [6] state that in emerging markets in electronics, the transportation, inventory and storage activities account for approximately 40% of the cost of the products. Similarly, Ramaa et al. [2] claim that the cost of storage represents between 2% and 5% of the cost of sales depending on the type of industry.

Nevertheless, most of the optimization activities in the manufacturing environment focus on production processes; therefore, there are very few researches related to warehousing process optimization [1].

Kelton et al. [7] declare that simulation refers to a broad collection of methods and applications to mimic the behavior of real systems, where a system is define as a facility or process, either actual or planned. In the last decades, the application of simulation models has been facilitated with the use of specialized software [8]. It is for this reason that simulation traditionally applied in productive environments has been implemented in service and government sectors [9]. Several investigations have successfully applied this technique for process optimization. Wang et al. [10] used the simulation to propose a material supply strategy that suits the current factory operation and provided important basis for the design of the workshop logistics system. Kaban et al. [11] showed, through

simulation, the performance improvements achievable in a manufacturing plant with the right definition of the sequencing rules for job shop scheduling. Giraldo et al. [12] were able to establish a comprehensive strategy to improve the operation of the production system in small and medium-sized enterprises through simulation. In that sense, simulation models usually require interacting with other methods to establish an optimization strategy; Carson and Maria [11] identified six-simulation optimization methods, such as the RSM, which was implemented in this work.

RSM is a procedure for fitting a series of regression models to the output variable of a simulation model, evaluating it at several input variable values, and optimizing the resulting regression function [13]. Montgomery [14] states that RSM was introduced in 1951 to improve the processes of the chemical industry; its purpose was to optimize chemical reactions to obtain higher yield and purity at low cost. Two important models are commonly used in RSM [15], the first-degree model (Eq. 1) and the second-degree model (Eq. 2). The objective of the models is to establish the relationship between the factors and the response variable, to determine the statistical significance of the factors and to determine the parameters of the factors in which the response variable is optimal.

$$Y = \beta_0 + \sum_{i=1}^k \beta_i X_i + \varepsilon \quad (1)$$

$$Y = \beta_0 + \sum_{i=1}^k \beta_i X_i + \sum \sum_{i < j} B_{ij} X_i X_j + \sum_{i=1}^k X_i^2 + \varepsilon \quad (2)$$

Additional techniques were introduced in the RSM with the aim of performing simultaneous optimization [15]. Lind et al. [15, 16] developed a technique where all responses are overlaid to graphically identify feasible regions where all responses meet the requirements. Harrington [15, 17] introduced the desirability approach, which defines a function in the space of factors that estimates the overall desirability of the product at each point. Through this function, the multivariate optimization problem becomes a univariate optimization problem. Nowadays, these techniques are widely used for optimization purposes in a wide range of disciplines. Wexler et al. [18] used RSM in the food industry to evaluate simultaneous response variables and determine the best process to produce fried papaya. Raihimi et al. [19] model and then optimize the schedule of subway train travels with the support of RSM. Aldemir and Hapoglu [13] applied simultaneous optimization to define the optimum conditions of process operation for wireless temperature control with RSM.

### 3 Methods

This research was performed as follows. First, a field investigation was done to collect information related to the warehouse process of a logistics company serving to the electronic sector in Tijuana, B.C. Mexico. This activity aided to perform a process mapping, to gather information about the process under study. Second, the work took an experimental approach, through the application of the methodology proposed by Hoover and Perry [9] for simulation studies, which considers the six steps developed in the case study.

## 4 Results and Discussion

Firstly, the process mapping was prepared to define the warehouse logistics system as shown in Fig. 1. It starts with product unloading to perform the receiving task; there is a flow delay to perform inventory update in the computer system; then the products are put away in one of the 234 locations in the warehouse waiting for a shipping order. Later on, as soon as the order is completed, the picking task is performed for order preparation. Hence, the warehouse inventory needs to be updated. Finally, the product loading activity is carried out to complete the order and ship out the product. The process mapping was the basis for the design of the simulation model.

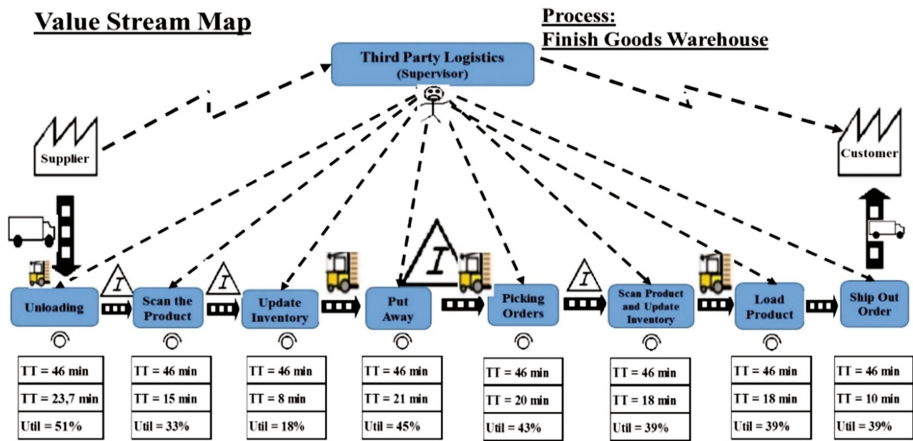


Fig. 1. Warehouse process value stream map

### 4.1 Problem Statement

One of the logistics challenges in manufacturing environment is the design of flexible warehouse operations, aligned to the seasonal market demand fluctuations. Thus, organizations need to evaluate strategies that aid the planning of these operations, in order to ensure the optimal allocation of resources. Nevertheless, a very few researches in the literature approach the planning of this process, most of them focus on manufacturing activities; as a consequence these areas have not been fully explored for this purpose [1]. For this reason, a study case was carried out in a warehousing operation from the electronics industry in the city of Tijuana, B.C. Mexico. Simulation models and optimization methods were applied to determine their effectiveness for process optimization purposes.

**Actual Situation.** The company where the study case was performed is dedicated to offer warehousing services to television manufacturing companies. In particular, the finish goods warehouse process is the area of interest for this research; since it is a very dynamic operation, where the operational capacity must be adjusted frequently to support seasonal demand fluctuations.

Currently the operation is designed to perform 13 receiving, and 13 shipping operations in average per day. In addition, the warehouse has capacity to store 234 fifty-three-foot trailers. For this reason, the dock doors, the equipment (forklifts) and warehouse personnel are important factors to evaluate in order to ensure optimal resource allocation and at the same time guarantee that market requirements are met.

## 4.2 Data Collection

The process mapping was performed with the value stream map tool; it was used as an instrument to collect the information required for the model construction. This step contemplates a cycle time analysis for each activity in the warehouse process. A statistical sample of 24 observations was considered to adequately estimate the cycle times of each operation, this was defined based on statistical sample size equation.

In this way, all the elements needed to build the simulation model were identified, resulting as follows:

1. Entities. Fifty-three-foot trailers are the entities for the simulation model; these are the ones moving through the warehouse logistics flow.
2. Variables. Two types of variables are considered. Response variables, the cost to perform the warehouse process is the first variable, while capacity belongs to the receiving and the shipping operations performed per day. Additionally, the input variables are forklifts, worker teams, working hours and warehouse dock doors.
3. Resources. Represents the cost related to the input variables. A benchmark with local suppliers was done to collect this information.
4. Statistics. This activity accumulates the statistics of the response variables, which are used for optimization purposes.

## 4.3 Simulation Model Design

The simulation model design needs to be perform based on the warehouse process and the interactions between entities, variables and resources; as shown in Fig. 2. The simulation model assumes the arrival of entities to represent the warehouse process through the activities of receiving, put-away, storage, picking and shipping. The model considers some failures in the receiving and shipping activities when the inventory is updated on the computer system.

## 4.4 Verification and Validation Model

The model verification confirmed that the entities move properly through the entire logistical flow of the warehouse process to simulate the proposed activities. In addition, the model validation stage compares the average of operations processed by the system per day, with the results of the current operation. The model was replicated 10 times to perform a statistical hypothesis test; the result obtained for the p-value was 0.591, which confirms that the virtual and real results belong to the same population. This concludes that the virtual model adequately represents the actual situation of the process.

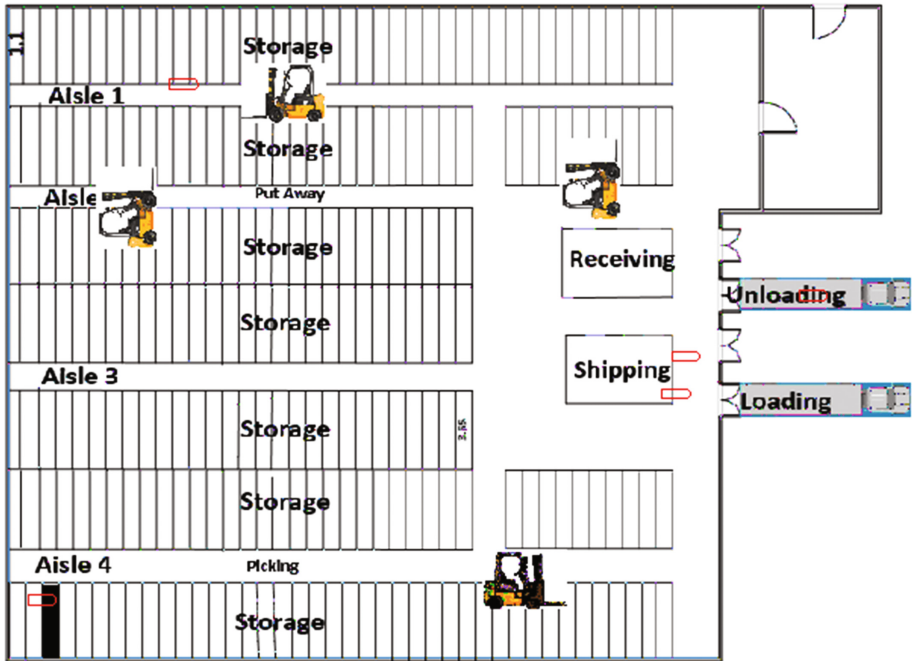


Fig. 2. Simulation model for warehouse process

#### 4.5 Experimentation and Model Optimization

This step consider the RSM as the optimization method, therefore the factors and levels to be tested must be defined. The first factor is called working hours, this was tested at a low level of 9 h per day (one shift per day) and at a high level of 17 h per day, (two shifts per day). The second is the worker teams; each one is integrated by a data clerk and two forklift operators, considering 2 at low level and 8 at high level. Finally, dock doors were tested at levels 4 and 8, this factor is crucial in receiving and shipping operations. These are special facilities whose construction must be planned in advance, since this is elemental to determine the capacity of a warehouse.

The first step in RSM is to validate if the response variables fit a first or second order regression model. In this case, a factorial design (FD)  $2^3$  with four central point was applied. This design was tested in twelve experiments, which are executed on the simulation model to collect the results of the response variables. The statistical analysis of these results determined that a second order model must be applied in the next stage of the RSM.

In this way, Composite Central Design (CCD) was selected for the second order model. The CCD technique is designed from a  $FD 2^k$ ; additionally to the factorial points, this includes axial and central points in the experiments. Based on this information, eighteen experiments were executed, and since all factors were statistically significant for the response variables in previous analysis, all of them were included in the CCD.

The experiments sequence was defined with Minitab, each configuration was executed in the simulation model. Table 1 shows the information generated by the CCD.

**Table 1.** Composite central design with three factors

StdOrder	RunOrder	PtType	Shifts	Work team	Dock door	Cost	Capacity
7	1	1	9	8	8	876	40
10	2	-1	19	5	6	853	75
14	3	-1	13	5	9	759	51
5	4	1	9	2	8	306	13
8	5	1	17	8	8	1194	85
4	6	1	17	8	4	1131	63
15	7	0	13	5	6	688	57
13	8	-1	13	5	3	651	34
9	9	-1	7	5	6	518	31
3	10	1	9	8	4	845	27
11	11	-1	13	0.5	6	229	6
6	12	1	17	2	8	462	28
17	13	0	13	5	6	685	55
12	14	-1	13	9.5	6	1137	61
2	15	1	17	2	4	405	29
16	16	0	13	5	6	686	56
18	17	0	13	5	6	686	55
1	18	1	9	2	4	270	13

Then, Analysis of Variance (ANOVA) is performed to evaluate the significance of the regression model, the factor effects and the model lack of fit. Figure 3 shows this indicator for the capacity variable. The regression model illustrates that in both, Cost and Capacity, the p-value is less than 0.05, which establishes that the second order model is a good predictor. The factor effects related to the Cost confirms that only linear effects are significant. Hence, all three factors must be considered in the CCD. Contrary to this, in the Capacity variable both linear and quadratic effects have statistical significance. Based on this, the application of a second-order model is recommended to properly represent the curvature on the response surface. Finally, the effect called lack-of-fit was evaluated, this indicates that there is lack of adjustment of the data for the model related to the Cost variable, since the p-value is less than 0.05. However, this lack of fit is compensated by the high coefficient of determination achieved, as previously described [20], this situation is due to the linearity of the effects. On the other hand, in the Capacity variable the data is adequately adjusted to the CCD, because the p-value is greater than 0.005.



Up to this point, the predicted coefficients of the determination index for the hierarchical regression model are 98.91% and 96.27%, for Cost and Capacity respectively. Hence, the model is tested excluding not significant effects and the index is evaluated to identify if the predictor model is improved, the index results are 99.7% for Cost and 97.12% for Capacity. Therefore, we can concluded that the predictor regression models, showed in Eqs. 3 and 4, are optimal.

$$Y_{capacity} = -53.4 + 15.47X_1 + 67.07X_2 - 5.08X_3 - 0.15X_1^2 - 0.38X_2^2 + 1.58X_3^2 + 3.26X_1X_2 + 0.02X_2X_3 \quad (3)$$

$$Y_{costo} = -80.29 + 3.68X_1 + 5.94X_2 + 17.66X_3 - 0.10X_1^2 - 1.15X_2^2 + 1.58X_3^2 + 0.52X_1X_2 + 0.75X_2X_3 \quad (4)$$

Response Surface Regression: Capacity vs. Shifts, Work Team, Dock Door						
S = 2.15059		PRESS = 310.288				
R-Sq = 99.55%		R-Sq(pred) = 96.27%		R-Sq(adj) = 99.05%		
Analysis of Variance for Operations						
Source	DF	Seq SS	Adj SS	Adj MS	F	P
<b>Regression</b>	9	8270.61	8270.61	918.96	198.69	<b>0.000</b>
Linear	3	6498.76	6498.76	2166.25	468.38	0.000
<b>Shifts</b>	1	2534.72	2534.72	2534.72	548.04	<b>0.000</b>
<b>Work Team</b>	1	3680.82	3680.82	3680.82	795.85	<b>0.000</b>
<b>Dock Door</b>	1	283.22	283.22	283.22	61.24	<b>0.000</b>
Square	3	1289.35	1289.35	429.78	92.93	0.000
<b>Shifts*Shifts</b>	1	2.12	26.23	26.23	5.67	<b>0.044</b>
<b>Work Team*Work Team</b>	1	911.56	998.94	998.94	215.99	<b>0.000</b>
<b>Dock Door*Dock Door</b>	1	375.67	375.67	375.67	81.23	<b>0.000</b>
Interaction	3	482.50	482.50	160.83	34.77	0.000
<b>Shifts*Work Team</b>	1	312.50	312.50	312.50	67.57	<b>0.000</b>
Shifts*Dock Door	1	8.00	8.00	8.00	1.73	0.225
<b>Work Team*Dock Door</b>	1	162.00	162.00	162.00	35.03	<b>0.000</b>
Residual Error	8	37.00	37.00	4.63		
Lack-of-Fit	5	34.25	34.25	6.85	7.47	<b>0.064</b>
Pure Error	3	2.75	2.75	0.92		
Total	17	8307.61				

Fig. 3. ANOVA composite central design for capacity

Based on these models, predictions can be performed for the response variables, where specific parameters for the factors are established to achieve the expected results in the warehouse process. The response surface and contour plots can be prepared through these models, to identify feasible regions that satisfy the optimization criteria for the response variables. Figure 4 shows an overlaid contour plot processed with Minitab for both response variables. The white region on the plot is a feasible region to identify the parameters for the actors; it stipulates a warehouse capacity between 13 and 17 operations by day with an operational cost between \$285 and \$385 (US Dollar).

Once the prediction models are defined, another useful optimization technique is

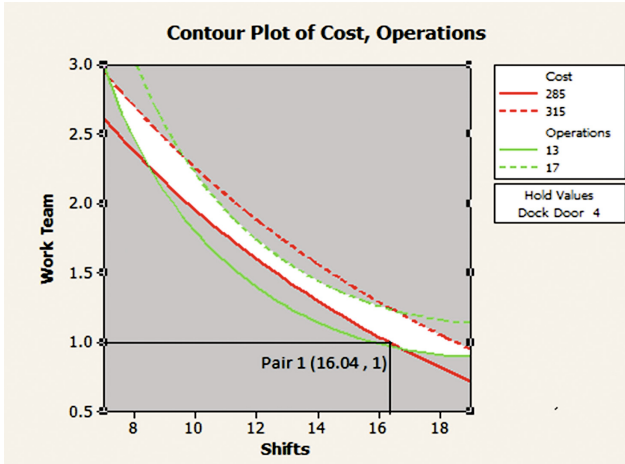


Fig. 4. Overlaid response variables contour plot

composite desirability. The objective for this study case is to maximize capacity of the warehouse which is the number of operations day, at the lowest cost. Therefore one response variable, Capacity, should be maximized, while minimizing the Cost. This activity was developed in the Minitab software. First, the desired optimization level for the response variables must be established. In this case, the technique must optimize Capacity to 15 operations per day, while minimizing the daily cost, not exceeding \$310. It is important to note that both response variables have the same weight and importance.

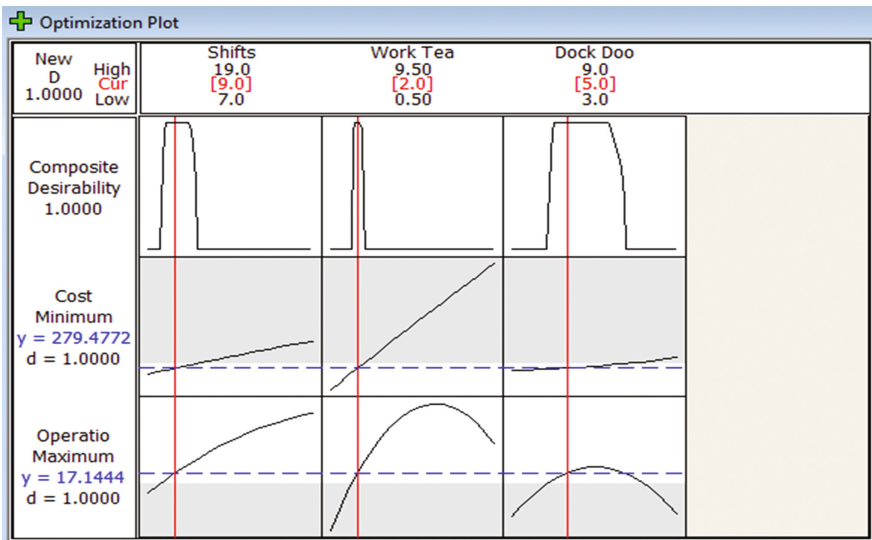


Fig. 5. Warehouse process optimization chart

After the response variables targets are defined, the optimization process is executed to identify the factor parameters where the optimization conditions are met. The parameters shown in Fig. 5 indicate that with 9.0 working hours, 2 worker teams and 5 dock doors, the system predicts that the warehouse process can perform 17.1444 operations per day at a daily cost of \$279.4772; with a composite desirability of 1.0, which is the highest achievable value. This indicates that this combination of parameters minimizes the variability of the response variables.

#### 4.6 Results

The defined mathematical models are the result of the implemented methodology, these are very important in processes with seasonal market demand fluctuations. Since it is through these models that operations patterns can be defined in order to allocate resources properly. An example of this activity is shown in Table 2. In this case, the first row defines the resources required to meet current customer requirements of 13 operations per day. The second row presents the required actions to duplicate warehouse capacity if necessary, and so on.

**Table 2.** Warehouse process operational pattern

Response variable desired results		Resources			Composite desirability
Capacity (operations per day)	Cost	Working hours	Team work	Dock doors	
13	\$270.00	9	2	4	1.0
28.24	\$415.66	17	2	4	1.0
40.29	\$536.32	17	3	4	1.0

## 5 Conclusion

This research applied model-based optimization in areas where these tools have not been fully explored, such as the warehouse process. We evaluate their effectiveness through the simultaneous optimization of two response variables. Identifying that the simulation model is a powerful tool to run virtual experiments in activities where it is not possible to execute them in real life, due to time constraints; and that the Response Surface Methodology is an excellent optimization method. It is concluded that these methods can be easily implemented on companies with the support of information technologies.

In this work, we show, through a study case, that the model-based optimization is an excellent and effective tool to evaluate alternatives, as well as to identify possible improvements in a certain process. This well-founded tool is functional for middle and/or top management decision-making. As a consequence, better and formally founded business strategies can be designed to achieve the desired performance in a given process. The optimization step empirically shows that this methodology is useful to improve the results of the response variables.

Finally yet importantly, the development of this research can corroborate the importance of information technologies, models and methods, which are generally considered complex, can be applied in a friendly manner, and have a positive impact in industrial and academia practices.

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# Comparison of Laboral Tension Between Management and Operational Teams

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**Abstract.** This research corroborates that stress level showed by upper management groups, and lowest labor ranks are similar, and that there is not statistical difference. Karasek questionnaire was used to measure labor tension level and resources available to the worker to deal with different job situations, such as qualifications, skills, experience, team work, including the amount of autonomy and participation in the decision making as well as the control over the development of the employee's activities. The study performed among 78 employees of several labor backgrounds and different professional skills, working in different local businesses. The levels studied were from operational up to management; sample divided in two segments according to hierarchical level within their workplace. 2-sample t test was used to compare the teams; results showed no significant statistical difference. The study offers to directives, elements to evaluate laboral stress level and effect on performance of employees.

**Keywords:** Dimensional control · Job demands · Social support · Hierarchy and camaraderie

## 1 Introduction

The purpose of this research was to determine the job strain levels showed by employees of different working levels, through the Karasek questionnaire [1], which evaluates stress levels in three dimensions: dimensional control, psychological demand and social support; and calculate a statistical comparison to find out if there is a significant difference between the results of the job strain levels.

The 78 participants were dividing in two teams: upper management teams and lowest labor rank teams, presenting several labor backgrounds and different professional skills and have been working in 12 different businesses, including small and large enterprises, such as maquiladora industries, supermarkets and service establishments.

The Karasek questionnaire measures, job strain level and resources available to the worker to deal with different job situations, such as qualifications, skills, experience, team work, beside the amount of autonomy and participation in the decision making as well as control over the development of employee's activities [1, 2]. The Method presuppose that maintain an equilibrium among the three dimensions will increase

satisfaction whereas a disequilibrium will take to high stress levels [3]. Studies support Karasek's hypothesis in explaining personal development, even though with a small effect size [4, 5].

One factor that has been affecting human performance at workplaces is occupational stress. Globalization has introduced to the organizations dramatic changes; the external competence is getting into the organizations high pressure to meet the objectives. Information and communication technology changes, reduction of company's employees, new working systems, although are looking for increased productivity, could provoke high stress levels [6, 7]. Integration has taking workers around the world to significant changes organizationally and individually; the modern working life requirements provoke greater pressure under them [8].

Stress at workplace could be a motivator to reach the people's very best, by other side could destroy lives, employees feeling unfairly treatment, fatigue, depression, attention decrement, tiredness symptoms. Sources of stress at work could be cause of role conflict, role ambiguity, role overload, lack of participation, poor laboral climate.

The study offers to directives, elements to evaluate laboral stress levels and the effect on performance of employees, to implement immediate actions to reach the enterprise objectives optimizing resources.

## 2 Occupational Stress

The situations faced at these times at the organizations, internal and external, could be an important factor to detonate occupational stress. Disorganization inside the enterprises, inadequate work environment, lack of clarity about the roles and responsibilities may well be a key factor to this imbalanced emotional stress.

The occupational stress has a price and the industrial societies have been ignoring it up to date, health statistics have been accounted for certain number of diseases grouped under the name of "stress's diseases"; mainly: drinking problems, diabetes, heart disease, Alzheimer's disease, gastrointestinal problems, depression and anxiety among others [9].

Acute responses to stress could be: (1) emotional as anxiety, irritability, low morale, depression, feeling powerless; (2) physical as headaches, stomach problems, eating disorders, sleep disturbances, muscle aches and pains; (3) organizational as low performance, negative peer relationships, turnover, and absenteeism [2].

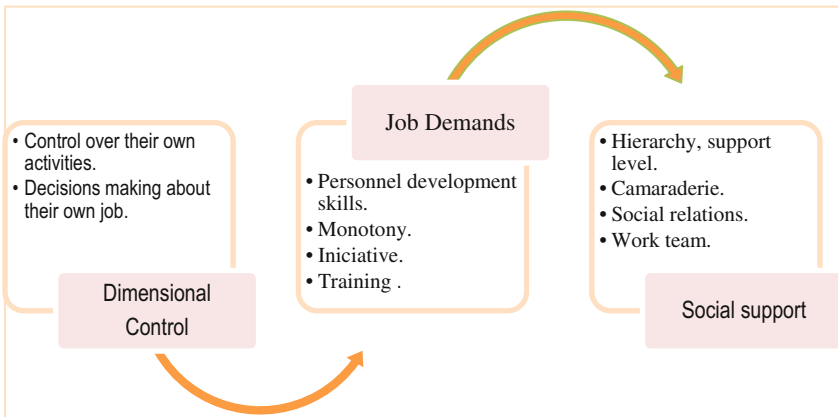
The World Health Organization (WHO) declares that occupational stress affects individuals' psychological and physical health likewise organizations' performance negatively.

In a case study about occupational stress developed by Instituto Mexicano Del Seguro Social [10], found that 75% of employees in Mexico suffer stress disease, provoking high absenteeism, and low productivity. Compared with other countries Mexico is global leader with the highest laboral stress index 75%, over China that reports 73% of the employees, while USA registers 59%. Until recently stress has been considered as a disease because provokes stomach problems, headaches, muscle aches and pains, among others. Even though, public health authorities inform that from the 75 thousand heart attacks yearly registered in Mexico, up to 25% of them related to this symptom.

Other study [11] “Desarrollo de la Escala Mexicana de Desgaste Ocupacional” (Mexican Occupational Wearing Scale Development) carried out by Universidad Nacional Autónoma de México out of 500 respondents, 100% reported certain degree of stress, at least 60% was reported on highest levels directly reflected on physical conditions. Besides 25.5% respondents expressed that they were occupying middle managerial positions at the company they were working for and 5.9% occupying top managerial positions.

Studies present that when excessive demand and pressure is required in a certain type of work and do not match workers’ knowledge and abilities, the possibilities to carry out any choice control is low, and there is little support from others, there is a stress growing area.

The Karasek questionnaire is a self-administered instrument designed to measure social and psychological characteristic of jobs, showed on Figure. The scales (a) decision latitude associated with the Dimensional Control, (b) psychological demands, and, (c) social support, are used to measure the high-demand/low control/low-support model of job strain development. The Model central point is that stress will be highest in jobs identified by the association of high job demands and low job control [8].



**Fig. 1.** Karasek questionnaire measures dimensional control, psychological and social support

The methodology, for this study, consisted in a sample of employees from operational to management level. The sample divided in two teams considering its hierarchical level within the organization. Different kinds of companies were included, such as, 10 manufacturing industries, 1 service company and 1 supermarket. The employees’ age range from 22 to 50 years, the seniority was from a month up to 17 years of company service.

Within the first team, there were considered 35 employees occupying lowest positions into the organization, as technicians, operators, auxiliaries, security officers, sales employees, front desk and clerks. Into the second team were included 39 employees occupying highest positions into the organization as supervisors, engineers, administrators, coordinators, managers and buyers.



The Table 1, Measurement process to determine the job strain, presents each one of the dimensions and the items included, also shows the items subtracted to perform the calculus according to the Karasek questionnaire that contains 29 items.

**Table 1.** Measurement process to determine the job strain.

Dimensional Control	Items
DC = Control + Decision latitude	
Control	1, 2, 3, 4, 7, 9
Decision latitude	6, 5, 8
Psychological demands and mental workload	10, 11, 12, 13, 14, 15, 16, 18
Subtract the item (excessive amount of job)	12
Subtract the item (insufficient time)	13
Subtract the item (contradictory orders)	14
Social support	
Hierarchies	19, 20, 21, 22, 23
Subtract the item (hostility of supervisor)	21
Coworkers	24, 25, 26, 27, 28, 29
Subtract the item (hostility of coworkers)	25

Job Strain Classification of Karasek Model, showed on the Table 2, It was used to determine the level of job strain in the three dimensions, the calculation were carried based on the data presented.

**Table 2.** Job strain classification of Karasek model

Job strain classification	Range
Low	1 to 1.9
Moderate	2 to 2.9
High	2.9 to 3

## 3 Results

### 3.1 First Dimension: Dimensional-Control

Include Components of Decision Latitude-Skill Discretion and Decision Authority; the model based on measures of psychological demands of work combined with a measure of task control and skill use (decision latitude). The dimension relates to “how hard workers work” (mental workload) organization constraints on task completion, and conflicting demands (Fig. 2).

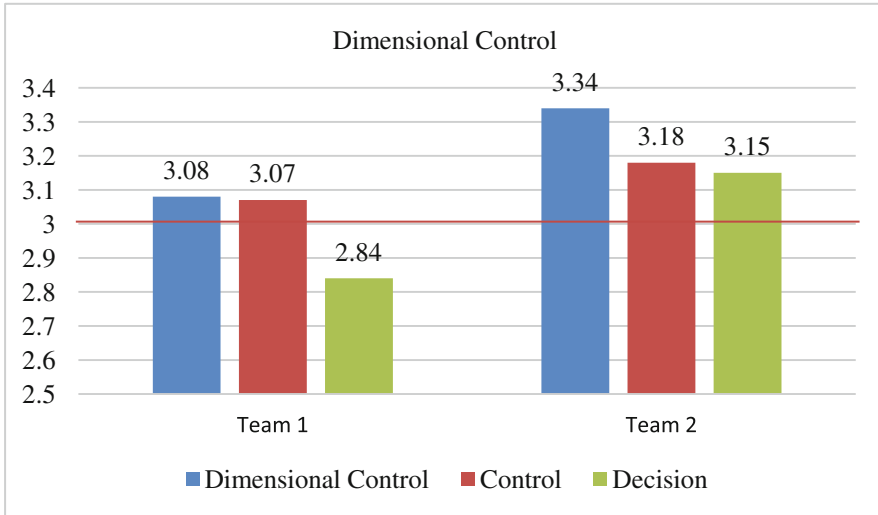


Fig. 2. Dimensional Control job strain from each team

First dimension. The results obtained of the both teams, in the section of task control show High Job Strain, also there is no a significant difference between both performances related to the set of questions about the level of skill and creativity, flexibility permitted to the worker in decide how skills to employ, autonomy and ability to learn new thing at job.

Employees in the team 1 show a moderate job strain in the section of decision latitude, it can reach the conclusion that feel less pressure to make not difficult decisions about their tasks in comparison with the second group of greater responsibilities in their jobs and high job strain.

### 3.2 Second Dimension: Psychological Demands and Mental Workload

Included items ten to eighteen. Demands for skills are those that are mostly of a psychosocial, mental, or physical nature. The job offers a variety of interesting tasks, opportunity to learn new things and personal development skills. The job is boring, monotonous or repetitive. Their work demands a high level of skills, knowledge and attitudes, including initiative (Fig. 3).

In this section, the employees of both categories show a moderate job strain (rank 2 to 3), related once the employee has acquired the necessary skills to perform his work, does not generate a high level of labor tension in comparison with the first dimension of Control and Decision latitude. Based on the evaluation there is no a significant difference between these two groups in the second dimension.

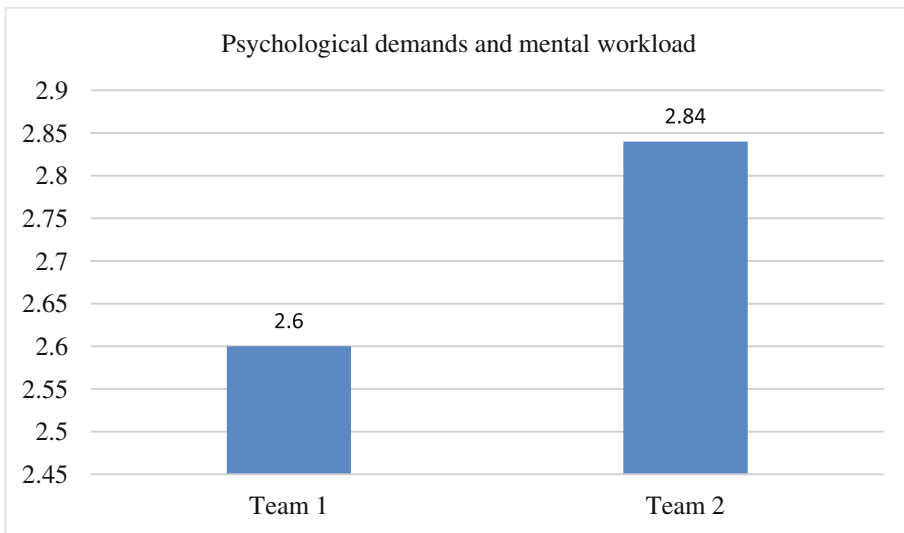


Fig. 3. Psychological demands and mental workload

### 3.3 Third Dimension: Social Support

Social Support acknowledges the need of any theory of job stress and behavior development to assess social relations at the workplace. The job insecurity effect can depend on the labor market requirements for particular skills, limiting possibilities future career development (Fig. 4).

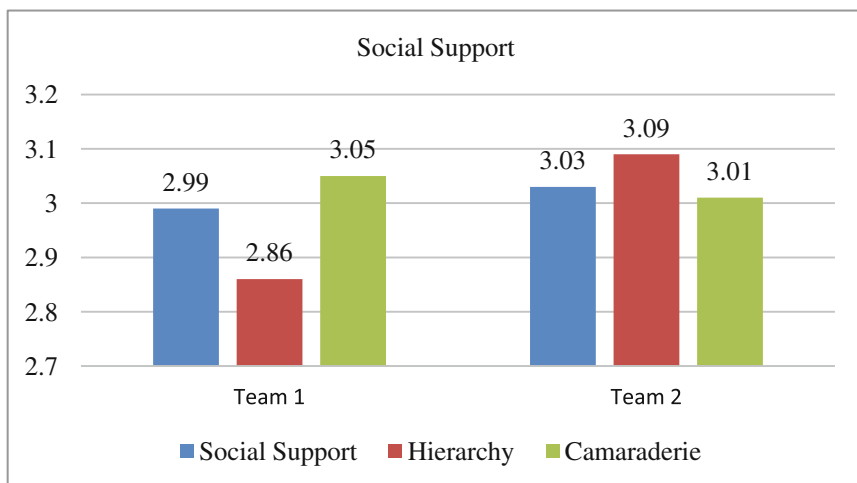


Fig. 4. Social support, hierarchy and camaraderie.

In this third dimension, the statistical results show that there is a significant difference in the result, the section of hierarchy employees; the first group feels less support from their supervisors and superiors than the employees of the higher hierarchy in administrative positions do, both groups are agree that they have a good relationship with their coworkers and supervisors. The 60% of the group agree that the people they work receive support each other (camaraderie) and work together, and the 76% agree that coworkers facilitate the work.

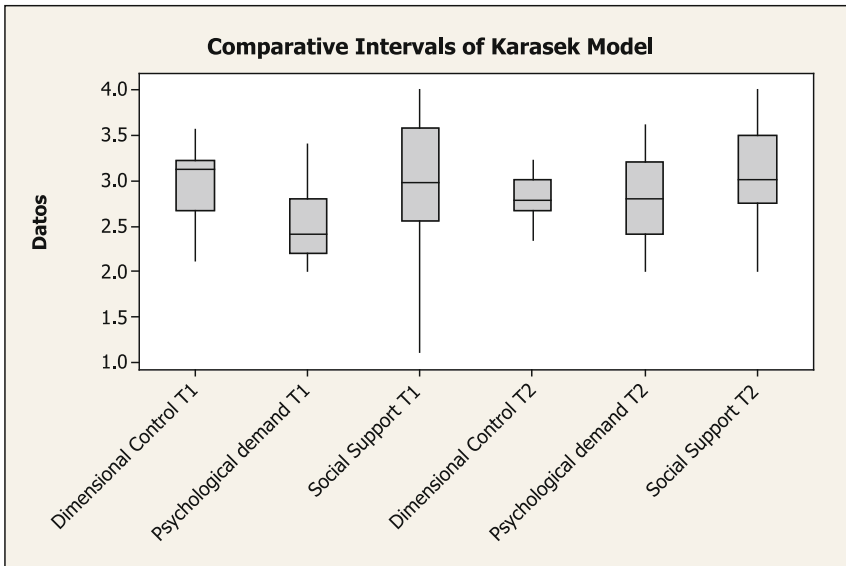
Statistical comparison using Two sample T Test. The two-sample *t*-test is determined if two population means are equal. In this case is used to analyze whether the means of two independent groups differ and calculate a range of values that is likely to include the difference between the population means.

### 3.4 Statistical Comparison Two Sample T Test

The Comparisons of the results of both teams were analyze whether there are statistically significant differences between the three dimensions evaluated, defined in the specific question: Is there statistically significant difference in the results of the level of labor tension between both groups.

For the two simple *t* test the hypothesis test is:

- Null hypothesis  $H_0$ : the population means are equal.
  - $H_0: \mu_1 - \mu_2 = \delta_0$  The difference between the population means ( $\mu_1 - \mu_2$ ) is equal to the hypothesis difference ( $\delta_0$ ).



**Fig. 5.** Comparative intervals of Karasek model, dimensional control, psychological demand and social support between teams.

- Alternative hypothesis H1: the means of the populations are different.
  - H1:  $\mu_1 - \mu_2 \neq \delta_0$  The difference between the population means ( $\mu_1 - \mu_2$ ) is not equal to the difference of the hypothesis ( $\delta_0$ ).

The Two simple t sample is a hypothesis test used to determine whether the arithmetic means (the value obtained by summing all the data and dividing the result by the total number of data) of the two independent groups differ. It calculates the confidence interval and makes a hypothesis test of the difference between the two populations, used in samples of 30 data or less, for small samples it works better if the data was extracted from normal distributions [12] (Fig. 5).

## 4 Conclusion

The Karasek Demand-Control model is a very useful and practical assessment to determine workers' stress level through their basic components of control over their own task and the collective control of workers over decisions about their work team.

The results on the different dimensions of the questionnaire were: (1) Dimensional Control section, both teams even having different positions within the organization, and different hierarchical level or responsibilities, maintaining control over their own task and decision latitude, job is a major generator of stress and the results evidence that both teams have a high level of job strain.

Employees can adapt to their work rhythm by acquiring the necessary skills such as speed to do it, their physical and mental effort and time they have to do it, as well as managing the breaks to avoid doing the activities for long periods. The evaluation indicates that the second dimension for both groups does not generate a high level of labor tension; they are at a moderate optimum level.

The last section of Social Support, both teams agree upon they have a good relationship with peers who make teamwork possible, it is important to note that employees with the mayor hierarchy within the organization and higher levels feel more supported by their supervisor or superiors. The Employees with the low hierarchy do not have that same perception.

It is recommendable that managers be aware of the performance of employees and constantly evaluate stressors, to implement immediately actions that allow them to achieve the objectives of the company by optimizing resources. It is important to transcend the negative, overcome frustrations to avoid that stress can influence psychological problems, or health workers, affecting not only the employees in the company, affecting the family environment.

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# Constructing a Career as a Determinant of Career Success in the Globalizing Society - on the Need for Pro-developmental and Proactive Behaviors of the Subject

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**Abstract.** In light of the pace of development of the global world, the acceleration of social life, the hard to predict direction of social change, the question arises about the quality of the transformations in the world of work and the process of constructing careers understood as investing in the career “portfolio”. A contemporary study of career requires us to take into account the multi-contextual occurring changes in the world of work, which create new requirement for the employees. Career development is a life-long process of a comprehensive nature. In the process of constructing a career emphasis is put on the subjects’ work on themselves, their permanent participation in life projects and multi-layered processes as well as the acquisition of experience and the capacity for self-awareness. This view is a background for thinking about career as a “property” of an individual, along with their individual career choices. This peculiar shift of an individual’s orientation from external conditions to internal conditions prompts us to consider career in connection with an individual seen as a pro-development and proactive subject, who possesses an individual career and a sense of success in its construction. Success in a career is the result of integration of two processes: career planning and career directing and management. In this sense, it is understood as the subject’s achievement of the objectives of their career. The distinguishing feature of proactive and pro-development planning, directing and management of a career is the awareness of being a causative agent that performs actions in a desired direction and influences the surrounding reality, thereby initiating changes. There is no doubt that active coping in a reality subject to permanent change requires people to adapt to the constantly changing context of creation of individual careers, and the new way of thinking about career means entering a path of permanent constructing of a career in the world of “boundaryless” careers.

**Keywords:** Globalizing society · Constructing a career · “Boundaryless Careers” · Career success · Pro-developmental orientation · Proactive orientation

## 1 Introduction

A contemporary study of career requires us to take into account the multi-contextual changes in the world of work, which create new requirements for the employees. The contemporary social configuration in which the quest for identity has become a flexible reference point, opens up a range of possibilities for an individual to shape their own career in the course of their life. The meanings assigned to career crystallize around the dominant messages and are rooted in specific space and time conditions. The contemporary processes of globalization of the world economy, its reorganization and restructuring are conducive to reflection on the specificity and the dominant of the global economic transformation [1–4]. Changes in the work environment, the structure of work, the perception of work, as well as in the realm of qualities, meanings and values attributed to work are undoubtedly a component of the phenomenon of economic globalization, and in particular the development of the market economy. It's hard to overstate the significance of these changes for the quality of the construction of careers, the course of careers, and the modification of their individualized paths.

## 2 Career as a “Property” of an Individual

Basing on the assumption presented by B. Arthur, K. Inkson and J.K. Pringle, that the accumulated values - which create career competencies and are useful in establishing and developing a career - constitute the career capital, we should emphasize the clearly subjective nature of the discussed conceptual category. This means that career capital (which may increase but also decrease in value, and may also be exchanged for “fresh” capital) is “a concept reflecting in the mind of an individual the diagnosis and the forecast of the accumulated personal assets” [5] acquired in the course of educational, professional, social, and cultural experiences. As a result the accumulated career capital contributes to securing “the future returns of the incurred investments, (...) and may provide payout in the form of security, satisfaction, socio-economic status, long-term employment or autonomy” [6]. In the knowledge-based economy, which in turn embodies the orientation of contemporary society towards knowledge, the development of careers of the members of society and the investment in career “portfolio” (which is an investment and a renewal of career capital) becomes a crucial element. As noted by K. Obuchowski, this peculiar shift “of an individual’s orientation from external conditions of existence to internal conditions” [7] prompts us to consider career in connection with an individual seen as an individual entity, who possesses an individual career and a sense of success in constructing that career [8]. Accordingly, the subject develops their career on the basis of their perception and attitude towards it. This means, as Patton and McMahon emphasize, that a career is “a pattern of influences, that coexist in an individual’s life” [9]. This view represents the subject’s individualistic tendency (ambition, sense of agency, motivation for action), which finds validation in economic theories that support investing in the potential of human resources within an organization [10]. This view is a background for thinking about career as a “property” of an individual, including their individual career choices, individual career planning strategies or the individual stages of career development.



### 3 Success in a Career

In our reflections on career we cannot overlook the issue of the subjective meaning assigned to career by the subject in the context of the possibility of experiencing the career in a satisfactory manner. As E. Ginsburg concluded, “the process of shaping a career is open, and its purpose is to find a job providing as much satisfaction as possible” [11]. The process of career development has a significant impact on the quality of the perceived satisfaction with work and the practiced career commitment. What’s more, the results of B. Adekola’s research indicate, that career development is more strongly associated with the individual’s sense of work satisfaction, than with their career commitment [12].

The issue of success in a career is an important domain of interest of career theorists. Referring to what is denoted and connoted by the concepts of “subjective career” and “objective career”, researchers recognize the existence of cognitive links with definitions of career success. The construct of career success is a specific composition of elements of a subjective or objective nature, as well as an emphasis on the existence of a duality (subjective and objective dimension) of success in a career. In an attempt to unravel the dilemma of what is the meaning of the construct “to achieve success”, references were made to the subjective (as the sense of success) or the objective (as a component of a system of the subject’s self-knowledge) understanding.

Success in a career, as a result of the subject’s experiences in a career, can be defined as “the realization of desired work tasks in every moment of a person’s professional experiences (...), the achievement of a desired goal, and the successful realization of an attempt to achieve something” [13]. Alternative meanings of success in a career, emphasizing that which is “desired” by the subject, or constituting an assessment of “successfulness” as a result of social comparisons, highlight its subjective and objective perception.

In the problematization of success in a career researchers highlight the need to withdraw from the selective approach to the ways of thinking about success. The depth of the construction of success in a career will be clear when viewed from two perspectives. The reflection on success is dominated by the relativistic approach, which highlights that an objective career success affects the subjective dimension of success in a career and that the subjective and objective sides of career success are mutually dependent on each other, or - if we adopt an evaluating perspective - it is stressed that subjective career success takes primacy over objective success [14].

The concept of success in a career is undoubtedly shaped in opposition to the one-sided approach to the issue. The interpretation of career success, referring not only to success in the objective sense (in relation to such indicators as: the number of promotions, salary increases, etc.), or success in the professional context (an indicator may be the scale of satisfaction with a professional career, the position of an individual in the organization), may also emphasize success in other domains of a subject’s life. In addition, career success can be assessed through the prism of the peer group, within or outside the organization in which the individual works. The issue of the idiosyncratic nature of success for the individual, taking into account their preferences and the balance between private and professional life, is particularly important [14].

The issue of success in a career, emphasizing the quality of the changes in the world of work - which determine the transformations in the structure of employment - expresses the issue of transience. In the modern landscape of "Boundaryless Careers" traditional media of career success, determined by a hierarchical order are increasingly adopting a horizontal form, and are certainly becoming significantly distorted. The "new order" of constructing careers is increasingly becoming an individualizing force. The "poly-mythology" [15] that allows us to participate in many creations of the history of constructing a career, gives the individual a chance to live through many stories, to refer to the plurality of independent objectives, rather than referring to the centralized objectives of the organization.

The presented observations on the sense of success in a career highlight its subjective nature. In this sense, success or rather the sense of success, can "be determined primarily on the basis of the subject's reports of its subjective state" [16]. Van Maanen defined "subjective career success" as "a person's internal apprehension and evaluation of his or her career, across any dimensions that are important to that individual" [13]. In the trajectory of a career, the sense of satisfaction, contentment and self-realization in professional work and the sense of success on the professional level, reinforce and determine each other [17]. Success can cause a range of experiences that together make up the professional potential of everyday life. It is prototypically derived from a recognized and perceived general success in the career domain. As emphasized by A. Bańka, the subjective character of success, where each person is heading towards career success along their own path, consequently means that it's difficult to talk about the development of identical careers. Due to the possibility of individuals responding to similar events differently and perceiving similar events differently, people may experience, feel and speak about success or failure while performing the same sequence of works, in the same time and place [18]. The subjective understanding of career refers to concepts expressing different subjective career aspirations. Subjective careers of people in similar social or employment circumstances may overlap, but, as emphasized by Bailyn, "it would be a mistake ... to assume that all members in a particular social category would share the same subjective career orientations" [13]. It seems that it's no accident that in the proposed theory of career construction Savickas clearly emphasizes the fact, that individuals differ from each other in their character traits, among which the author includes: personality traits, concepts of self and abilities. It is the degree to which the subject is able to demonstrate the possessed features that determines the quality of the defined success in a career [19]. What's more, the definition of success changes taking into account the temporal change, and in addition one's own definition of success in a career does not necessarily have to remain in line with its "objective" determination. At this point it is worth to recall, that "the success of objective career" is defined as an external perspective, which outlines more or less tangible indicators (e.g. profession, professional role, income, social role and social position) of the situation in the subject's career. Objective success in a career reflects the organization of the understanding of success around status differences [20]. In their studies R.J. Pollegrin and C.J. Coates indicate, that such a split is often visible, and discuss the processual dimension of defining success. In the early stages of career development it is defined in terms of prestige, power and income. Over time, the definitions of success highlight the importance of the possibility of meeting needs of a higher order, which include

self-fulfillment or professional satisfaction [21]. Professional success can be approached as a function of the possibilities and the potential inherent in the subject and the criteria that have to be met by a candidate for a selected position. In this sense, as noted by R. Davis, G. England and L. Lofquist, the ability to adapt and to allocate the possessed competencies and skills to the work environment is of fundamental importance for achieving success [22].

It's difficult to point to simple and direct correlations between personal variables, environmental variables and the sense of satisfaction or success in a career. What's more, it is difficult to indicate the existence of a high correlation between satisfaction with a career and success in a career. In this context it is worth to point out the originality of the classic studies on the mutual relationship between career satisfaction and career success carried out i.a. by Gellman, Heron, as well as Brayfield and Crockett [23]. In reality it is more of a chain of causal links.

Interesting conclusions were reached in the studies of N. Frijda. One stimulant of positive emotions identified as an antidote to adaptation to happiness and a way to extend it could be gratitude. In the concept of gratitude conceptualized as an emotion, an attitude, or a moral virtue, sharing common mechanisms with happiness and welfare, emphasis is placed on the overall disposition of the subject to positively experience the events of everyday life, to be able to perceive opportunities, to appreciate existing and new possibilities, and to invest mental energy in the development of the belief that life is a gift that the individual receives every day. It is assumed that gratitude is prototypically derived from the positive perception of the results achieved by the individual through their own activity and the activity of other people as their external source, and as a result of the relationship with other people [24]. At the basis of considerations about career satisfaction, the construct of gratitude understood as a general disposition created in the subject's everyday activities, allowing the individual to positively experience it, certainly deserves empirical examination.

One cognitively interesting issue in the context of the dynamics of the relationship between satisfaction and success in a career is the process of adaptation to a career. The achievement of career satisfaction can be illustrated as progressing along a cyclic curve. If we take as a reference point the career development model presented by D. Super (in which career is divided into three stages: establishment, maintenance and decline), the satisfaction with a career reaches a high level at the time of entry into a profession, then it reaches the lowest level in the middle phase of the establishment stage (especially if the initial expectations of fast career progression are delayed or frustrated) and then increases once again (although not to a level as high as at the beginning of the career cycle) to asymptote, which takes place around the age of 40. In the case of success in a career, at the beginning the individual experiences a crisis, followed by a period of linear growth lasting until the middle adulthood, which is followed by the stage of decline. As emphasized i.a. in the studies of Bengé and Copwell or Crites, the developmental trends of the processes of satisfaction with a career and success in a career differ from each other at the individual stages of an adult person's life career, with possible convergence in the middle of the career, which falls around the age of 40. For this reason, cross-sectional data concerning satisfaction with a career and success indicate a lack of clear relationship. Only the convergence of the lines of satisfaction and success in middle age, between 35 and 40 years of age,

indicates that the developmental trends for career satisfaction and career success have the highest degree of correlation. This leads to the conclusion, that we can expect a negative correlation between the variables at the beginning of the establishment stage, when satisfaction with a career is at a high level and the career success is at a low level, and indirect correlation between the variables at the stage of establishment and the central part of the maintenance stage. The originality of this perspective undoubtedly lies in the inclusion of the developmental trends concerning the issues of career satisfaction and success in a career, and the dynamics of the relationships between them with reference to the life stages of an adult human, as a factor that can have an impact on these two supposedly complementary elements of career adaptation [25].

The construct of success in the career domain is a specific composition of elements of a subjective and objective nature. However, the concept of the *sense of success in a career* highlights its personal, subjective nature. The potential of a subjective career consists in the sense of satisfaction and success stemming from career development, and namely the individual's recognition, perception and expression regarding the "happy ending", "successful outcome", "experienced encouragement to take up another challenge", "achievement of goals" [26]. In the trajectory of a career, success constitutes the potential of the subject's everyday life, and the developmental trends differ from each other at the individual stages of a person's career.

#### **4 Pro-development and Proactivity as a Determinant of Behaviors of an Individual Aimed at Achieving Their Preferred Goals in a Career**

One cognitively interesting thread in the context of the dynamics of success in a career, is the reflection, that it is precisely the individuals characterized by pro-developmental and proactive orientation, who will be able - on the path towards success in a career - to actively participate and interact in the reality of permanent change and multitude of possibilities.

The essence of pro-developmental activities, in general terms, lies in the individual's orientation towards the realization of a certain vision of the ideal state. T. Zysk, citing J. Reykowski and J. Kozielicki, emphasized, that the most essential and characteristic feature of the human mind is the ability to formulate a vision of the future state of things. The subject is convinced about the perfection of this state and takes actions aimed at achieving this state through the transformation and subordination of reality [27]. Among the psychological properties conditioning pro-developmental attitudes and behaviors T. Zysk included intrinsic motivation, orientation towards the future and active coping with reality [28].

Intrinsic motivation (described as "the desire to...") is determined by the vision of the ideal state and is most often characterized as the individual's aspiration to engage in some activity, because it brings pleasure to the subject or arouses their interest. Behaviors that are based on intrinsic motivation, appear and are maintained even despite the lack of immediate or visible reinforcement. Motivation is associated with the disclosure and fulfillment of needs, and, according to E.L. Deci and R.M. Ryan, intrinsically motivated

behaviors include the behaviors which are derived from the need for competence (which is associated with the need to compete, with cognitive curiosity, with a tendency to manifest perfectionism in action, and also with a sense of satisfactory experience of one's self) and for self-determination (equated with a sense of agency and conducive to the formation of a sense of responsibility for the undertaken activities) [29]. The subject focuses not on "fate" but on "choice" [30].

It is assumed that the focus on the future - providing that the ideal state is correctly formulated - directs the individual towards action, which is conducive to developmental and creative activities. W. Łukaszewski points to the fact, that if the orientation towards the future is to constitute an important element of a subject's pro-developmental activities, the vision of the ideal state must have realistic and instrumental features [31]. It is associated with what A. Inkeles defines as a "planning mentality" [32]. Planning - as emphasized by A. Sarapata [33] - characterizes people who are active, who direct their own destiny, who are prudent and foreseeing, and who realize the adopted objectives and tasks.

Active coping with reality is manifested in the active transformation of the existing state, aimed towards the realization of the visions of the ideal states. R. Diaz-Guerri stresses, that active coping with reality "takes place not only in situations where an individual is responsible for what they do or what is happening around them, but also when the responsibility is attributed to someone else. The essence of active coping with reality is also dealing with the results of someone else's actions, and not only one's own actions" [28]. The subject actively copes with the surrounding reality, is convinced that it is possible to change the situation, and has a huge sense of agency. The individual is also characterized by a need for achievements which is manifested in "constantly aiming to achieve the best results in conditions of competition, innovative predispositions, (...) a constant tendency towards objective analysis and judgment of one's own actions" [30].

T. Zysk made an attempt to characterize the pro-developmental mentality, taking into account the above assumptions. A pro-developmental individual is characterized by cognitive flexibility (understood as openness to new experiences and ability to assimilate them), cognitive curiosity (understood as a high level of aspiration to acquire knowledge resulting from the high evaluation of its usefulness, and manifested in the willingness for its continued acquisition), focus on the future (described as a sense of time and the ability to plan), a sense of agency (understood as a sense of ability to influence the surrounding reality, the course of events), trust towards others and the world (manifested in the belief that the social world is friendly, that it can be "trusted"; a general belief that one can rely on other people) and a sense of dignity and mutual respect (manifested in the conviction about one's own worth and respect for the partners in social life) [34]. As the author pointed out, the described syndrome of "pro-developmental mentality" which is "both the promoter and the result of developmental changes" [27] is timeless in nature.

Proactivity is understood as taking actions aimed at change. Proactive behaviors, as the deliberate actions of a subject, have been the subject of interest of Z. King, R.A. Noe, and C. Orpen. Studies allowed for distinguishing two groups of components of proactivity, which can be described as: cognitive components and behavioral components [35]. The main distinguishing feature of proactivity is taking the initiative to

change the environment, which means, that the individual “has the ability to shape the environment to an extent exceeding the ability of the environment to shape their behaviors” [36]. As emphasized by A. Bařka, the developmental dimension of shaping the proactive orientation in a career may determine the essence of creating change, rather than just anticipating it, creating the future, rather than just predicting it. “The proactive individual does not have anyone who will adapt the living environment to his needs. Instead he actively and subjectively takes agentic causative actions on his own” [36]. The proactive personality connects with proactive behavior through the scope of self-efficacy in the fulfilled role [37]. As emphasized by T.S. Bateman and J.M. Crant, agentic causative actions undertaken and manifested in the social reality can be the effect of “proactivity as an attitude of involvement resulting from life conditions, circumstances and other needs created by the environment” [38]. As emphasized by J.M. Crant, the construct of proactivity defined in such a way covers both the individual and the contextual variables. As emphasized by S.K. Parker, the sense of “role breadth self-efficacy” determines the subject’s ability to carry out a wider range of tasks than is imposed by the formally assigned requirements of the role” [39]. As emphasized i.a. by M.E. Gist and T.R. Mitchell, role self-efficacy, also described as the individual’s assessment of own potential, is a fundamental variable of the subject’s motivation, who tends to be more effective in the performance of tasks, cope more efficiently with changes, set more complex objectives or apply effective task strategies when referring to their inherent causative potential. Generalized self-efficacy is a competence relating to the potential of an individual directed to the proactive performance of tasks and it contributes to an increased sense of the subject’s agency in the construction of a career [40]. According to T. Bateman and J.M. Crant, proactive persons are distinguished by seven mutually interrelated characteristics: search for the possibility of change, setting effective and change-oriented objectives, anticipation of problems and undertaking remedial measures, searching for ways to achieve goals, entering the path of action with the awareness of risk and responsibility, perseverance in the pursuit of goals and achievement of goals, showing achievements and implementing changes which impact the environment [41].

The distinctive feature of people “searching for the possibility of change” is the exploration of the environment in order to bring about change or achieve something. The motivating factors include: maximization of achievements, utilization of the responsibility, search for changes that will transform the environment. “Creative individualism” is a permanent focus on searching for ways to achieve the defined objectives. Entering the path of action and not settling on the idea, with the awareness of the undertaken risk and responsibility. Proactive individuals are characterized by “perseverance in the pursuit of goals”. It is the unyielding desire to achieve the objective, rather than stubborn attachment to the methods of achieving them, that characterizes the perseverance of a proactive individual. In addition, the achievement of goals, implementation of changes and making commitments “affects the social environment” [41].

## 5 Conclusion

The above narratives allow us to conclude that one of the fundamental problems in the discussion of career success is the issue of the subjective-objective duality of a career. It is worth noting, that although this thread is not far-removed from inspiration with the theory of structuration - which is the subject of “Giddensian” considerations - it particularly stresses the intrinsic “two-sidedness” of the concept of a career. The duality and the interdependence of the subjective and the objective perspective of approaching success in a career, in a way forces us to connect both the objective and the subjective side of success in a career and to clarify the nature of the relationship between the highlighted sides of career success [42]. We can repeat after Van Maanen, that “there is little reason to assume the (subjective and objective careers) coincide on any dimension”, and that “this issue (the degree of coincidence between them) is a crucial issue for careers research” [43]. The subjective-objective duality of career is also the subject of considerations about the possible compromise between work and family, work and leisure time. This is in fact a quest for an answer to the question of the possible compromise between the objective expectations of a career and the individual’s subjective preferences in a career. This indicates the need to capture both sides of success, but above all the need to recognize the role of time in the relativistic approach to the interdependence between subjective and objective careers [42]. What is important from this perspective is the fact, that the pro-developmental approach and proactivity direct the behaviors of an individual aimed at achieving their preferred goals in a career. The developmental effect therefore lies in “being a causative agent”, while taking into account the stream of changes in the surrounding socio-cultural reality which is constantly constructed anew.

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# Comprehensive Internationalization at HAN University of Applied Sciences: Articulated Institutional Commitment

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**Abstract.** The Netherlands Universities Foundation for International Cooperation (Nuffic) conducted a study [1, 2] into institutional policy on internationalization in 2014 in the Netherlands. This study included most Dutch Higher Education Institutions (HEIs). Of these, 27 (59%) had a central-level plan, eight (17%) were developing such a plan, whilst seven (15%) did not have a separate central-level plan. Only four of the HEIs (9%) in the study did not have a central-level internationalization policy. It can be concluded that the penetration of internationalization in terms of policy is high in the Netherlands. This article is a part of an extensive research project developed at HAN University of Applied Sciences and traces the recent institutional developments within the context of its strategic planning and internationalization policies. In particular, this article deals with the “Articulated Institutional Commitment” dimension of the Comprehensive Internationalization CIGE model [3].

**Keywords:** Comprehensive internationalization · Higher education · Internationalization policies · Internationally connected university

## 1 Introduction

Many research studies indicate growing support for internationalization in higher education in recent years [4–7]. According to the fourth Global Survey of International Association of Universities 89% of universities worldwide claim to have an institutional policy or to have implemented internationalization within their overall strategy, and 22% are preparing an internationalization strategy [8].

Embedding internationalization goals into the overall institutional strategic plan can help gain buy-in from board members and other key stakeholders, but a stand-alone internationalization plan is often more concrete and motivating. Institutions should consider campus culture and the current status of internationalization when determining which approach (or combination of the two) is likely to be most effective [3].

This article is using the Center for Internationalization and Global Engagement’s (CIGE) model as a strategic basis for comprehensive internationalization; this process brings programs, policies, and initiatives into alignment with university strategic plans to become globally oriented and internationally connected [3]. The model contains six

target areas: (1) Articulated Institutional Commitment, (2) Administrative Leadership, Structure, and Staffing, (3) Curriculum, Co-curriculum, and Learning Outcomes, (4) Faculty Policies and Practices (5) Student Mobility, (6) Collaboration and Partnerships; and will help identify implementation strategies that support internationalization at the university level. In particular, this article deals with the “Articulated Institutional Commitment” dimension of the CIGE model.

This paper seeks to document how these aspects of internationalization are perceived by HAN University of Applied Sciences faculty and higher management in form of institutional strategic planning and policies. The researcher is planning to encompass a consideration/evaluation of the specific university policies and practices in relation to the theme and the model used as well as an evaluation of institutional responses of University to a range of issues, policies and strategies concerning internationalization.

This paper contributes to knowledge by attempting to develop faculty leadership in the strategic planning of the internationalization process by determining the best practices while creating a process for internationalization to increase the university’ global competitiveness. It positions the responses to internationalization of chosen university within the policy context that the university sets. In a conceptual context, this research is exploring the various tiers of internationalization and tries to equate them to the overall context of institutional strategic planning made by the studied university.

## **2 Problem Definition and Research Design**

This paper traces the chosen university recent development and seeks to account for this in terms of institutional internationalization strategic planning. It seeks to document how different aspects or dimensions of internationalization are perceived by university administrators and faculty. In addition, this paper highlights some of the major issues in connection with institutional responses to the impact of internationalization with respect to responsibilities that range from being local to international in nature. In particular, the strategic planning is explored, and as the literature shows this aspect is critical in identifying reasons for institutional responses of complex organizations, such as universities.

Following the “Articulated Institutional Commitment” dimension of the CIGE model, strategic planning involves key stakeholders that articulate an institution’s commitment to internationalization and provides a roadmap for implementation. Formal assessment mechanisms reinforce this commitment by framing explicit goals and holding the institution accountable for accomplishing them. The mentioned below steps will be used to structure the research [3]:

Step 1: Strategic planning. Internationalization is prioritized in mission statements and institution-wide strategic plans and through explicit internationalization plans.

Step 2: Internationalization committee. A steering committee comprised of representatives from across the campus is designated to oversee implementation of internationalization initiatives.

Step 3: Campus stakeholders. Focus groups, surveys and open discussions convey priorities, address concerns and gain buy-in by students, faculty, staff and other stakeholders.

Step 4: Assessment. Following from articulated goals, progress and outcomes of internationalization are formally measured and assessed.

In line with these recommendations, the researcher chose a combination of interviews, archives, and observations, with main emphasis on the first two. In line with the explorative nature of the study, the goal of the interviews was to see the research topic from the perspective of the interviewee, and to understand why he or she came to have this particular perspective.

Policy and other documentation for the university was collected on site, to supplement the primary and secondary data gathered, when made and recorded. For the international policy context, sources of documentary information were used to scale the international, national and local position on higher education in selected university. Several governments and other websites were used to glean policy and positional information. Sources referenced in research papers were also utilized as resources from online searches through various electronic databases and search engines. The documentation from institution was collected to gain insight into the institution and the strategies and policies in place. Sources of this information included: strategic plans; management and academic structure charts; annual reports; internationalization policy documents; websites etc. These documents were the first types of units of observation.

### 3 Results and Outcomes

“Colleges and universities articulate their commitment to internationalization and global engagement through mission statements, institution-wide strategic plans, and internationalization plans. Strategic planning for internationalization requires the involvement of stakeholders campus-wide, and may be coordinated by an internationalization task force or committee” [3].

In accordance with a performance agreement with the Dutch Ministry of Education, Culture and Science, by 2016 all HAN programmes need to have embedded internationalization in their curricula [9]. In HAN’s strategic policy paper from 2012–2016 internationalization was considered to be one of the most important vehicles for improving the overall quality of education and research [10].

Regarding **Step 1: Strategic planning** of the CIGE Model, at HAN Internationalization has long since ceased to be merely a theme or focal point in economic education; it is now the norm.

In its Institutional Plan 2016–2020, HAN is ambitious with regard to internationalization: “Internationalization at HAN is an institutional must. It is developing into a comprehensive internationalization of our education and research” [11, 12].

“Comprehensive internationalization is a commitment, confirmed through action, to infuse international and comparative perspectives throughout the teaching, research and service missions of higher education. It shapes institutional ethos and values and touches the entire higher education enterprise. It is essential that it is embraced by

institutional leadership, governance, faculty, students and all academic service and support units. It is an institutional imperative, not just a desirable possibility” [13].

The HAN Institutional Plan 2016–2020 set strategic priorities such as:

“We expressly include internationalization in all our goals and activities. We embed foreign language knowledge and intercultural skills in the curriculum and develop joint education and research programmes with foreign partners, create diversity in the classroom and give students the opportunity to take part in international projects of social relevance” [11].

“Students learn to deal with people from different backgrounds. We achieve this explicit focus on diversity partly by internationalizing education and research. That can be done, for example, by simplifying and strengthening internationalization at home, but also by means of international exchanges and work placements” [11].

At HAN, in work placements, final projects and research assignments, students, lecturers, researchers and professors work on real-life internationalization issues that businesses face. This ‘innovation driver’ is a constant stimulus both for international business activity and for knowledge development. It also forms the basis for clearer professional profiles in the individual courses.

Higher vocational education is closely associated with the professional field. Employers today particularly need professionals who think critically and communicate clearly in written and spoken form. They often find the specific study programme less important than the ability to resolve complex problems by developing and applying knowledge. They want to see these competences included in the education. Internationalization in the curriculum and student mobility are good tools to achieve this, as they contribute to the development of these employability skills among students [14].

According to Harder (2010) “Internationalization activity in higher education is not a new phenomenon. There is, however, a growing movement toward a global knowledge economy and higher demand for employees with international experience has resulted in unprecedented internationalization efforts in higher education. Colleges recognize they must provide students with skills to succeed in globally integrated economies, culturally diverse societies, and multinational organizations” [15].

The Faculty of Economics and Management at HAN believes it is important that their students are able to think independently and critically. Students must be able to understand the social and cultural environment in which they live and must be able to participate in discussions by expressing their own well-founded opinions. This concept is frequently discussed at HAN; called ‘Bildung’ [16]. It includes aspects such as inquisitiveness about the world, critical awareness and curiosity about the past to understand the culture from which we have emerged. But also getting to know other perspectives, being able to express what you think about something and having self-knowledge.

Internationalization is an excellent way of enabling the students to acquire those attitudes and skills and further develop.

For HAN, internationalization is an important tool to reach the wanted increase of quality, intensity and impact of the cohesion between education, research and professional field so that they deliver qualified professionals with an international and intercultural perspective; not afraid to explore outside the box and continuously improving themselves, socially involved while sailing on a moral compass.

HAN internationalization activities and agendas compress a well-defined goal which is that by 2020 HAN University of Applied Sciences will be “seen” as an innovative higher education institution [12]. On the HAN Campus you can taste an international sphere, where the international student is seen as an worthy equal partner where cooperation with the professional field and the university is done multidisciplinary to engage international perspectives [17].

When it comes to **Step 2: Internationalization committee**, HAN has indeed such a committee comprised of representatives from across the campus which is designated to oversee implementation of internationalization initiatives. Strong support from the management is critical when institutions create a designated committee or task force to lead internationalization efforts.

Based on the underlying idea that internationalization has an important contribution to an increased quality of teaching and research, the institution must systematically and objectively look at its internationalization vision, policy and implementation [18]. This way, it helps the institution to examine the quality of internationalization, from which this vision is shaped, what is the appropriate policy and how does it work out in practice through the entire institution.

At HAN the steering committee is called HINT (HAN Internationalization Committee) and consists of policy staff Internationalization of the four faculties, the coordinator international recruitment, the HAN subsidy desk and the senior policy coordinator internationalization, which meets every month.

According to the Strategic Internationalization Agenda 2016–2020 [18], as per December 2016 the following points of action regarding the internationalization policy at the HAN University of Applied Sciences were set:

- Each institute has a internationalization vision and plan derived from this agenda.
- Development of up-to-date expertise in the use of ICT resources in international education and research cooperation.
- Providing more ICT facilities for internationalization@home, such as virtual mobility, international cooperation at distance and virtual classrooms, including licensing, implementation and maintenance costs.
- Internationalization is explicitly included in HAN ICT policy.
- HR consultants are prepared for an international, diverse and inclusive organization.
- Embedding of international and intercultural competencies in HR recruitment policy and annual evaluation cycles.
- Improving management information systems, including development indicators to quantify applied research, where international comparisons are more possible (e.g. U-Multirank).
- On the medium term (next Institutional Plan period) HAN intends to achieve the European certificate for internationalization (ECA).
- International HAN presents itself as recognizable and uniform. International communication, positioning and branding is taken into account in the development of the communication positioning and branding process.
- Both developing and maintaining a full, responsive HAN website in English and German (incl. Mobile version) will facilitate the development process for the new Dutch HAN website.

- Improving management information systems, so that international comparisons are more possible (U-Multirank).
- Improvement of clear, transparent and user-friendly processes for outgoing and incoming student mobility, such as digital support MoveOn4 or other systems, to facilitate clear arrangements between contact persons and other institutions.
- Monitoring, evaluation and improvement of processes for the benefit of (international) student experience.
- Not only for greater diversity in the classroom but also in front of the class; thus HR processes and policies are designed to increase diversity of staff.
- Campus Facilities in Arnhem and Nijmegen are also optimally equipped and organized for international students and staff.
- Improving international student satisfaction regarding HAN's facilities and involvement and support of international students.
- Organize appropriate guidance targeted to specific needs and demands of international students, trained by professionals in guiding specific target groups within the international student population.
- Each programme has internationalization included in their final objectives and provides ample space for international exchange and mutual recognition of credits. Where necessary, the curriculum will be adjusted accordingly.
- Teachers professionalize their international and intercultural skills, including mastery of a good level of English or German.
- Offering teaching team training in diversity and inclusiveness.
- Each HAN teacher/researcher has gained international and intercultural experience through a mobility programme.
- The teacher participates in international networks and/or conferences.
- The integration of internationalization research is explicitly included in the learning environment of the students, for example by the use of international literature and international cases and cooperation with international partners.
- Each program ensures internationalization and interculturalism in its major curriculum, including learning outcomes securing international and intercultural competencies.
- All institutions strive for an annual growth in the number of minors offered in English or German, to have more connection and exchange with international partners.
- Every continuous learning research has linked an international dimension to one of the research priorities.
- HAN hosts each year at least one high-quality international research conference.
- Teacher-researchers and Ph.D. students present themselves more internationally, by participating in international research collaborations, presentations at international conferences and international publications.
- Establish indicators to select at least 3 or 4 strategic partners for HAN strategic international collaboration in education and research.
- All courses offer their students the opportunity to be a part of their study, including the major, to do abroad, in cooperation with strategic partners as part of the internationalization of the core curriculum.

- Better enable the intake of refugee students by eliminating as much as possible procedural barriers and HAN-wide coordination and transparency about unambiguous admission criteria.
- The further development and implementation of a HAN Europe-wide strategy, in line with the research, education and support priorities.

**Regarding Step 3: Campus stakeholders**, focus groups, surveys and open discussions convey priorities, address concerns and gain buy-in by students, faculty, staff and other stakeholders; HAN is very much aware of the importance of this matter.

Besides the HINT, there are also “portfolio” meetings on internationalization between one member of the board of directors, the director of the Faculty of Economics and Management and a Senior Coordinator Internationalization Policy, once in a two months.

A Focus (Steering) Group Internationalization advising the HAN Management on different matter regarding internationalization, meets four times a year. Each faculty has a specialist on internationalization within the faculty management team. At a faculty level, there is regular contact and discussion panels between the specialist on internationalization within the FEM management team, the policy makers internationalization and the education manager.

In Bucharest in 2012 Ministers of the EHEA affirmed the notion that mobility should be integrated within universities’ internationalization efforts. Institutions adopt and implement their own strategy for their internationalization and for the promotion of mobility in accordance with their respective profile involving the stakeholders (in particular students, early stage researchers, teachers and other staff in higher education) [19].

HAN uses also different national and international students surveys (The National Student Survey and International Student Barometer) where HAN students provide feedback and advice on student international life for example, but also on matters of study programmes quality and internationalization. Results and plans of improvement are discussed at management level meetings as the ones explained above.

There is also a Degree Programme Committee (DPC) at Arnhem Business School that defends the interests of students and lecturers and it is composed by lecturers and students from the different degree programmes. The DPC is a participation council for the English-taught programmes at Institute level that advise the institute management, faculty board and faculty council on all kind of matters concerning the quality of the education in the relevant degree programmes [20].

**Step 4: Assessment.** Following from articulated goals, progress and outcomes of internationalization are formally measured and assessed.

In 2010 a pilot by Dutch Flemish Accreditation Organization (NVAO) on internationalization demonstrated that the lag behind the research universities remained. The universities of applied sciences scored lower than the academic programs on both international learning outcomes and integration of internationalization within the institutions’ vision, mission statements and policy [21].

Regarding this pilot, the HAN, the IBMS programme scored in 2013 Satisfactory on Distinctive Quality feature Internationalization. The study program has developed a vision on Internationalization together with different internal and external stakeholders. Based on this vision, goals have been formulated with regard to study, teachers and



facilities. The NVAO panel finds a working evaluation system for the evaluation of the vision to be lacking. The view of the panel is that the study program complies with the envisaged quality standards for the distinctive feature, but that the study program must work on establishing an evaluation system to evaluate its vision and goals regularly.

At this moment, at HAN the courses develop a vision of the internationalization of their curriculum, focused specifically on the professional profile for which they train students. They do that on the basis of research conducted among alumni and the professional field into the desired international and intercultural competences of their students. This enables them to hone their professional profiles and the course objectives (formulated in NVAO Quality Standard 1) and to define the international and intercultural aspects of the final qualifications. They also formulate assessment criteria (Standards 3 and 4). They incorporate these fully in the curriculum (Standard 2) and assessment (Standard 3). Both the vision of internationalization and the renewed curriculum are given a place in the course plan [16].

According to the yearly report, HAN University of Applied Sciences has set its priorities to target all performances within its courses and curriculum, thereby achieving this dimension in 2016, while progress will be made in this direction until 2020 [22]. Some examples include Internationalization@home, a learning environment that offers students and staff alike a possibility to develop international and intercultural competencies while also being introduced to the internationalization process within the first years of most of the courses and projects.

Still HAN should take into consideration that they need support in exploring appropriate evaluation methods to capture the impacts of internationalization both on aspects related to their missions (and specific to them) and the country-wide strategic goals, such as economic growth, job creation, and social inclusiveness. Also attention needs to be paid to qualitative indicators and improve the interpretation of quantitative indicators (“more is not always better in internationalization”) and longitudinal series developed where possible, to make the evaluation results more meaningful [23].

At the same time other partners need to be involved in the evaluation process, including alumni students, employers, international students employed in their host or home country, regional authorities and innovation centers, local communities who may benefit from the internationalization of the campus.

## 4 Conclusions and Further Research

An institution must articulate their commitment for internationalization through mission statements, strategic plans, international education offices, and campus-wide international education committees. Any institution actively pursuing international research should establish guidelines to enable internationalization.

Institutions aggressively pursuing internationalization must have mechanisms to financially support their faculty and student travel abroad programs for meetings and conferences, and study or establish research collaborations and teach abroad. In addition, universities should provide incentives to junior faculty who are not tenured and would like to pursue international collaborations early in their careers [23].

Universities need to have a clear view on global higher education and whether or not they want to participate in a more globalized approach to higher education, informed through dialogue between governments, institutions and other stakeholders. Institutions need to take care to use language accessible to decision-makers in describing their own internationalization strategies and ambitions.

Universities that analyze both the supply and demand sides of internationalization will be better placed to understand the driving forces (e.g. dynamic demographics in one country may inflate outgoing student mobility) and to examine the range of responses to be provided [23].

Making the internationalization strategy clear and transparent is important for both the academic community and the stakeholders. Yet gathering information on which universities base their internationalization strategy may prove difficult for stakeholders.

Regarding the HAN Internationalization strategy implementation for the 2020, they should provide continuous and inclusive support to international students, designed to facilitate students' social and academic success and focusing particularly on the transition processes. HAN should prioritize a strategic transformation of internationalization away from economic and financial imperatives towards educational values and objectives as stated in the institutional plan.

They should also develop internal reflection on the purposes served by hosting international students, recognizing that strategies can range from the broad educational value of a cosmopolitan campus to specific academic targets associated with the internationalization of specific programmes [23].

Fostering connections among domestic and international students and value the inputs of international students on campus is proven to be a good effective tool of facilitating internationalization [24]. HAN should also support faculty in reaping the educational benefits of having international students on campus and reinforce quality assurance mechanisms for international students and gear them to their expectations when necessary.

Having in mind that this article is a part of the extensive research project of the International Business Centre of Expertise at the HAN University of Applied Sciences and traces the recent institutional developments within the context of its strategic planning and internationalization policies, final conclusions and interpretations will be drawn at the end of the research project.

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# Relationship Between Diversity Faultlines and Turnover Intentions of Nurses in Japan

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**Abstract.** The importance of promoting diversity in the nursing workforce is broadly acknowledged. Diversity in the nursing workforce is considered to be an essential element of success in the team medical-care and provides opportunities to deliver quality care which promotes patient satisfaction. Recently, diversity “diversity faultlines” has received worldwide attention. Lau and Murnighan [1] proposed the term diversity faultlines refer to hypothetical dividing lines that may split a group into subgroups based on one or more attributes. In the present study, we have demonstrated that the current status of faultlines in nurse organization and the relationship between faultlines and turnover intentions among Japanese nurses. This study was carried out in the university hospital in Japan. Through the informed consent procedure, questionnaires were distributed to 692 nurses and responses from 633 female nurses and 42 male nurses were analyzed. The results revealed that nurses in Japan perceived faultlines just like workers did. The fact suggests that it is needed to pay attention to reduce probability of faultlines formation for the success in diversity and retention management of nursing organization.

**Keywords:** Diversity · Diversity faultlines · Retention management · Japanese nursed · Turnover intentions

## 1 Introduction

The importance of promoting diversity in the nursing workforce is broadly acknowledged and it is considered to be an essential element of success in the team medical-care. However, gender diversity is not fully achieved in Japanese nursing organizations. Historically, the vast majority of nurses have been women in Japan although the proportion of male nurses has been increasing slowly—from 7.2% of registered nurses in 2004 to 8.9% in 2014. The shortage of nurses is also a crucial problem in Japan. The average turnover rate climbed to 11.0% in 2010 and remained high.

Recently, “diversity faultlines” has received worldwide attention. Lau and Murnighan [1] proposed the term faultlines refer to hypothetical dividing lines that may split a group into subgroups based on one or more attributes. Faultline theory explains how the combination and configuration of the attributes of team members can influence the team’s behavior and ultimately its performance (Fig. 1). The attributes that drive

faultlines can be surface-level or deep-level. Readily detectable attributes such as gender, age, nationality, and education are surface-level. Underlying, or deep-level, attributes include values, personality and knowledge. Iwaasa et al. [2] clarified the actual current status of faultlines in Japanese workplace for the first time in Japan. They showed that all the participants perceived some kinds of faultlines and that those with strong faultlines tend to have high stress levels than the other groups. In the present study, we have demonstrated that the current status of faultlines in nurse organization and investigated the relationship between faultlines and turnover intentions among Japanese nurses.

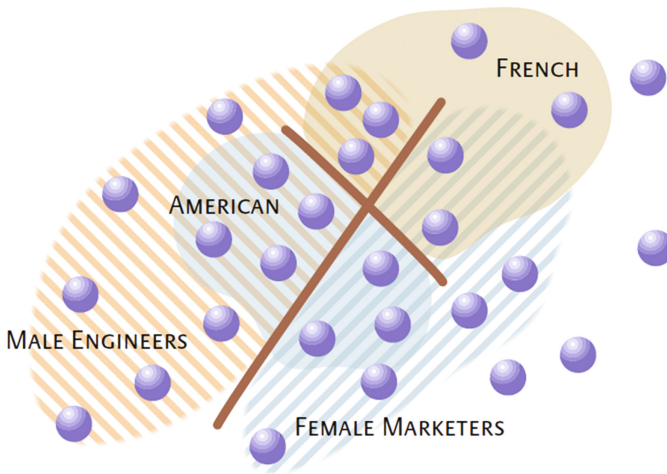


Fig. 1. The emergence of faultlines [3]

## 2 Methods

This study was carried out in the university hospital in Japan from November 2016 to January 2017. Through the informed consent procedure, self-reported questionnaires were distributed to 692 nurses and responses from 633 female nurses and 42 male nurses were analyzed (mean age 30.0,  $SD = \pm 8.0$  years, range 20–64). The response rate was 96.2% (range: 4.6 to 29.8 years). The questionnaire consisted of three sections, the first of which was a face sheet. The second section was a set of items designed to assess the degree to which explored participant's perception of faultlines in the nurse station and the hospital (e.g. "Is there a hypothetical line that may split your team/organization into subgroups based on the difference in race?"), which was measured with four 5-point Likert questions, anchored from 1 = "Not at all" to 5 = "Extremely much". In this study, we employed 28 attributes listed in Fig. 2 based on Jackson et al., Joshi and Jackson, and Taniguchi [4–6]. The third section assessed participant's turnover intentions including the following three items: (a) willingness to move their present division, (b) willingness to leave their present hospital, and (c) willingness to quit being a nurse,

which was measured with four 5-point Likert questions for each. The participants were divided into two groups based on quartiles of the degree of the perception of faultlines; the top quartile group and the other group. To examine the association of turnover intentions among nurses with their perceptions of faultlines, sexes, positions and years of service, logistic regression analysis was conducted.

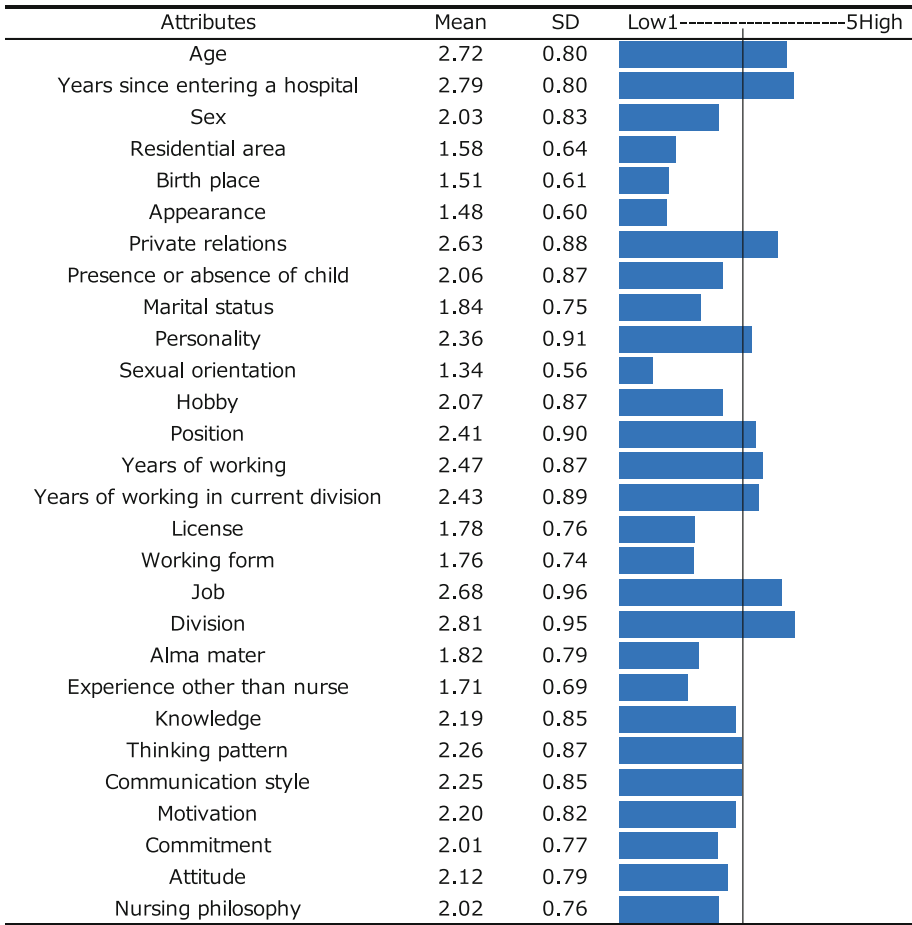


Fig. 2. Attributes investigated in this study

### 3 Results

#### 3.1 Participants

All of the participants were full-time nurses working as registered nurses in a university hospital. A total of 692 valid participants were nurses who ranged in age 20–64 (mean age 30.0, SD = ±8.0 years), 633 (92.42%) were male, 42 (7.58%) were female,

68 (37.88%) were in administrative posts. The participants had a length of service 7.3 years (SD = 7.1). 119 (92.42%) of the participants had their child/children under primary school, and 64 (9.5%) of the participants had relatives in need of nursing care.

### 3.2 Status of Faultlines

The degree of the perception of faultlines tended to increase with increase in age and tenure, though there was statically no difference among the age and tenure level. Figure 2 shows the current status of faultlines that participants perceived. The results revealed that every participant perceived some faultlines in their hospitals. 5 out of 28 listed attributes were above average point (ranged 1–5): division (M = 2.8 SD = 0.9), years since entering a entering a hospital (M = 2.8 SD = 0.8), age (M = 2.7 SD = 0.8), profession (M = 2.7 SD = 1.0), personal relationship (M = 2.6 SD = 0.9), tenure (M = 2.5 SD = 0.9), years of experience in the same ward (M = 2.4 SD = 0.9), position (M = 2.4 SD = 0.9), personality (M = 2.4 SD = 0.9), thought process (M = 2.3 SD = 0.9), communication style (M = 2.3 SD = 0.9), motivation (M = 2.2 SD = 0.8), and ability/knowledge (M = 2.2 SD = 0.9). They are considered to be important factors that influenced the emergence of faultlines.

### 3.3 Status of Turnover Intentions

The percentages of those who had a turnover intention were as follows: intention to leave their departments, 18.6%; intention to change their organizations, 18.7%; intentions to quit being a nurse, 7.3%. Comparison of Turnover intentions between male and female nurses showed that male nurses had a significantly low degree of intention to change their organizations ( $p < 0.05$ ). Comparison between supervisory and non-supervisory showed that head nurses and chief nurses had a weak intention to change their organizations and to quit being a nurse compared to staff. Comparison of experience of service, nurses with 1 year or more to less than 3 years' experience of service and more than three years less than 5 years had an intense intention to change their organizations compared to those more than 5 years' experience. Furthermore, nurses with 1 year or more to less than 3 years' experience of service and more than three years less than 5 years had an intense intention to quit being a nurse compared to those more than 5 years' experience. Those who had more than 5-year experience of service had an intense intention to continue working. In contrast, those who had less than 5-year experience of service, especially, had a weak intention to continue working.

### 3.4 Relationship Between Faultlines and Turnover Intentions

To examine the association of turnover intentions among nurses with their perceptions of faultlines, sexes, positions and years of service, logistic regression analysis was conducted. Results of the logistic regression analysis showed a significant relationship was found between faultlines and intentions to quit being a nurse (Adjusted OR 2.75, 95% CI 1.52–4.99), and intentions to leave their departments (Adjusted OR 1.57, 95%

CI 1.02–2.42), though there was no significant relationship as for intention to change their organizations. There were no significant relationship between turnover intentions and extraneous factors. (See Fig. 3).

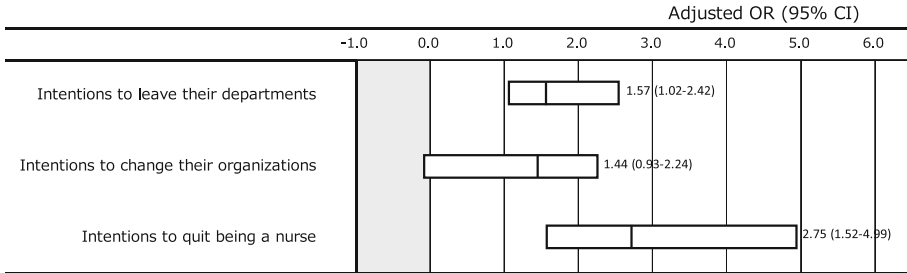


Fig. 3. Relationship between the perception of faultlines and turnover intentions

### 4 Discussion

The purpose of this study was to examine the relationship between faultlines and turnover intentions. According to faultline theory, researchers pointed out a negative relationship between faultlines and group or individual outcomes such as stereotyping, productivity, distrust, emotional conflict, information sharing, creativity, and occupational stress [5, 7–11]. Therefore, we hypothesized that the perception of faultlines of nurses would be a negative impact on individual outcomes, turnover intention. These results as shown above provide partial support for this hypothesis. We found that faultlines would negatively impact on intentions to quit being a nurse. Our results suggest that when those perceive strong faultlines might trigger depressive mood as with burnout, restlessness, and so on.

One limitation of our study is that future research needs to examine the external validity of these results. Furthermore this study was conducted in only one university hospital. However our research also has practical implications. The results suggest that nursing teams that need to diverse strategically should be careful not to emerge faultlines and to start to develop retention management policies that enhance nurses’ job satisfaction and reduce turnover intentions by bridging faultlines in organizations.

### 5 Conclusion

The results revealed that nurses in Japan perceived faultlines just like workers did. However nurses tend to perceive strong faultlines based on attributes such as age and to make subgroups depending on colleagues. The fact suggests that managers or leaders in hospitals need to pay attention when they organize teams for reducing probability of faultlines formation for the success in diversity and retention management of nursing organization.



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# **Human Factors and Organizations**

# Examining the Role of Self-leadership in an Integrated Model of Work Characteristics and Health-Related Outcomes

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**Abstract.** Modern working environments bring about new opportunities for personal growth but also increased risks for health impairment. In this setting, self-regulatory competence becomes a key skill. Building on an integrated model of work characteristics rooted in action regulation theory, we examine the role of self-leadership in the relationship of work characteristics with health-related indicators.  $N = 395$  employees participated in a survey study. Work characteristics (learning requirements, work overload) and health-related outcomes (intrinsic work motivation, exhaustion tendency) were assessed by well-established measures. Self-leadership was assessed by a new measure. Statistical analyses confirmed main and moderating effects of self-leadership, although observed and predicted direction of the effects differed in some cases. The partly unexpected findings highlight the importance of considering the complex interplay of self-leadership with organizational context, individual factors, and conceptual clarity, among others.

**Keywords:** Work characteristics · Self-leadership · Work motivation · Employee health · Action regulation theory

## 1 New Challenges of Work

Today's working environments are in a process of constant change in order to accommodate to the demands of globalization, knowledge and service work, flexibilization, and individualization [1]. This brings about new opportunities for personal growth but also increased risks for health impairment. Established models of work design, too, are in a process of constant revision to represent new prospects, challenges, and hindrances [2]. While situational prevention (i.e., designing working conditions) promises sustainable improvements, it can be hard to implement in organizations due to costs and resistance to change. On the other hand, personal prevention (i.e., strengthening personal resources to master demands at work) both targets and is limited to individual coping. However, since personal resources play a prominent role in current trends toward flexible and individualized work, interventions aimed at

individuals are considerably easier to implement than interventions aimed at structural change [3]. Thus, efforts toward the integration of personal resources into existing framework models of work design are a promising endeavor.

In this context, a particularly salient personal resource is set forth in the concept of self-leadership [4]. However, research on outcomes of self-leadership has primarily focused on performance and motivational outcomes; studies that examined effects on health impairment are rare ([5] for an overview). Furthermore, to our best knowledge, the interplay of self-leadership with distinct types of work characteristics has not been studied systematically. Therefore, the present study examines the role of self-leadership as a personal resource in an integrated model of work characteristics and health-related outcomes.

## 2 Theoretical Considerations

### 2.1 The Concept of Self-leadership

The self-leadership concept offers a normative model of self-influencing in organizational contexts by means of behavioral and cognitive strategies [6]. It is grounded in the theoretical framework of self-regulation, which at its core investigates the reduction of the gap between a current state and a set standard. This can be achieved by either altering behavior or cognitively adjusting the standard [7]. Supplementing this perspective of discrepancy reduction, social cognitive theory suggests a perspective of discrepancy production, i.e., self-directed setting of performance goals driven by self-reactive influences of self-satisfaction and self-efficacy [8]. Drawing upon self-regulation theory as well as social cognitive theory, the self-leadership concept addresses not only the question of how to accomplish a goal but also which goals to establish and why [6].

The current self-leadership concept suggests three strategy dimensions split into various facets [5, 6]. First, *behavior-focused strategies* aim at performing personally unattractive tasks that might yield extrinsic rewards. Second, *natural reward strategies*—derived from the concept of intrinsic motivation [9]—focus on achieving intrinsically rewarding goals. Third, *constructive thought pattern strategies* suggest using cognitive imagery in order to cope with tasks. Both the normative concept and the specific strategies of self-leadership may serve as a versatile personal resource in guiding self-directed work behavior, a key competence in today's work systems.

The strategy dimensions and its facets may be measured by the 35-item Revised Self-Leadership Questionnaire (RSLQ; [36]). In this instrument, behavior-focused strategies are represented by five facets and constructive thought pattern strategies are represented by three facets. Natural reward strategies are not differentiated in multiple facets. While a number of studies have demonstrated the reliability and validity of the original RSLQ, translations of the instrument and adaptations for different cultural backgrounds could not always preserve the factor structure [10]. Furthermore, the undifferentiated measurement of natural reward strategies has been criticized not to correspond with its high salience in interpersonal perception in leader-follower dyads [11]. Finally, two studies employing the German translation of the instrument

(RSLQ-D) [12] reported poor reliabilities of the natural reward strategies dimension [13, 14], further questioning its appropriateness.

For these reasons, this study investigates a new, still unpublished instrument, the Self-Leadership Skills Inventory (SLSI) [15]. The SLSI improves measurement of self-leadership in two ways. First, *natural reward strategies* are measured by three facets (positive focus, success and vision, intrinsification) instead of one facet in the RSLQ. Second, the other two strategy dimensions of the RLSQ are consolidated into a single strategy dimension called *cognition-based strategies* with four facets (strategic planning, self-reminding, self-verbalizing, self-analysis; corresponding to RSLQ facets self-goalsetting, self-cueing, self-talk, evaluating beliefs and assumptions). Beyond measurement, the SLSI also extends the self-leadership framework itself by including a social perspective, as represented by the new strategy dimension *social self-leadership skills*. However, because this innovation is still in preparation [15] and exceeds the existing self-leadership concept, we will ignore social self-leadership skills and focus on two strategy dimensions solely.

## 2.2 A Tripartite Model of Work Characteristics

The job demands-resources model (JDR) [16] is among the most influential framework models for work design. Two adaptations of the JDR relevant for this study will be discussed briefly, namely the nature of demands vs. resources and the role of personal resources in the JDR [17]. The first adaptation was triggered by a meta-analysis [18] that found ambiguous effects of work characteristics on motivation and health impairment. In line with previous research [19], the authors introduced a differentiation between challenge and hindrance demands that explained the ambiguous effects. The distinction has since been integrated into the JDR [20]. Interestingly, the distinction of challenge demands, hindrance demands, and job resources parallels a long-standing trichotomy in action regulation theory (ART) [21, 22] of beneficial learning demands, detrimental job stressors, and supportive job resources. Beneficial learning demands denote challenging aspects of work tasks that require the acquisition of new skills and, therefore, offer potential for learning and personality development. Job stressors interfere with the proper execution of tasks without offering any innate potential for learning and thus unfold detrimental effects. Job resources do not, by themselves, offer a learning potential either but they are ascribed a moderating role, either augmenting positive effects of learning demands or buffering detrimental effects of job stressors [23].

An integrated model of this trichotomy of work characteristics and health-related outcomes has been tested empirically [23]. While this integrated model shares many features with the JDR, a major difference is its theoretical foundation. JDR draws upon transactional stress theory [24] and thus the individual's appraisal to determine the nature of a demand (challenge vs. hindrance). In contrast, the integrative model provides a normative distinction based on ART that is independent of the individual to distinguish learning demands from job stressors. As work design is a task for experts, a normative grounding for "good" working conditions will be superior to the individual appraisal of workers.

Job resources can be classified as work-related (e.g., autonomy at work) or person-related (e.g., self-leadership). The second adaptation relates to different ways personal resources may play in models of work design. While five roles of personal resources have been examined to date (main/moderating/mediating effects, effect on the perception of work characteristics, third variable effect) [17], a predominant role has not yet been established. What’s more, self-leadership as a personal resource has not been studied systematically within the framework of any model of work design. This study will therefore provide a starting point by examining main effects of two self-leadership strategy dimensions on the motivational process (as indicated by intrinsic work motivation) and the health impairment process (as indicated by exhaustion tendency) proposed by both JDR and the integrated model [16, 23]. Furthermore, we will examine interactive effects of self-leadership with learning requirements (a learning demand) and work overload (a job stressor), respectively, on both the motivational and the health impairment process [16].

**2.3 Hypotheses**

As laid out above, learning demands (such as learning requirements) are linked to personality development and were found to correlate positively with intrinsic motivation [23]. Job stressors (such as work overload), on the other hand, are defined as characteristics that impede the proper completion of a task and are therefore experienced as undesirable. Regarding the nature of the self-leadership strategy dimensions, a similar distinction can be made. Natural reward strategies are linked to intrinsically rewarding tasks, whereas behavior-focused strategies are linked to unattractive behaviors and extrinsic rewards [5, 6]. Constructive thought pattern strategies, on the other hand, are not clearly linked to either intrinsic or extrinsic rewards.

We therefore assume that the application of natural reward strategies may be effective when dealing with learning requirements but not with work overload, since the latter lacks potential for intrinsic motivation and growth. As cognition-based strategies contain elements of both behavior-focused strategies and constructive thought pattern strategies, their utility should not be limited to aversive task characteristics. We consequently assume that the application of cognition-based strategies

**Table 1.** Hypotheses of main and moderating effects.

<i>Main effects of self-leadership strategy dimensions</i>	
Hypothesis 1a (H1a)	Natural reward strategies relate positively to intrinsic motivation
Hypothesis 1b (H1b)	Cognition-based strategies relate negatively to exhaustion tendency and positively to intrinsic motivation
<i>Moderating effects of self-leadership strategy dimensions</i>	
Hypothesis 2a (H2a)	Natural reward strategies augment the beneficial effect of learning requirements on intrinsic motivation
Hypothesis 2b (H2b)	Cognition-based strategies mitigate the detrimental effect of work overload on exhaustion tendency and augment the beneficial effect of learning demands on intrinsic motivation

will primarily be effective when dealing with detrimental work overload but also—albeit to a lesser degree—with beneficial learning requirements. Table 1 summarizes the hypotheses, Fig. 1 shows a graphical representation of the model.

### 3 Method

#### 3.1 Sample

$N = 395$  municipal employees of a medium-sized German city participated in a cross-sectional survey study conducted as part of a workplace evaluation of job characteristics and psychomental health. Access to the study was restricted to employees in three social service departments. Participants were allowed to fill in the survey on the job and could choose between a paper-pencil or online form. Table 2 shows that most respondents were female and about one in five respondents had leadership functions.

**Table 2.** Characterization of the sample.

Department	n	Female	Leaders	Age (M[SD])	Paper-pencil
Day nursery	254 (64%)	244 (96%)	53 (20%)	36.8 (12.5)	175 (69%)
Social welfare	78 (20%)	56 (72%)	12 (15%)	44.7 (10.7)	13 (17%)
Youth welfare	63 (16%)	51 (81%)	10 (16%)	45.5 (10.1)	12 (19%)
Total	395	351 (89%)	75 (19%)	39.7 (12.4)	200 (51%)

#### 3.2 Measures

**Work Characteristics.** Two subscales of three items each were chosen from the “Work Analysis Instrument for Hospitals” [25] in an adapted and validated general version. The response format ranged from 1 (*no, not at all*) to 5 (*yes, definitely*). To represent learning demands, the subscale *learning requirements* was selected ( $M = 4.0$ ,  $SD = 0.8$ , Cronbach’s alpha [ $\alpha$ ] = .77, sample item: “In my work, I have to acquire new theoretical knowledge regularly.”). As a job stressor, we opted for the subscale *work overload* ( $M = 3.1$ ,  $SD = 1.0$ ,  $\alpha = .87$ , sample item: “Frequently, there is too much work at once.”).

**Self-leadership.** The Self-Leadership Skills Inventory [15] provided two strategy dimensions. The response format ranged from 1 (*not at all*) to 5 (*very often*). *Natural reward strategies* were measured with nine items from three facets ( $M = 3.2$ ,  $SD = 0.7$ ,  $\alpha = .86$ ) and *cognition-based strategies* were measured with 12 items from four facets ( $M = 3.3$ ,  $SD = 0.7$ ,  $\alpha = .87$ ). Sample item wordings for each facet are provided in the Appendix (Table 4).

**Strain-Related Variables.** To represent the motivational process, we measured *intrinsic work motivation* with five items from the Work and Life Attitudes Survey [26] (five-point scale from 1 = *no, not at all* to 5 = *yes, definitely*, sample item: “I take pride in doing my job as well as I can”,  $M = 4.0$ ,  $SD = 0.6$ ,  $\alpha = .67$ ). The health impairment

process was represented by three items from the Gießen Subjective Complaints List [27], measuring *exhaustion tendency* (five-point scale from 1 = *not* to 5 = *strongly*, sample item: “rapid exhaustibility”,  $M = 2.2$ ,  $SD = 1.0$ ,  $\alpha = .80$ ).

**Control Variables.** All analyses were controlled for influences of *sex* (0 = male, 1 = female), *leadership position* (0 = no, 1 = yes), and *age* (in years).

### 3.3 Data Analyses

As missing values were very rarely observed, both per respondent ( $M = 0.8\%$ , range: 0.0%–18.8%) and per variable ( $M = 0.7\%$ , range: 0.0%–2.7%), they were not given special treatment. Because self-leadership was measured with a new, unpublished questionnaire, preliminary confirmatory factor analyses (CFA) were conducted in order to establish factorial validity. For hypothesis testing, we employed path modeling in order to maintain a favorable ratio of sample size to number of parameters [28]. All analyses were conducted in R using the lavaan package [29].

## 4 Results

### 4.1 Confirmatory Factor Analyses

Table 3 depicts fit parameters of the CFA models. The SLSI strategy dimensions exhibited very good fit (social self-leadership strategies were included here to test the factorial validity of the complete SLSI). Regarding the global SLSI model, a solution with nine first-order facets showed better fit than a solution with nine first-order facets grouped in three second-order strategy dimensions. However, both solutions fit the data

**Table 3.** Fit indices of CFA models.

Model	$\chi^2$	<i>df</i>	<i>p</i>	$\chi^2/df$	CFI	TLI	RMSEA [CI]	CN
<i>SLSI strategy dimensions</i>								
NRS	40.43	24	.02	1.68	.99	.99	.042 [.017, .063]	357
CBS	93.07	48	<.01	1.94	.98	.98	.049 [.034, .064]	276
SLS	17.70	8	.02	2.21	.99	.97	.055 [.019, .090]	348
<i>SLSI global</i>								
Three SD	2654.35	321	<.01	8.27	.58	.54	.138 [.133, .143]	53
Nine F	552.28	288	<.01	1.92	.95	.94	.049 [.043, .055]	227
Three SD & nine F	629.80	312	<.01	2.02	.94	.94	.052 [.046, .058]	215
<i>Full measurement model</i>	884.17	505	<.01	1.75	.94	.93	.045 [.040, .050]	233

*Note.* SLSI = Self-Leadership Skills Inventory; NRS = natural reward strategies; CBS = cognition-based strategies; SLS = social self-leadership strategies; SD = strategy dimension; F = facet;  $\chi^2$  = chi-square discrepancy; *df* = degrees of freedom;  $\chi^2/df$  = relative chi-square; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = 90% confidence interval for population RMSEA; CN = Hoelter’s critical *N*.



satisfactorily. The full measurement model included work characteristics, outcomes, as well as the SLSI natural reward strategies and cognition-based strategies and showed good fit as well.

## 4.2 Main Effects of Self-leadership

Since the coefficients of first-order terms in a model that includes second-order terms (i.e., interactions) represent marginal effects conditional on the second-order terms, the main effects were investigated in a separate model. The structure of this model is not depicted but corresponds to the model in Fig. 1 with the interactions of the self-leadership strategy dimensions removed. The model exhibited good overall fit ( $\chi^2 = 5.66$ ,  $df = 3$ ,  $p = .13$ ,  $\chi^2/df = 1.89$ , CFI = .98, TLI = .90, RMSEA [CI] = .048 [.000, .108], CN = 535).

Work characteristics related to outcomes as expected: learning requirements were positively associated with intrinsic work motivation ( $\beta = .11$ ,  $p = .03$ ) and work overload was positively associated with exhaustion tendency ( $\beta = .34$ ,  $p < .01$ ).

Natural reward strategies were positively associated with intrinsic work motivation ( $\beta = .20$ ,  $p < .01$ ) but not with exhaustion tendency ( $\beta = -.03$ ,  $p = .61$ ), confirming H1a. Cognition-based strategies related positively to both intrinsic work motivation ( $\beta = .14$ ,  $p = .03$ ) and exhaustion tendency ( $\beta = .13$ ,  $p = .05$ ). Since the reversed direction was postulated for the latter effect, H1b was confirmed only partly.

Women reported higher levels of both intrinsic work motivation ( $\beta = .50$ ,  $p < .01$ ) and exhaustion tendency ( $\beta = .43$ ,  $p < .01$ ), whereas younger participants reported higher levels of exhaustion tendency ( $\beta = -.18$ ,  $p < .01$ ). No effects were observed for leadership position.

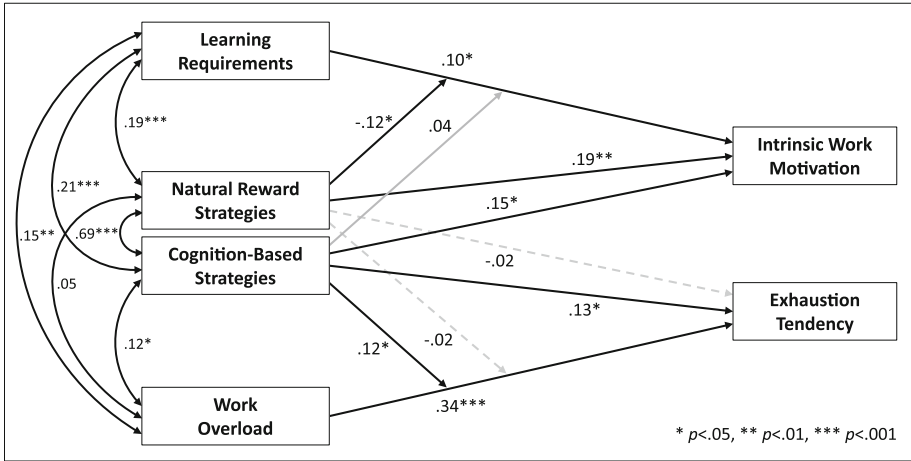
## 4.3 Moderating Effects of Self-leadership

Moderating effects of self-leadership were tested as shown in Fig. 1. Compared to the model without interactions, main effects remained stable and led to identical conclusions. Overall model fit improved slightly ( $\chi^2 = 9.56$ ,  $df = 7$ ,  $p = .22$ ,  $\chi^2/df = 1.37$ , CFI = .98, TLI = .94, RMSEA [CI] = .031 [.000, .074], CN = 570).

Natural reward strategies were found to moderate the positive effect of learning requirements on intrinsic work motivation ( $\beta = -.12$ ,  $p = .05$ ). However, the negative sign indicated a buffering effect where an augmenting effect was expected. In line with expectations, natural reward strategies did not moderate the effect of work overload on exhaustion tendency ( $\beta = -.02$ ,  $p = .69$ ). Overall, H2a was confirmed only partly.

Cognition-based strategies moderated the positive effect of work overload on exhaustion tendency ( $\beta = .12$ ,  $p = .05$ ). However, the positive sign indicated an augmenting effect where a mitigating effect was expected. Apart from that, no moderating effect of cognition-based strategies could be found on the effect of work overload on intrinsic work motivation ( $\beta = .04$ ,  $p = .52$ ). Therefore, H2b was not confirmed.

As above, women reported higher levels of both intrinsic work motivation ( $\beta = .49$ ,  $p < .01$ ) and exhaustion tendency ( $\beta = .45$ ,  $p < .01$ ), and younger participants reported



**Fig. 1.** The moderation model. Solid black lines indicate statistically significant effects ( $p < .05$ ). Solid grey lines indicate expected but statistically nonsignificant effects. Dashed grey lines indicate effects expected to be statistically nonsignificant.

higher levels of exhaustion tendency ( $\beta = -.17, p < .01$ ). Again, no effects were observed for leadership position.

### 5 Discussion

This study examined main and moderating effects of two self-leadership dimensions, natural reward strategies and cognition-based strategies, in an integrated model of work characteristics (learning requirements and work overload) and motivational and health-related outcomes (intrinsic work motivation and exhaustion tendency).

In accordance with the motivational process predicted by JDR, higher levels of both natural reward strategies and cognition-based strategies were associated with higher levels of intrinsic work motivation. Regarding the health impairment process, natural reward strategies did not relate to exhaustion tendency, which was expected as well. However, higher levels of cognition-based strategies related to higher levels of exhaustion tendency, which was diametrically opposed to our prediction.

In line with predictions, natural reward strategies were effective when combined with challenging features of the work situation, whereas cognition-based strategies were primarily effective when combined with adverse work characteristics. However, the direction of moderated effects, again, was diametrically opposed to our prediction. On the one hand, higher levels of natural reward strategies diminished the positive effect of learning requirements on intrinsic work motivation. On the other hand, higher levels of cognition-based strategies augmented the detrimental effect of work overload on exhaustion tendency. In explaining these results, we will consider conceptual, individual, and organizational aspects.

## 5.1 Conceptual Aspects

The positive main effect of cognition-based strategies on exhaustion tendency not only questions the function of self-leadership as a personal resource but also implies a conceptual contradiction: While self-leadership is an action-oriented concept, exhaustion tendency describes a situation where action is inhibited due to a depletion of energy. In contrast, existing evidence speaks in favor of the energizing nature of self-leadership [5, 15, 30]. A possible explanation may be derived from the fact that participants in this study were unfamiliar with self-leadership. In absence of knowledge about the detailed concept, self-leadership facets may be prone to misinterpretation or overgeneralization. In this case, self-leadership items may capture a broad and unspecific range of “self-improvement” strategies that might prove ineffective or even harmful. For example, some self-leadership facets such as self-reminding, self-verbalization, or self-analysis may capture dysfunctional, state-oriented preoccupation (i.e., uncontrollable self-rumination; [31]) in untrained persons. To clarify possible conceptual misunderstandings, future studies should investigate the effects of self-leadership on health-related outcomes in both trained and untrained persons.

## 5.2 Individual Aspects

An explanation for the diminishing effect of natural reward strategies on the positive relationship between learning requirements and intrinsic work motivation is based on the overjustification effect suggested by cognitive evaluation theory [9]. According to theory, intrinsic motivation may be corrupted by an external incentive that is perceived as external control. In examining the intrinsically rewarding features of a work task (such as learning requirements), the application of a strategy to augment intrinsic rewards may be perceived as self-manipulation. This might lead to a sense of impaired autonomy, which in turn diminishes intrinsic work motivation. For this rationale to hold, a conceptual modification of the overjustification effect must be made in terms of the source of the incentive that exerts the corrupting influence. In this case, the incentive is not external but internal, as the person itself applies the strategy to achieve an (augmented) intrinsic reward. This suggests a “self-initiated overjustification effect” with its decisive element being whether the incentive (the self-leadership strategy applied) is in accordance or in dissonance with one’s personal attitudes. In case of a dissonance, the strategy may be perceived as a self-imposed restriction of autonomy and, consequently, corrupt intrinsic motivation. The concept of “interested self-endangerment” [32] sets forth a possible mechanism of such self-exploiting behavior for the sake of optimized functioning in the work context. In summary, the question arises whether or under which circumstances the application of a strategy in order to achieve intrinsic rewards may be perceived contradictory.

Another line of argument draws upon ego depletion theory [33], which models self-regulatory capacities as a limited resource. In a workplace setting, the application of self-leadership strategies requires that the individual expend cognitive and behavioral effort over and above to completing work tasks. In the presence of a challenging and/or stressful working environment, cognitive self-control may be drained even faster

if self-leadership strategies require additional attention. Ultimately, a depletion of self-control capacities may follow, which then could trigger perceptions of exhaustion and impaired motivation. Of course, the supportive nature of a resource may be defined in this framework as an overall energy effort less than the effort spent without utilizing the resource. In other words, instead of representing an additional source of strain, a resource should facilitate coping. One key factor that determines the effectiveness of self-regulation is training [34]. The more a self-regulative strategy is exercised, the less effort is necessary to apply it and the more beneficial effects it may exert. The participants in this study did not undergo training in self-leadership prior to the study and were probably unfamiliar with the concept. In this situation, an unduly effort to apply self-leadership strategies may interfere with high learning demands and/or high job stressors, explaining, in part, the unexpected results of the moderation analyses. Future studies should examine not only motivational but also health impairment indicators in both trained and untrained individuals.

### 5.3 Organizational Aspects

A last line of argument concerns both organizational requirements and opportunities to employ self-leadership strategies. Different organizational contexts, e.g., “active jobs” vs. “low strain jobs” [35], require the application of self-leadership strategies to a higher or lower degree. In a similar vein, factual latitudes at work define the extent to which self-leadership strategies may be put into practice. In this sense, the present sample of social service workers may not be an ideal target group to study self-leadership. This view speaks against assuming generally beneficial effects of self-leadership regardless of context. Instead, the results may call for careful selection of appropriate organizational contexts for the investigation of self-leadership.

### 5.4 Limitations

The collected data originated from a homogenous sample of mostly female participants working in a single institution and in similar professions. Future research should seek to gather more diverse samples. The cross-sectional design does not lend itself to causal interpretations without caveats. However, while reversed directions of effects may be possible, from the perspective of work design, the causal chain from work characteristics on personal outcomes is certainly of prime interest. Both the relevance and possible misunderstandings of the self-leadership measure among participants have not been controlled for. The combination of self-leadership as a personal resource with work-related resources like job autonomy and social support has yet to be explored. The SLSI is a new, unpublished measure. Although some evidence for its reliable and valid measurement has been presented here, the reader is referred to a validation publication currently in preparation [15].

## 5.5 Conclusion

The present study examined self-leadership as a personal resource in an integrated model of work characteristics and health-related outcomes. Self-leadership was measured with a new instrument that exhibited good psychometric properties. However, the partly unexpected findings cast doubt on the assumption of a generally beneficial effect of self-leadership as a personal resource. The utility of self-leadership depends on a number of factors, such as organizational context, individual attitudes, comprehension of the concept, and level of training. As scholars have pointed out [5], higher levels of self-leadership may not always be better.

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## Appendix: Self-leadership Sample Items

**Table 4.** Sample item wordings of self-leadership facets.

<i>Natural reward strategies</i>	
Positive focus	I try to leave aside negative aspects of a task in order to have fun and pleasure while doing it
Success and vision	When I start to work at a task, I imagine what it will be like when I have accomplished it successfully
Intrinsification	I try to incorporate rewarding aspects into my tasks
<i>Cognition-based strategies</i>	
Strategic planning	I plan every single step in my mind before I get to work
Self-reminding	I use reminders (e.g., notes) to keep myself aware of my aims
Self-verbalization	In order to accomplish my tasks more effectively, I talk to myself
Self-analysis	While working at a task, I observe my actions

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# Cultivating Networked Innovation: Tools and Techniques for Innovation in Maritime Clusters

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**Abstract.** This paper discusses how to cultivate networked innovation and development in maritime clusters and what tools and techniques are available. The nature of innovation and development is increasingly driven in open and dynamic networks of people with complementary competences. Traditional innovation and development models conceptually located within the confines of corporate walls do not suffice. Professionals from industry, academics, and civil servants need to find spaces and approaches to come together, a practice that we have termed “networked innovation”. This paper develops an approach to community-based innovation and development with participatory design principles. These principles are tested and analyzed with empirical data from an innovation and development workshop attended by international participants from the maritime cluster as part of a project funded by the Swedish Institute.

**Keywords:** Networked and community-based innovation · Participatory design · Maritime clusters · Tools and techniques

## 1 Introduction

The need for and nature of innovation and development are rapidly changing. To be able to innovate and develop is pivotal for any organization. In the case of maritime businesses, where the impact of technological and economical change is significant, incremental development is not in itself enough: a capability to radically transform everything from technical tools to internal structures and process is called for.

The maritime sector sees the establishment of maritime clusters as a strategic solution to surviving in global business competition and to innovating. This view seems to match the nature of innovation and development, which is increasingly driven in open and dynamic networks of people with complementary competences. However, it is not clear to what extent such modern innovation and development models can develop. Here, the absence of defined tools and techniques to foster innovation becomes problematic, while the concept of maritime clusters cannot alone cannot guarantee results in the lack of any systematic application. Professionals from industry, academics, and civil servants must therefore find spaces and approaches to come together, a practice that we have termed “networked innovation”.



The following section describes related work of maritime clusters and innovation, innovation in networked communities, and participatory design tools and techniques for innovation. This is followed by the description and analysis of an empirical case of an innovation workshop, where concrete examples are put forward to illustrate lessons that can be learnt by organizations in maritime clusters. Examples of tools and techniques are presented for broader use and development. The analysis and discussion in this paper contribute to a modern outlook of promoting the capability for innovation and development.

## 2 Maritime Clusters and Innovation

The community for innovation that this paper looks into is that of maritime clusters. The concept of “cluster” was originally proposed by Michael Porter, who defined it as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities” [1]. This “cluster” concept was co-opted into the maritime sector by a Norwegian economist, G.K. Sletmo, when the industry faced production cost competitions. By applying the cluster concept to the maritime sector, Sletmo communicated his belief in a new era of supporting the maritime environment through policy to strengthen the industry itself [2].

Since the 1990’s, the maritime cluster concept has been well received as a catalyst for the sustainable growth of the maritime economy internationally, such as in Norway [3], Denmark [4], Netherlands [5], Greece [6], Singapore [7] and Japan [8]. In keeping with this trend, a case study in the maritime cluster in the Algarve region exemplifies the increase of partnerships between different maritime corporations as a positive outcome of establishing a maritime cluster [9]. However, it is not clear whether such a phenomenon has merely resulted from the establishment of a maritime cluster or from other business trends, such as countermeasures against mergers and acquisitions. Since maritime corporations tend to be highly vulnerable according to the world’s economy, it can be difficult for the sector to facilitate innovation and development at the workers’ level, and managers tend to control decision-making processes from a strategic management perspective to survive the competition. Systematic failure in maritime governance, including a lack of coordination among maritime stakeholders [10], is also problematic in terms of fostering innovation and development in the maritime sector.

This paper therefore argues that the concept of maritime clusters seems to fail to establish a human-centered approach to develop networked innovation in given situations due to its economy-driven motivations. How can a maritime cluster cultivate its networked innovation, and what tools and techniques can be proposed for community-based innovation?

## 3 Innovation in Networked Communities

Organizations are challenged to develop and sustain capabilities for innovation to cope with the increased pressure for change, the acceleration of globalization, and the possibilities that come with new Information Technologies [11, 12]. According to

Lawson and Samson [13], an innovation capability is the “ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the firm and its stakeholders”. At the same time, both the capability to innovate and the knowledge of how to put innovations into use are a learning process that is continuously developing [13].

Current developments in the understanding of the conditions for innovation provide new opportunities for organizations faced with the challenge to innovate. Using the concept of “Democratizing Innovation”, von Hippel [14] shows that in many cases it is the users who actually take the first step and make basic innovations. According to von Hippel [14], user-centered innovation processes offer great advantages in that users can develop exactly what they need. This differs from the traditional model, in which dedicated designers and engineers develop products and services. In this traditional model, the user’s role is to have needs, which are funneled in design and where somebody else develops solutions [14].

This new innovation trend is supported by technological developments that enable users to both innovate products and services and to share their innovations. This is illustrated by the development of new innovation communities, where individual users do not have to develop everything they need on their own: they can benefit from innovations developed and shared by others. Users joining together in networks and communities provide useful structures and tools for their interactions and for the distribution of innovations.

Different spheres of user-centered innovations can be distinguished. Von Hippel focuses on the benefits to the consumer in the marketplace of user-centered innovations, and how innovations by users provide a necessary complement and feedstock to manufacturer innovation. Companies are well advised to open their innovation models to incorporate the innovations of lead-users of their services in particular and products in their business models: “if [...] the information needed to innovate in important ways is widely distributed, the traditional pattern of concentrating innovation-support resources on a few individuals is hugely inefficient” [14]. Björgvinsson et al. [15] discuss democratized innovation from the point of view of public spheres and everyday life. They address the question of how open innovation milieus can be participatory designed for the user as a citizen, and how new constellations, issues, and ideas evolve from bottom-up and long-term collaborations among diverse stakeholders.

This article looks into democratized innovation from the perspective of users as members of organizations in maritime clusters. In this context, democratized innovation is about the need for organizations in maritime clusters to take advantage of the capabilities of their own members, and how new innovation communities can be formed. User-centered innovation by organizational members is needed for organizations to develop new products and services as well as internal operations [12, 16]. Organizations need to make use of and cultivate the capabilities of their members, the communities that they are part of, and the networks to which they have access—inside and outside the organization. Here, the challenge is understanding how new working innovation communities can be rapidly formed, and how their innovations can be supported using methods, tools, and techniques.

## 4 Participatory Design

In this study, Participatory Design (PD) was used as a conceptual framework to understand both the design of tools and techniques applied in the innovation workshop and to analyze the results. PD has a long-term industry and research track record of putting the user at the center of development activities—both for reasons of ethics and effectiveness. Early and influential PD projects supported democratic planning in the organizational and even national arena, and were often anchored in the search for humanization and ethics in the workplace [17, 18]. The PD projects showed how workers were important as intelligent, creative, and productive contributors to organizations, if they were empowered to express their expertise, exercise decision-making capabilities, and given responsibility for the impact of their decision-making [19].

Contemporary, PD projects have often focused on developing “tools for skilled workers” [20]. The user is put at the center when using PD tools, techniques, and methods to develop knowledge in different areas of relevance for situated innovations with high requirements for usefulness and usability. Bødker, Kensing and Simonsen [21] have developed a knowledge framework to understand the use of PD tools, techniques, and methods in different areas of work and technical knowledge development. As shown in Table 1, the knowledge framework positions the need to create knowledge about present work practices, technological options, and new technological usage. Knowledge development involves both abstract knowledge, such as the use of sketches, rich-pictures, and prototypes to negotiate and develop knowledge about a new solution, and concrete experience, where the value of first-hand experience is highlighted, for example, through field visits and the development of prototypes that are tested in practice. This PD framework of knowledge development will be used in this study to frame the analysis and discussion of the tools, techniques, and methods used in the innovation workshop.

**Table 1.** Knowledge framework to position PD tools, techniques, and methods (adopted from Bødker, Kensing and Simonsen [21]).

	User’s present work practices	New technological usage	Technological options
Abstract knowledge	Relevant descriptions of users’ present work practices	Visions and design proposals	Overview of technological options
Concrete experience	Concrete experience with users’ present work practices	Concrete experience with new IT usage	Concrete experience with technological options

## 5 Empirical Case and Research Methods

An exploratory case study on how a networked innovation can be cultivated in maritime clusters was conducted during an innovation workshop as part of a project organized and funded by the Baltic Maritime Science Park (Region Blekinge, Sweden) and the Swedish Institute. The workshop was used as an empirical case to explain

modern innovation and development models. The total number of participants invited to the workshop was 35, comprising academic personnel of maritime universities and colleges from the Baltic Sea region (7 from Gdynia Maritime University, Poland, 10 from the Estonian Maritime Academy of Tallinn University of Technology, Estonia, and 4 from the Lithuanian Maritime Academy, Sweden), as well as 13 MSc students from an elective subject in knowledge management and 1 PhD student from the World Maritime University (WMU), Sweden. The WMU students were maritime professionals employed in different parts of the maritime cluster in their home countries, such as Argentina, Algeria, Ghana, Nigeria, Sierra Leone, Malawi, South Africa, Indonesia, China, Vietnam, and Trinidad and Tobago.

The researchers, who are faculty at WMU, took part in designing the workshop and used a participatory observation method to study a networked innovation in six hypothetical maritime cluster groups organized in the project workshop. The events and incidents of the workshop were documented by the researchers by taking photographs, collecting the results of the methods, tools, and techniques used in the workshop (as described in the following section), as well as keeping diary notes.

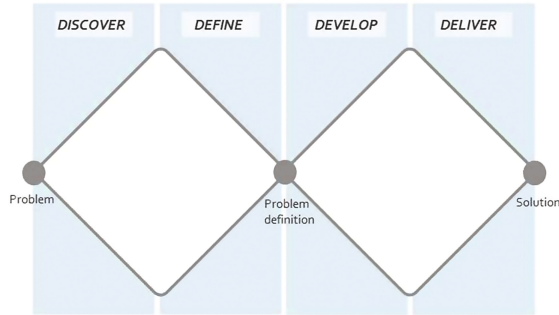
As part of their course assignments, the WMU students also documented and reflected on the workshop. After the workshop, they were prompted to critically reflect on it and tasked with giving a post-presentation. These presentations were video-recorded and used for the analysis of the workshop for this paper (with the consent of the students).

The researchers analyzed the empirical material gathered through an open coding approach. Both an individual analysis as well as joint reflection and development of categories through a series of meetings were undertaken. The recordings of the students' presentations was used as a mean of researcher triangulation [22], whereby all the recordings were reviewed by the researchers and incorporated into the analysis of the workshop process and outcomes.

## 6 A Case of Networked Community Innovation

To set the scene for the innovation workshop, the name “innovation race” was chosen in the invitation to the participants. This was defined as “an intense, highly interactive and creative process where participants are challenged to generate ideas and solutions to real problems”. At the onset of the race, a specific maritime organization presented a real challenge that it was facing. Guided by a professional innovation facilitator, the participants worked in groups to develop possible solutions to the problem/challenge.

The central tenets of the workings of the innovation workshop are detailed in the following sections: (Sect. 6.1) Rapid community-building; (Sect. 6.2) “Discover”—identify, research and understand the initial problem; (Sect. 6.3) “Define”—limit and define a clear problem to be solved; (Sect. 6.4) “Develop”—focus on and develop a solution; and (Sect. 6.5) “Deliver”—test, evaluate, and ready the concept for production and launch. These process steps were derived from an innovation framework called the double-diamond model developed by the Design Council [23] (see Fig. 1). For each section, the undertaken activities and the analyses of the results—both the intended and actual results—are described.

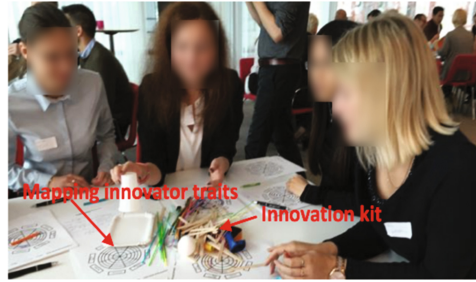


**Fig. 1.** The double-diamond model. (Source: Design Council [23])

## 6.1 Rapid Community-Building

The first challenge of the workshop was how to rapidly form innovation teams among the workshop participants, who in many cases had not met before. A number of activities were undertaken, for example:

- Day 1 started with team-building exercises, where the whole group worked together. Participants were tasked with introducing themselves and interviewing each other about their interests in a “speed-dating” format. Both Day 2 and 3 were initiated with team-building exercises as well.
- The role of the facilitator was established. Throughout the workshop, he actively used an approach based on simplicity and engagement. He, for example, eliminated PowerPoints and the static presentation media; instead instructions were written down on large-pieces of papers to allow for the in-situ adaptation and inclusion of feedback from the participants.
- The facilitator laid out a basic framework for the workshop. An example was a number of “golden rules” of innovation, such as “Lean in, you get what you live”; “Everybody is right, but only partially”; and “Be here, and have fun”. As exemplified by these simple rules, the workshop was motivated by simplicity, and the construction of a participatory and inclusive philosophy.
- The participants were asked to form six innovation teams that would work together during the workshop. In addition, each innovation team was tasked with creating a name for the team based on their interests and profiles to establish their team identity.
- The next task was for the team members to understand their capabilities as innovators—individually and as a team. A framework of different innovator traits was given to the team members: to synthesize information, to learn, to be curious, to have fun, to use one’s imagination, to employ one’s technical ability, to be able to observe, to have historic knowledge, to have empathy. The teams were then tasked with mapping their innovation capabilities based on an innovation kit exercise. The accompanying “innovation kit” bag contained various items such as strings, sticks, straws, and balloons. Each team was asked to rapidly assemble these items to express their innovative ideas to reflect on their own and their team members’ strengths and weaknesses as innovators (see Fig. 2).



**Fig. 2.** Understanding innovator traits based on the innovation kit exercise. (Source: Authors)

Based on participatory observation and the post-analysis, several elements appeared during the preparation phase of the innovation workshop, namely, “rapidly forming innovation teams”, “a strong framing key”, and “understanding innovator capability”:

**Rapidly Forming Innovation Teams.** The first activities were primarily intended to rapidly build a working community among the team members, which appeared to be successful. It can be recognized that this was a challenging task, as in many cases the team members had never met before and the timeframe was limited. It was nonetheless a crucial task for the workshop outcomes. The community-building succeeded in creating a basic relation and comfort-zone between the participants, and establish an informal style of communication, beyond their formal titles and positions.

**A Strong Framing Key.** During the workshop, it was clear how both the facilitator and basic framework laid out in the beginning was key to the workshop process and outcome. Especially, given the highly intensive format, the participants needed to be able to relate to a working frame. For this purpose, the facilitator made the deliberate choice not to use static presentation media, for example, in order to establish a feeling of interaction that contributed to supporting networked innovation among the participants.

**Understanding Innovator Capability.** The tools and techniques used in the community-building creation exhibit the effectiveness of simplicity. An “innovation kit”, containing items like strings, sticks, and colored tape, may come across as child-play. It was, however, clear how these tools and techniques worked in a non-threatening and disarming way, allowing everybody to participate. In this sense, the result was as much about understanding different innovators’ traits as about continuing to build the community around the mission of the workshop. Additionally, it was clear how the innovation kit exercise was intended to be used as the first tool in a systematic process of innovation.

## 6.2 Discover—Identify, Research, and Understand the Initial Problem

The first phase of innovation for the formed innovation teams was to identify, research, and understand a problem. In this experiment, a frame of the initial problem

formulation was given to the participants: they were to identify and solve a problem about sustainability in ports. It was open to the teams to work out and define what particular problems and solutions might be out there. The framing of the problem was selected by the workshop organizers, based on an understanding of the participants' profiles, before the workshop.

The second part of Day 1 was initiated by an activity to broadly identify the problem. Using different colored sticky notes, the team members were tasked with brainstorming port-related problems, identifying assumptions about those problems, and turning the assumptions into questions to discuss both within their own group and with the other groups (see left image in Fig. 3). This was followed by a field visit to Malmö-Copenhagen port, where the participants were given a tour of different port facilities as well as a presentation by a port management representative, with the opportunity to ask questions about their particular problems. In the first part of Day 2, the team members continued to work to define their innovation problems and assumptions based on the field visit. The following elements are depicted from the first phase in the innovation workshop: “open discovery of problems” and “the importance of first-hand experience”.



**Fig. 3.** Brainstorming about problems (left) and field visit to Malmö-Copenhagen port (right). (Source: Authors)

**Open Discovery of Problems.** The objective of the activity as part of the double-diamond innovation framework was intended to support the team members in broadly identifying problems and categorizing potential problem domains. It facilitated an inclusive process, in which everybody found it easy to share their own ideas, test the assumptions through discussion, and if necessary, discard ideas as well. Using different colored sticky notes was again an example of those simple yet non-threatening tools that facilitate an open process in which everybody can participate in brainstorming. As a result, each group managed to come up with a large number of problems.

**The Importance of First-Hand Experience.** Anchoring problems and solutions in practice turned out to be important, but challenging. The other innovation activities of the workshop were of an abstract nature, in the sense that they were carried out separately from practice. The field visit was intended to give the teams an opportunity to inquire into the viability of their problems, assumptions, and questions in relation to

a real-world case and company. The relation between abstract development and real-world anchoring was pointed out as important in PD to achieve useful development results [21], a limitation of which is the frequent focus on the former.

Given the compressed timeframe of the workshop, the anchoring to practice, however, turned out to be the most challenging activity of the workshop. Both during and after the workshop, the participants commented that it would have been beneficial to get more time to iterate both problems and solutions in relation to real-world practices.

### 6.3 Define—Limit and Define a Clear Problem to Be Solved

The second phase of the innovation workshop was to limit and define a clear problem, based on the open discovery activities of the previous phase. The activities entailed continuing to develop the ideas outlined in the sticky notes from the previous phase in a more structured format. Several tools and techniques such as a “power/interest map” were used to zoom in on a problem and understand different aspects of the assumptions and questions posed (see Fig. 4).

The “power/interest map” intended to support the team members in identifying stakeholders and how they related to the problem domain: did they have the power to affect the problem and/or did they have an interest to do so, and was it a prioritized problem? The second phase of the workshop resulted in “closing in on the problem”.

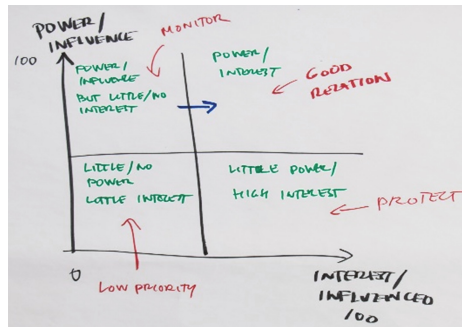


Fig. 4. Power/interest map. (Source: Authors)

**Closing in on the Problem.** The function of the activities and tools of the phase were intended to close in on and define a problem, compared to the open discovery of the previous phase. The activities and tools of the second phase of the workshop had the different function of promoting simple and inclusive approaches that framed the workshop: the team members’ different backgrounds and interests were drawn on to generate innovative ideas; however, these also at times prompted difficult negotiations to arrive at a common understanding of what to prioritize and how to move forward. The structured tools such as the power/interest map allowed the team members to discuss and test their ideas in a structured manner to facilitate this process of negotiation and definition.



## 6.4 Development—Focus on and Develop a Solution

The third phase of the innovation workshop was to again open up the innovation process to develop ideas for solutions based on the problem defined in the previous phase. A new set of techniques was introduced to the innovation teams for this purpose. One such technique was to develop a challenge map, where the challenge is positioned in the center of the map, and to prompt reflections about reasons and their relations: on the one hand, why do we want it, and on the other, what is holding us back? During the third phase of the workshop, “a process of focusing and refocusing” was captured in a systematic approach led by the facilitator.

**A Process of Focusing and Refocusing.** The challenge that the third phase of the double-diamond model addressed as well as the use of tools such as the challenge map was to refocus the project teams around a new activity. The negotiations to arrive at the definition of a problem to work on had sometimes been difficult. The third phase explicitly intended to direct the team members to move on to and focus on a new activity. As one of the team members commented, “Everybody wanted to be a leader. At one point, I was losing it. My voice was left behind. But when the problem needs a solution and there is no time, we need the same community of practice to come together.” In this way, the value of framing the activities of the workshop with a systematic approach was that it allowed for flexibility but also guided the participants to move in a step-by-step fashion toward the goal of innovating a joint solution.

## 6.5 Deliver—Test, Evaluate and Ready the Concept for Production and Launch

The final phase of the innovation workshop was to arrive at a solution. Each team developed a solution as a rich-picture prototype, through which they both described the solution and its workflows. As shown in Fig. 5, the innovation teams developed different kinds of rich-picture prototypes: the left image shows a rich-picture developed on a series of sheets of paper, and the right image, another group choosing to develop a three-dimensional prototype of a port. All the groups presented their prototypes to each other. In addition, a representative from Malmö-Copenhagen port was invited as an industry expert and researchers from WMU also attended. The fourth and final phase of the workshop highlighted “a cohesion within networked innovation”.



**Fig. 5.** Prototypes as a result of the innovation workshop. (Source: Authors)

**A Cohesion within Networked Innovation.** The participants' reflection about this phase appeared to draw on the cohesion that the team members had strengthened during the process of cultivating innovation. All the teams were excited to present their prototypes. For the team that had worked within their own community, the final phase gave them exposure to the other five communities, from which they were also able to learn. For example, one team suggested a short-term solution to a problem, and the other, a long-term solution. The participants found each other's ideas interesting and complementary. This facilitated further amendment and analysis of their prototype for improvement in design. As a result, participants seemed to be confident and comfortable in using their creativity and competence to support networked innovation.

## 7 Concluding Remarks and Future Work

"Networked innovation" requires professionals from industries, governments, and academics to find spaces and approaches to come together. In this case study, a rapid community-building for innovation worked surprisingly well, especially given that the participants initially did not know each other. In analyzing the post-reflection recordings, many participants commented that they had not expected to be able to form an innovation team with that level of commitment to achieve a complex set of tasks, such as identifying and negotiating a problem and designing a solution, so fast and effectively. Given the diverse professional and cultural backgrounds of the participants, not only source creativities but also divergent opinions generated the dynamic innovation process described in the double-diamond model. The type of community in which Hippel [14] recognizes the importance of user-centered innovation was observable, yet such communities are often organically formed over a long time [24]. The innovation workshop demonstrated a new possibility to create communities for innovation with a number of tools and techniques that had not been explored in maritime clusters.

In the innovation workshop, the application of PD tools and techniques was taken to a new level. From previous experience, we have seen the success of using PD tools and techniques that focus on user-centered innovations (see for example, [25]). Here, a new dimension was added, wherein the workshop was designed to apply the PD tools and techniques in a linked and systematic process to effectively focus the participants on rapid innovation—from problem to solution. Referring back to the knowledge framework of Bødker et al. [21], discussed in Sect. 2, in respect of knowledge development in user-centered development, it is clear how both the work domain and technical options were taken into consideration in the development of a new solution.

Most of the innovation tools were applied to develop "abstract" knowledge, and this process was facilitated by the fact that the workshop activities were conducted off site from the situated and real-world activities. It is an important consideration for future work how first-hand experience such as field visits can be used to link "abstract" knowledge and real-world activities within the context of networked innovation. Better anchoring and possibilities to iterate inquiries and feedback in the context of real-world cases were emphasized by the workshop participants both in identifying problems and innovating solutions. In this particular workshop, the double-diamond model was used as a frame, and a set of particular PD tools was chosen for the participants to work with.

It is important to note that there is an extensive catalogue of other tools as well (see, for example [21, 26]). Furthermore, PD tools have to be systematically applied with linkages that are well thought out.

Another area for future work would be how to work with sustainability in networked innovation. In this workshop, new innovation communities were formed that managed to create a solution for a problem that they found relevant based on their professional experience. However, the question remains what happens after the workshop ends? Will the solutions created be implemented in some form? This element is not clear due to the limited experiments and data available in this study. For future work, it would be interesting to work with a series of innovation workshops that are mixed with real-world implementations over a long-time period to understand issues of sustainability.

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# Developing and Testing a Methodological Approach to Assess the QWL in Retail Banks

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**Abstract.** The banking sector has been facing several changes related to the characteristics of the respective activities and the technological advances. The increasing use of new technology has led to a reduction in the number of jobs, flattening of hierarchies and the assignment of multiple functions and intensification of workload for employees who remained in the companies. In this context, this work proposes a methodological approach to assess the quality of work life (QWL) in order to identify the factors that must be prioritized to improve the QWL in retail banks. A study was conducted in 33 Brazilian branches and a 55-item questionnaire was designed to obtain the respondents' satisfaction degree with the QWL. Factor analysis was used to identify relationships between the dimensions and the items. One-way ANOVA was conducted to examine the difference in the QWL according to male and female employees and Quartile analysis was used to identify the most critical items. Professional growth and stability, work characteristics and remuneration policies are the factors that most influence on the QWL in banks. The bank activities are stressful to bank employees. Some differences between the QWL of male and female employees are perceived. The questionnaire is valid and reliable.

**Keywords:** Quality of work life · Human resource management · Employee well-being · Banking industry · Retail banks

## 1 Introduction

Retail banks are typically service companies and the banking sector has been facing several changes related to the characteristics of the respective activities and the technological advances that have emerged to keep pace with contemporary scenery of competitiveness. More specifically, after the 1990's, the banking sector is characterized by the development of electronic services based on the use of automated teller machines (ATM) and the Internet, which allow customers to perform various financial transactions from anywhere in the world. Nowadays, several banking services applications are available to mobile devices (cell phones, smart phones, tablets, etc.).

Although the use of Internet may have been seen as a means of securing a competitive advantage, many providers of various forms of retail services (as the case of the retail banks) are now being compelled to adopt Internet-based services because their competitors have [1, 2] and the consumer adoption of mobile financial services has

risen. On the other hand, there are customers that reject a relationship based on machines or self-service processes, preferring the personal contact they were used to have [3–7]. Further, the increasing use of these technologies has led to a reduction in the number of jobs, flattening of hierarchies and the assignment of multiple functions and intensification of workload for employees who remained in the companies. More specifically, a minor number of employees for customer services increases the waiting time for service and the pressure on the employee to cater for everyone, and it also results in the accumulation of activities to be made after banking hours. Such issues are important in the quality of work life (QWL) context whether the increasing of the dissemination of mobile services is carried out in reducing the number of employees since it is supposed that the minor number of employees and the changes in work environment may become the activities performed more stressful to the employees.

In Brazil, studies have uncovered such issues as high turnover and the increasing reduction of the number of employees in the last years [8]; high numbers of workplace accidents and a significant amount of sick pay benefits [9]; and exposition to adverse psychosocial working conditions [10] that enhance the need for assessing the QWL in the banking sector. Even though recent studies have focused the QWL in the banking sector in order to verify the existence of significant difference between the QWL of the male and female employees [11, 12], examine the relationship between the workplace physical conditions and employee's productivity [13], and investigate how the QWL may have strong influence in personal life and professional banking, resulting in improved organizational performance [14], studies on this subject are still in the early stages and their findings may be influenced by external factors as culture, religion, attitudes and behaviors of the employees in the countries the studies were conducted. Further, there is still no consensus on which dimensions and indicators are most appropriate for evaluating QWL in the banking sector [15].

The objective of this work was to develop a methodological approach to measure the quality of work life in retail Banks. By conducting a study in 33 branches of the five most important Brazilian banking institutions, this work also aims to answer the following research questions: What are the factors that most influence on the QWL in banks and the items that must be prioritized in order to improve the QWL in banks? Are the activities performed stressful to bank employees? Are there differences between the QWL of male and female banks employees?

## **2 Quality of Work Life and Job Satisfaction**

Quality of work life and job satisfaction are very similar constructs that have become some of the most important research fields in the context of the growing need to reconcile the interests of individuals and companies by ensuring the health and welfare of employees performing their professional activities. Many studies (e.g. [16–23]) concerning QWL and job satisfaction subjects have been developed highlighting the dimensions of work which represent the existent relationship between the employee and the working environment. However, recent studies (e.g. [11, 24]) have also underlined that QWL is a comprehensive evaluation made by the employee, based on the various experiences and outcomes of his/her work life, on the professional and

personal fronts [25]. On the other hand, job satisfaction is a positive or pleasurable emotional state resulting from the appraisal of one's job or job experiences [17] and it is a viewpoint employees have about their work and their organization [26]. However, the focus of QWL is beyond job satisfaction since QWL does not only affect job satisfaction but it also involves the effect of the workplace on satisfaction in non-work life domains, and satisfaction with overall life, personal happiness, and subjective well being [21]. Further, it is essential for companies to understand that satisfied employees tend to have a higher level of efficiency and quality of work. According to Lau [27], the positive effects are specially perceived when service value is created by satisfied, committed, productive employees because they enjoy the quality of work life provided by the service company.

### 3 Methodology

The proposed evaluation model started in a study conducted by Barcelos and Freitas [12] and it focused on assessing the QWL in the banking sector, concerning the perception of a sample of 41 employees. Initially, the elements and procedures that make the modeling of the problem are defined.

#### 3.1 The Object of Study

This study was conducted in collaboration with the Bank Employees Union of a 500,000 inhabitants' city of the countryside of Brazil. The Human Resource Manager of the 33 branches of the municipality was contacted and all employees were invited to participate of the study. Branches of the five most important Brazilian public and private banking institutions participated of the study.

#### 3.2 Relevant Items

Several dimensions and subdimensions existing in QWL evaluation models and studies were considered by Barcelos and Freitas [12] in order to develop a hybrid 47-item evaluation model to evaluate QWL in the banking sector. However, the model was changed and consisted of 56 questions, divided into 9 dimensions.

Constitutionalism ( $D_1$ ) concerns the labor rights, equal treatment, freedom of expression, and privacy [16, 18]. Working conditions ( $D_2$ ) refers to the daily work schedule, available resources in terms of quantity and quality, workplace conditions (area, temperature, etc.), concern for health (health examinations, work activities), levels of turnover, levels of rework, ergonomics, level of stress caused by work activities, requirement of meeting goals, and accessibility [16, 18, 21, 22]. Work characteristics ( $D_3$ ) concerns the relevance of the task, autonomy, feedback received, variety of skills, necessity of learning several technologies, necessity of knowing internal routines from other sectors, difficulty in assimilating new tasks, number of tasks employee is responsible for, self-esteem [16–19, 22]. Relationship between work and personal life ( $D_4$ ) involves the amount of overtime, personal time, time spent with

family [11, 16, 18, 21, 22]. Remuneration policies ( $D_5$ ) involves the equal wages (internal and external) and fair and appropriate remuneration) [11, 16, 18, 21, 22]. Social integration ( $D_6$ ) includes the absence of prejudice, relationships (with supervisors, subordinates, and peers), and company's concern in integrating employees [11, 16–18, 21, 22]. Stability ( $D_7$ ) concerns the recognition, reward policies for length of employment, and level of turnover (admissions and layoffs) [16, 18, 22]. Professional growth ( $D_8$ ) involves the incentives for training and career plan [11, 16, 22], and Social relevance of the work ( $D_9$ ) refers to the importance of work in life, company's image in society, and sense of pride regarding the company [16, 17, 21, 22].

### 3.3 Questionnaire Design

The questionnaire designed to assess the QWL in the banking sector was composed of two blocks of questions: In Block I multi-category structured questions were defined to obtain responses concerning the characteristics and profile of the respondents, such as age, gender, length of employment in the banking sector, initial and current education level, and job function. In Block II 55 items were designed for measuring the QWL regarding the respondents' Satisfaction Degree. The respondent describes his/her degree of satisfaction for each item using a non-comparative itemized rating scale ranging from 0 (very dissatisfied) to 10 (very satisfied). According to Parasuraman et al. [28] an itemized rating scale is easier to respond to and more meaningful from the respondent's perspective.

### 3.4 Methods

Factor analysis was used to identify relationships between the dimensions and the items and to summarize the information contained in the original items and dimensions into a smaller set of new composite dimensions (factors). The Cronbach's alpha [29] and item-to-total correlations were used to identify items that could be dropped to increase the questionnaire's reliability.

One way Analysis of Variance (ANOVA) was conducted to examine the difference in the service quality perceptions of males and females. In this context, for all items, the null hypothesis is that male and female perceptions have the same distribution ( $H_0$ :  $\mu_{\text{male}} = \mu_{\text{female}}$ ), against the alternative hypothesis that male and female perceptions do not have the same distribution ( $H_1$ :  $\mu_{\text{male}} \neq \mu_{\text{female}}$ ). The test consists of rejecting the null hypothesis if  $F$  test statistic is larger than 1.0 and the  $p$ -value  $\leq \alpha$  [30]. Quartile Analysis [31] was conducted to identify which questions were most critical. Such analysis is a ranking measure which classifies questions by four priority levels (critical, high, moderate, and low) based on to the satisfaction averages for the questions. Questions with satisfaction averages below the first quartile are designated as critical priority because the averages are lowest for these questions, and questions with performance averages above the third quartile are designated as low priority.



### 4 Data Analysis and Results

The percentage of male and female respondents is approximately equal, and 52.7% of the respondents are married. In addition, 26.8% have more than 20 years of experience working in the banking sector, and 42.5% have a workload of 40 h per week. Only 27.1% are currently attending school, and a total of 51.9% have completed a college degree, and 7.7% have a second job.

Some testing assumptions were preliminary considered to verify the feasibility of factor analysis. Regarding the sample size, there is approximately a ratio of 7 observations for each variable. According to Hair et al. [32] this sample size provides an acceptable basis for the calculation of correlations between variables. The inspection of the correlation matrix reveals that 96% of the correlations are significant at the .01 level. The Bartlett’s test shows that nonzero correlations exist at a significance level of .0001. Finally, the Kaiser-Meyer-Olkin (KMO) resulted in the measure of sampling adequacy (MSA) with a value of .938. In this sense, all those tests indicate that the set of variables is appropriate for factor analysis.

The factor solution was derived from component analysis with Varimax rotation of 9 initial dimensions. After applying the latent root criterion of retaining factors with eigenvalues greater than 1.0, seven factors were extracted. For interpretation purposes, factor loadings ±.40 or above were considered. Only one item was not included in the factor solution. The seven factors explained 57.23% of the total variance. Table 1 shows the factors, items, factor loadings and the percentages of variance explained.

**Table 1.** Factor solution

Factor interpretation (% variance explained)	Loading	Variables (items) included in the factor
(F <sub>1</sub> ) Professional growth and stability (10.603%)	.568	I <sub>1</sub> Company concern for your health (periodic health examinations, etc.)
	.644	I <sub>2</sub> Behavior of people when you have an occupational disease
	.411	I <sub>3</sub> Level of company turnover (transfer of employees between branches)
	.574	I <sub>4</sub> Company participation in integrating employees (holding events, etc.)
	.494	I <sub>5</sub> Level of recognition for your work
	.670	I <sub>6</sub> Certainty of not losing your job for being absent for various reasons, in cases where the law does not protect it (vacation, medical certificate, etc.)
	.762	I <sub>7</sub> Certainty to be working in this bank in the future (level of admissions and dismissals in the Bank)
	.591	I <sub>8</sub> Company incentives for your qualifications (courses, training, etc.)
	.622	I <sub>9</sub> Career plan offered

(continued)

**Table 1.** (continued)

Factor interpretation (% variance explained)	Loading	Variables (items) included in the factor
(F <sub>2</sub> ) Work characteristics (10.504%)	.597	I <sub>10</sub> Relevance of the tasks you perform
	.462	I <sub>11</sub> Level of rework (how many times you redo or change the same task)
	.526	I <sub>12</sub> Level of autonomy you have in performing tasks
	.391	I <sub>13</sub> Feedback you have received regarding the tasks you have performed (feedback from your supervisors about your work)
	.732	I <sub>14</sub> Variety of skills needed to perform your tasks
	.685	I <sub>15</sub> Level of difficulty in assimilating the use of technologies (specific software, electronic equipment, etc.)
	.691	I <sub>16</sub> Necessity of knowing internal procedures for other sectors
	.686	I <sub>17</sub> Frequency that you need to assimilate new tasks
	.558	I <sub>18</sub> Responsibility for tasks of various types (number of tasks you are responsible for)
	.442	I <sub>19</sub> Time to perform the tasks (perform one task at a time)
	.505	I <sub>20</sub> Satisfaction you feel when performing your work (self-esteem)
(F <sub>3</sub> ) Remuneration policies (9.744%)	.549	I <sub>21</sub> Level of interference of your job in the work of other employees
	.557	I <sub>22</sub> Level of stress caused by your activities
	.591	I <sub>23</sub> Meeting weekly or monthly goals
	.714	I <sub>24</sub> Remuneration received for your position
	.525	I <sub>25</sub> Equal remuneration for people with the same position as you
	.641	I <sub>26</sub> Remuneration of your position relative to other companies
	.615	I <sub>27</sub> Subsidy received to replace another employee with different function of yours (for various reasons)
	.656	I <sub>28</sub> Payment policy for profit sharing and results (PSR)
(F <sub>4</sub> ) Workplace and working conditions (9.133%)	.650	I <sub>29</sub> Reward program policies for length of service
	.527	I <sub>30</sub> Appropriate furniture and equipment for your needs
	.759	I <sub>31</sub> Amount of resources available to perform your tasks (computers, printers, etc.)

(continued)

**Table 1.** (continued)

Factor interpretation (% variance explained)	Loading	Variables (items) included in the factor
	.761	I <sub>32</sub> Quality of the resources available to perform your tasks (computers, printers, etc.)
	.711	I <sub>33</sub> Workplace area (sufficient space for all employees)
	.471	I <sub>34</sub> Workplace accessibility (for individuals with special needs)
	.656	I <sub>35</sub> Workplace acclimatization (temperature)
	.529	I <sub>36</sub> Safety of company facilities (revolving doors, metal detectors, fire extinguishers, etc.)
	.579	I <sub>37</sub> Cleaning and organizing of the workplace
	.487	I <sub>38</sub> Place to rest and feed
	(F <sub>5</sub> ) Social integration and relevance of the work (8.101%)	.682
.697		I <sub>40</sub> Relationship with your supervisors
.707		I <sub>41</sub> Relationship with your subordinates
.615		I <sub>42</sub> Non-prejudicial treatment of people in the workplace (race, religion, etc.)
.453		I <sub>43</sub> Respect for labor rights (paid time off, 13th salary, etc.)
.545		I <sub>44</sub> Your level of pride in working for this company
.650		I <sub>45</sub> Importance of your work in your life
.535		I <sub>46</sub> Your company's image in society
(F <sub>6</sub> ) Relationship between work and personal life (5.763%)	.480	I <sub>47</sub> Daily work hours
	.486	I <sub>48</sub> Frequency of overtime per wk
	.709	I <sub>49</sub> Time you spend on personal activities outside of work per week (gym, sports, etc.)
	.781	I <sub>50</sub> Time spent with family per week (travel, leisure, etc.)
	.674	I <sub>51</sub> Stability of your working hours regarding the frequency of change
	(F <sub>7</sub> ) Liberty of expression and action (3.379%)	.486
.518		I <sub>53</sub> Level of privacy regarding your personal life
.420		I <sub>54</sub> Break time
.427		I <sub>55</sub> Level of sector turnover (change of positions)

Table 2 shows the Average Degree of Satisfaction on each item  $i$ ,  $(\overline{DS})_i$ , according to gender and general employees. The Cronbach's  $\alpha$  values per factor ( $\alpha$ ), the  $\alpha$  value if an item  $i$  is excluded from the dimension ( $\alpha_{Ie}$ ) it belongs, and the item-total correlations are also presented. Since the lower limit to assure the reliability of a dimension is  $\alpha = .60$  [32, 33], the questionnaire is reliable in all factors (dimensions) for both male and female respondents. The reliability measure concerning female responses is

**Table 2.** Cronbach's alpha, item-to-total correlations and average performances

F	I	All respondents				Female				Male			
		$(\overline{DS})_i$	itc	$\alpha$	$\alpha_{Ie}$	$(\overline{DS})_i$	itc	$\alpha$	$\alpha_{Ie}$	$(\overline{DS})_i$	itc	$\alpha$	$\alpha_{Ie}$
F <sub>1</sub>	I <sub>1</sub>	7.15	.70	.91	.90	7.18	.72	.91	.90	7.11	.70	.91	.90
	I <sub>2</sub>	5.47	.66		.90	5.27	.65		.90	5.66	.67		.90
	I <sub>3</sub>	6.07	.49		.91	6.14	.52		.91	6.01	.46		.92
	I <sub>4</sub>	6.08	.66		.90	6.22	.69		.90	5.96	.64		.91
	I <sub>5</sub>	6.18	.72		.90	6.28	.70		.90	6.12	.75		.90
	I <sub>6</sub>	6.53	.73		.90	6.47	.76		.89	6.62	.71		.90
	I <sub>7</sub>	6.40	.76		.89	6.33	.73		.90	6.45	.80		.89
	I <sub>8</sub>	6.57	.73		.90	6.63	.71		.90	6.48	.76		.90
	I <sub>9</sub>	5.53	.73		.90	5.56	.71		.90	5.46	.76		.90
F <sub>2</sub>	I <sub>10</sub>	7.62	.65	.90	.89	7.43	.68	.92	.92	7.79	.61	.87	.86
	I <sub>11</sub>	6.21	.52		.90	6.18	.52		.92	6.28	.52		.87
	I <sub>12</sub>	6.65	.63		.89	6.83	.68		.92	6.47	.60		.86
	I <sub>13</sub>	6.58	.48		.91	6.40	.67		.92	6.79	.34		.90
	I <sub>14</sub>	7.00	.74		.89	6.91	.74		.91	7.08	.75		.85
	I <sub>15</sub>	7.34	.68		.89	7.34	.73		.92	7.39	.64		.86
	I <sub>16</sub>	6.78	.64		.89	6.57	.71		.92	6.95	.58		.86
	I <sub>17</sub>	6.69	.69		.89	6.57	.73		.92	6.80	.67		.86
	I <sub>18</sub>	6.42	.62		.89	6.32	.66		.92	6.49	.57		.86
	I <sub>19</sub>	5.60	.61		.89	5.47	.65		.92	5.75	.56		.86
	I <sub>20</sub>	7.34	.69		.89	7.23	.69		.92	7.49	.69		.86
	I <sub>21</sub>	7.19	.67		.89	6.99	.76		.91	7.37	.62		.86
F <sub>3</sub>	I <sub>22</sub>	4.49	.53	.89	.89	4.45	.51	.89	.89	4.54	.57	.90	.89
	I <sub>23</sub>	4.76	.61		.88	4.78	.60		.88	4.69	.62		.89
	I <sub>24</sub>	5.22	.75		.87	5.21	.76		.87	5.18	.75		.88
	I <sub>25</sub>	5.94	.67		.88	6.07	.65		.88	5.81	.69		.88
	I <sub>26</sub>	5.57	.73		.87	5.64	.75		.87	5.50	.74		.88
	I <sub>27</sub>	4.02	.61		.88	3.96	.64		.88	4.04	.62		.89
	I <sub>28</sub>	5.42	.72		.87	5.36	.71		.87	5.41	.73		.88
	I <sub>29</sub>	4.19	.69		.87	4.32	.70		.87	4.09	.71		.88
	F <sub>4</sub>	I <sub>30</sub>	5.99		.51	.87	.87		5.92	.67	.90		.88
I <sub>31</sub>		7.07	.74	.85	7.00		.78	.87	7.12	.71		.80	
I <sub>32</sub>		6.72	.75	.85	6.74		.76	.88	6.68	.73		.80	
I <sub>33</sub>		7.47	.68	.85	7.53		.72	.88	7.49	.61		.82	
I <sub>34</sub>		7.16	.60	.86	6.94		.48	.90	7.36	.46		.83	
I <sub>35</sub>		7.02	.53	.87	6.93		.65	.88	7.13	.52		.82	
I <sub>36</sub>		7.75	.65	.86	7.94		.59	.89	7.63	.44		.83	
I <sub>37</sub>		7.76	.65	.86	7.73		.74	.88	7.80	.50		.83	
I <sub>38</sub>		5.59	.47	.87	5.60		.57	.89	5.64	.44		.84	

(continued)

**Table 2.** (continued)

F	I	All respondents				Female				Male			
		( $\overline{DS}$ ) <sub>i</sub>	itc	$\alpha$	$\alpha I_e$	( $\overline{DS}$ ) <sub>i</sub>	itc	$\alpha$	$\alpha I_e$	( $\overline{DS}$ ) <sub>i</sub>	itc	$\alpha$	$\alpha I_e$
F <sub>5</sub>	I <sub>39</sub>	8.88	.36	.86	.86	8.80	.69	.88	.86	8.98	.63	.81	.78
	I <sub>40</sub>	8.16	.56		.85	8.08	.72		.86	8.28	.60		.78
	I <sub>41</sub>	8.81	.67		.83	8.83	.64		.87	8.82	.47		.80
	I <sub>42</sub>	8.19	.67		.83	8.07	.65		.87	8.31	.43		.81
	I <sub>43</sub>	9.37	.59		.84	9.39	.36		.89	9.38	.33		.81
	I <sub>44</sub>	7.78	.69		.83	7.69	.73		.86	7.89	.63		.77
	I <sub>45</sub>	8.54	.65		.83	8.60	.70		.86	8.48	.58		.78
	I <sub>46</sub>	8.08	.65		.83	8.23	.67		.86	7.91	.60		.77
F <sub>6</sub>	I <sub>47</sub>	7.08	.50	.79	.77	7.18	.50	.83	.83	7.00	.52	.75	.71
	I <sub>48</sub>	6.20	.42		.80	6.14	.52		.82	6.24	.34		.77
	I <sub>49</sub>	5.13	.63		.73	4.79	.68		.77	5.44	.57		.69
	I <sub>50</sub>	5.95	.72		.69	5.86	.75		.75	5.98	.70		.64
	I <sub>51</sub>	6.93	.58		.75	7.00	.68		.78	6.83	.48		.72
F <sub>7</sub>	I <sub>52</sub>	7.03	.54	.70	.61	6.71	.54	.72	.64	7.39	.54	.69	.58
	I <sub>53</sub>	7.93	.51		.63	7.99	.51		.66	7.90	.51		.61
	I <sub>54</sub>	6.45	.42		.71	6.21	.42		.72	6.75	.41		.68
	I <sub>55</sub>	5.92	.53		.61	6.02	.59		.60	5.89	.47		.62

superior to male responses on five factors (F<sub>2</sub>, F<sub>4</sub>, F<sub>5</sub>, F<sub>6</sub> and F<sub>7</sub>). On the other hand, the reliability measure of male responses is superior to female responses on factors F<sub>1</sub> and F<sub>3</sub>. If some items are excluded, the reliability of the factor they belong increases. Such items are not highly correlated with a composite of the remaining items of their factor. The remaining items show relatively high item-to-total correlations with the composite score of the remaining items. Rules of thumb suggest that item-to-total correlations exceed .50 [32]. Specifically, the analysis refers to items I<sub>3</sub> ( $\alpha I_e = .911$ ; itc = .493), I<sub>13</sub> ( $\alpha I_e = .905$ ; itc = .476), I<sub>39</sub> ( $\alpha I_e = .860$ ; itc = .355), I<sub>48</sub> ( $\alpha I_e = .796$ ; itc = .424) and I<sub>54</sub> ( $\alpha I_e = .705$ ; itc = .416) and such items should be revised in future works. In this study, no items were excluded for the forthcoming analysis.

#### 4.1 Gender Differences

One way ANOVA reveals that at the  $\alpha = .05$  level of significance, there is sufficient evidence to conclude that there is a statistically difference in employees' perception of QWL by gender for items I<sub>49</sub> ( $F(1, 378) = 4.287, p = .039$ ) and I<sub>52</sub> ( $F(1, 378) = 6.399, p = .012$ ). Regarding those items, the null hypothesis is rejected ( $p$ -value is smaller than  $\alpha = .05$ ). Once  $F$  statistic is robust to unequal variances when sample sizes are equal or nearly equal, a post hoc test – the Welch statistic test is more powerful than  $F$  statistic when it not occurs [34] – and it was conducted to test for the equality of group means. As with the  $F$  statistic, the Welch statistic is significant below .05 for those items (I<sub>49</sub>,  $p = .012$ ; I<sub>52</sub>,  $p = .039$ ) and it confirmed the findings for the  $F$  statistic. This means

PRIORITY		All respondents	Male	Female
		Critical	Items I <sub>27</sub> <sup>*</sup> , I <sub>29</sub> <sup>*</sup> , I <sub>22</sub> <sup>*</sup> , I <sub>23</sub> <sup>*</sup> , I <sub>49</sub> <sup>*</sup> , I <sub>24</sub> <sup>*</sup> , I <sub>28</sub> <sup>*</sup> , I <sub>2</sub> <sup>*</sup> , I <sub>9</sub> <sup>*</sup> , I <sub>26</sub> <sup>*</sup> , I <sub>38</sub> <sup>*</sup> , I <sub>19</sub> <sup>*</sup> , I <sub>55</sub> , I <sub>25</sub>	I <sub>27</sub> , I <sub>29</sub> , I <sub>22</sub> , I <sub>23</sub> , I <sub>24</sub> , I <sub>28</sub> , I <sub>49</sub> , I <sub>9</sub> , I <sub>26</sub> , I <sub>38</sub> , I <sub>2</sub> , I <sub>19</sub> , I <sub>25</sub> , I <sub>55</sub>
	1° Quartile	5.94	5.92	5.97
High	Items I <sub>50</sub> <sup>*</sup> , I <sub>30</sub> <sup>*</sup> , I <sub>3</sub> <sup>*</sup> , I <sub>4</sub> <sup>*</sup> , I <sub>5</sub> <sup>*</sup> , I <sub>48</sub> <sup>*</sup> , I <sub>11</sub> <sup>*</sup> , I <sub>7</sub> <sup>*</sup> , I <sub>18</sub> <sup>*</sup> , I <sub>54</sub> <sup>*</sup> , I <sub>6</sub> <sup>*</sup> , I <sub>8</sub> <sup>*</sup> , I <sub>13</sub> , I <sub>12</sub>	I <sub>4</sub> , I <sub>50</sub> , I <sub>3</sub> , I <sub>30</sub> , I <sub>5</sub> , I <sub>48</sub> , I <sub>11</sub> , I <sub>7</sub> , I <sub>12</sub> , I <sub>8</sub> , I <sub>18</sub> , I <sub>6</sub> , I <sub>32</sub> , I <sub>54</sub>	I <sub>55</sub> , I <sub>25</sub> , I <sub>48</sub> , I <sub>3</sub> , I <sub>11</sub> , I <sub>54</sub> , I <sub>4</sub> , I <sub>5</sub> , I <sub>18</sub> , I <sub>7</sub> , I <sub>13</sub> , I <sub>6</sub> , I <sub>16</sub> , I <sub>17</sub>	
	2° Quartile	6.65	6.75	6.57
Moderate	Items I <sub>17</sub> , I <sub>32</sub> , I <sub>16</sub> , I <sub>51</sub> <sup>*</sup> , I <sub>14</sub> <sup>*</sup> , I <sub>35</sub> <sup>*</sup> , I <sub>52</sub> <sup>*</sup> , I <sub>31</sub> , I <sub>47</sub> <sup>*</sup> , I <sub>1</sub> <sup>*</sup> , I <sub>34</sub> , I <sub>21</sub> , I <sub>20</sub> , I <sub>15</sub>	I <sub>13</sub> , I <sub>17</sub> , I <sub>51</sub> , I <sub>16</sub> , I <sub>47</sub> , I <sub>14</sub> , I <sub>1</sub> , I <sub>31</sub> , I <sub>35</sub> , I <sub>34</sub> , I <sub>21</sub> , I <sub>15</sub> , I <sub>52</sub>	I <sub>8</sub> , I <sub>52</sub> , I <sub>32</sub> , I <sub>12</sub> , I <sub>14</sub> , I <sub>35</sub> , I <sub>34</sub> , I <sub>21</sub> , I <sub>31</sub> , I <sub>51</sub> , I <sub>1</sub> , I <sub>47</sub> , I <sub>20</sub>	
	3° Quartile	7.34	7.44	7.28
Low	Items I <sub>33</sub> <sup>*</sup> , I <sub>10</sub> <sup>*</sup> , I <sub>36</sub> <sup>*</sup> , I <sub>37</sub> <sup>*</sup> , I <sub>44</sub> <sup>*</sup> , I <sub>53</sub> <sup>*</sup> , I <sub>46</sub> <sup>*</sup> , I <sub>40</sub> <sup>*</sup> , I <sub>42</sub> <sup>*</sup> , I <sub>45</sub> <sup>*</sup> , I <sub>41</sub> <sup>*</sup> , I <sub>39</sub> , I <sub>43</sub>	I <sub>20</sub> , I <sub>33</sub> , I <sub>36</sub> , I <sub>10</sub> , I <sub>37</sub> , I <sub>44</sub> , I <sub>53</sub> , I <sub>46</sub> , I <sub>40</sub> , I <sub>42</sub> , I <sub>45</sub> , I <sub>41</sub> , I <sub>39</sub> , I <sub>43</sub>	I <sub>15</sub> , I <sub>10</sub> , I <sub>33</sub> , I <sub>44</sub> , I <sub>37</sub> , I <sub>36</sub> , I <sub>53</sub> , I <sub>42</sub> , I <sub>40</sub> , I <sub>46</sub> , I <sub>45</sub> , I <sub>39</sub> , I <sub>41</sub> , I <sub>43</sub>	

Fig. 1. Quartile analysis

that the time spent on personal activities outside of work appears to better fulfill the requirements of males than females and the level of freedom of expression seems to be more perceptible for males than to females.

Conversely, there is insufficient evidence to assure that there is a difference between male and female perceptions of QWL regarding issues related to professional growth and stability, work characteristics, remuneration policies, workplace and working conditions, and social integration and relevance of work. Further, contradicting the assumptions of Tabassum et al. [11] and Barcelos and Freitas [12], there is no sufficient evidence to conclude that there are significant gender differences in QWL concerning issues related to adequate and fair compensation, flexible work schedule and job assignment, attention to job design and employee relations. Since one-way ANOVA revealed some differences in the QWL concerning gender, the satisfaction averages are used to calculate three quartiles by which the items are classified into the previously mentioned priority levels for male, female and all respondents (Fig. 1). Asterisks indicate items that are simultaneously assigned by males and females into the priority categories. The critical items which are in common for both male and female employees are related to subsidy received to replace another employee with different function, reward for length of service, level of stress in the job activity, success in meeting goals, time spent for personal activities outside of work, remuneration received for job, payment policy for profit sharing, behavioral of people when the employee have an occupational disease, career plan, place to rest and feed, and time to perform the tasks. Conversely, minor attention could be dedicated to low priorital issues, such as: respect for labor rights, level of pride in working for the company, level of difficulty in assimilating the use of technologies, satisfaction when performing the work, relationship with peers, supervisors and subordinates, importance of work in life, workplace area, level of privacy regarding personal life. All low priorital items are in common for male and female employees.

## 5 Discussion

The study reveals that professional growth and stability, work characteristics and remuneration policies are the most influential factors on the QWL. Moreover, remuneration policies is the most critical factor of QWL since eight out nine items belonging to this factor have been classified as critical priority. Indeed, remuneration, payment policy, career plan and reward for length of service have also been identified as critical points in other previous studies concerning banking activities [11, 12, 15].

Differently from previous studies, the results of the study indicate that the job activities are stressful to male and female bank employees and that people do not care about the employee when he/she has an occupational disease. Specifically, the stress level probably can be related to the need or obligation of performing the task time schedule in order to get success in meeting the bank goals and the number of activities the bank employees are responsible for. In this context, the results of the study induce the conclusion that the minor number of employees and the changes in work environment may become the bank activities more stressful to the employees. Those results are even more worrying once the time for personal activities outside of work is also critical. To encourage customers to use electronic banking services is one of the possible actions to reduce the workload of employees in bank branches and thus reduce the level of stress. However, the stress level in bank activities seems not be related to the difficulty of employees in using new technologies, dissatisfaction when performing the activities and the relationship with peers, subordinates and supervisors since all those issues are considered low priority items.

Quartile Analysis reveals interesting and complementary results for improvement of QWL regarding the critical items, since some differences in QWL were perceived concerning gender. More specifically, the results corresponding to “all respondents” eventually do not contain some items considered critical by male respondents but not by females (or vice-versa). For example, only considering the critical priority region, the level of employee turnover and the equal remuneration for people with the same position seem to be critical items for male employees (but not for female employees). On the other hand, the time spent with family and the appropriate furniture and equipment are critical items for female employees (but those items do not have critical priority level for male). All those items should therefore be analyzed by managers in order to provide possible improvements, knowing that some of them need prior attention to male or female employees. Thus, a more careful analysis should take into account the items belonging to the critical regions.

## 6 Limitations

The study was conducted in 33 branches of the five most important Brazilian banks. The results should be carefully analyzed and interpreted when they are compared with the results of studies conducted in other countries, since social-demographic characteristics may vary from country to country. For example, the Brazilian bank customers must have more (or less) ability and more (or less) fear to use the new banking technologies than customers of other countries. As the current scenery in the banking

sector is characterized by the reduction of the number of bank employees and if more clients prefer the use of the traditional services, queues are formed and consequently the waiting time is longer. Such situation probably makes the job activities more stressful to the employees and influence negatively on the assessment of the QWL concerning the bank employees' perception. Further, the ratings of QWL may be influenced by cultural, religious and political aspects existing in the countries, especially when perceptions of female employees are considered. Those issues can be considered limitations of the study while they also can be considered outstanding opportunities for future work involving researchers and practitioners from different countries.

## 7 Conclusion

In this paper, we presented a methodological approach to assess the QWL in retail banks. Based on existing models and scientific studies, a hybrid QWL evaluation model which incorporates current characteristics of the banking sector is proposed. A questionnaire was designed to obtain responses concerning the characteristics and profile of the respondents and to assess the QWL regarding the employees' satisfaction degree in terms of the 55 items. By conducting an experiment with the participation of 391 employees from Brazilian banks, the nine original QWL dimensions were regrouped into seven QWL factors (professional growth and stability; work characteristics; remuneration policies; workplace and working conditions; social integration and relevance of the work; relationship between work and personal life; liberty of expression and action). The questionnaire was considered valid and reliable.

The results indicate that professional growth and stability, work characteristics, remuneration policies are the factors that most influence on the QWL in banks. Consequently, it was also shown that issues related to payment policy, career plan, reward for length of service, remuneration, time to perform the activities and level of stress are some of the main aspects that should be prioritized by bank managers in order to improve the QWL. The results also indicate that the job activities are stressful to both male and female bank employees. The findings suggest that the stress level is probably related to the need or obligation of performing the task time schedule in order to get success in meeting the bank goals and the number of tasks the employees are responsible for. Furthermore, the study reveals that there are differences statistically significant between male and female employees concerning the time spent on personal activities outside of work and the level of freedom of expression. However, the results of a complementary analysis reveal differences and similarities between the perception of male and female bank employees that are perceived when the ratings of the satisfaction degree with QWL concerning gender is considered to classify the QWL into categories of priority. Finally, this work contributes for managerial actions, since it is possible to obtain relevant results for analysis and management of QWL in banks. Not wishing to exhaust the discussion of the problem of assessing the QWL in the bank sector, the continuation of this study aims to investigate whether the QWL ratings given by public and private employees differ.



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# Research on Enterprise Personnel Safety Awareness Based on Voronoi Diagram

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**Abstract.** Accident analysis aims to help understand the majority of production safety accidents, which can be caused by management loopholes. As an important factor affecting the safety management, employees safety awareness has been an important topic. In the enterprise's production activities, enterprise management and employee safety awareness is closely related, where many accidents are due to poor management, such as staff group safety awareness. In order to improve safety management leadership, it is necessary to improve the employees safety awareness of typical and safety issues root causes, and based on the analysis of safety and complexity of environment. This study utilized Matlab software and Voronoi diagram simulation method to build personnel safety awareness model, by adjusting the safety rules, education, communication and other factors and their the impact of security management, thereby strengthening the leader of the enterprise safety management.

**Keywords:** Safety awareness · The leader · Safety management · Complex system · Voronoi diagram

## 1 Introduction

With the rapid development of modern enterprise economy, problems of safety production enterprises have become increasingly prominent. The staff as the main body of the enterprise, the production activities of people, material and environmental cognition, emotional psychological process of the sum is called the safety awareness of employees. The results show that in recent years, most of the enterprise safety accidents are due to enterprise management is not in place, the staff's weak awareness of safety leads to unsafe behavior or errors caused by staffs. Such as August 2015, Tianjin Tanggu Development Zone, Binhai New Area, an enterprise hoarding of dangerous goods warehouse explosion, caused nearly a thousand casualties, the loss of up to 6.866 billion yuan of economic. From the leadership to the staff of the safety awareness uneven cause enterprise management confusion finally lead to the accident [1]. In the 1920s, Industrial Accident Prevention, published by Heinrich in the United States, examined 75,000 industrial safety incidents, concluded that: 88% of industrial safety accidents are due to unsafe behavior caused by human, 10% due to unsafe conditions or

conditions caused by, and there are 2% inevitable [2]. Many foreign scholars have used the Human Factors Analysis and Classification System (HFACS) to investigate the lack of safety management and human unsafe behaviors, such as navigation, aviation, medical and railway [3, 5]. So it is urgent to study the safety management of enterprise leaders. From the complex system point of view, because the enterprise personnel safety awareness is not the same, and the influence of leaders are different, so the safety awareness as the impact of the leaders of the elements of enterprise management considerations. In view of this, in order to deeply study the safety management of enterprises, the author, from the perspective of safety awareness that may affect the safety management of enterprises, is applied to the research of employee safety awareness through the emergence of complexity [6] and Voronoi diagram modeling method [7, 8]. Safety awareness model, the regulation of employee safety awareness of the scope of the impact of awareness to make the enterprise employees to achieve a balanced state of mind, which is conducive to the leadership of all staff management, improve enterprise safety management efficiency and reduce the occurrence of safety issues.

## 2 Enterprise Safety Management System and Related Concepts

In this paper, researchers utilized the theory of complex systems based on the emergence of a combination of safety awareness of staff safety and research on management leadership, with the emphasis of improving production safety and increase enterprise economic benefits. This paper introduce the enterprise as a complex system with all related concepts of safety management system.

### 2.1 Complex System

**Complex Science.** Complexity science is rapidly evolving, it has become the focus of scientific community. In the mid-1980s, the Santa Fe Institute marks the establishment of complex system research, and the science of complexity is considered a turning point in the development of science. Mainly because it does involve many research fields. The research on complexity is still in full swing in the fields of natural sciences, humanities, and social sciences. Most of the developed countries, as well as China, Brazil, Russia and other developing countries, the complexity of natural science is also full of passion, it has become another scientific innovation [9].

Complexity science evolves from the intelligence and adaptive, self-organization and other systems of life characteristics, which focus on the complexity of the system how to form, the complexity of the performance characteristics of the system and the overall effect of complex behavior [10]. Complexity science is the result of the integration of chaos, fractal theory, synergetic, nonlinear system dynamics, dissipative structure theory and artificial life and complex adaptive system theory. So far, the complexity of the performance of the system within the various components of the

inter-linkages, can form a complex network system, if one of the individual changes, and its adjacent parts will be affected in conjunction with the dynamic development of the system. The system has a certain degree of openness, and is closely related to the inorganic environment or the organic environment. It can change itself to adapt to the environment constantly in different environments, and has a certain tendency to predict itself.

**Complex System.** Complex systems study includes all aspects of life. The study of the disciplines involves physical, chemical, astronomical, meteorological and other aspects of the system; population research also involves animals and plants, human beings; form involves social, economic, political and ecological. As the complexity of complex systems research involves a wide range, so scholars of various countries have their own opinions, there is no unanimous conclusion.

The essence of complex system is that its components has certain intelligence, capable of recognizing and predicting the changes in their environment, then has the ability to take a series of improvement actions according to the target. At the Santa Fe Institute in the United States, is a complex system composed of many components, these components exist between tight interaction, it is the spontaneous self-organization behavior of these interactions makes the system.

When many independent individuals form a system with certain structure according to certain rules, there will be a whole system has characteristics but individual or individuals do not have accumulated, the features and attributes, when we will be the overall reduction, these features, functions and attributes will disappear, we call this nature of emergence [11]. Emergence as a complex system of essential features, in life, society, thinking and other fields, there will be such a phenomenon. For complex systems, the emergence of emergent and complex system itself is inseparable from the characteristics of each subsystem within the complex system of self-organization self-adaptive interaction, and the interaction with the external environment, resulting in system changes occur.

The research of complex systems [12], reveals the internal mechanism of complex systems and the laws of its effective control, to achieve our desired goals and needs. As a representative of complex systems, there are some new phenomena that affect the leader's management of the enterprise because of the interaction of different safety awareness among employees and other influences.

## 2.2 Enterprise Safety Management System

The enterprise is a complex system in the social environment, in addition to its influence factors, but also by the nature of government policy, safety and regulatory standards, affecting the safety laws and regulations and other external constraints, but the operating mechanism of enterprises, enterprises in the structure and scale of development and prospects of system factors play a decisive role. Although the enterprise is for the purpose of profit, but also must be to ensure the safety of production as the premise, and a series of planning, arrangement, cooperation and operation control work is called enterprise safety management [13, 14]. In modern

enterprise management, safety management is very important. It is the guarantee of realizing the sustainable development, and the role of leader in enterprise management is essential. They are the important factors to control the communication between personnel and equipment. There are both internal and external factors that affect the safety of enterprises, but external factors often play a role through the internal system, so the safety of enterprises depends on the internal system.

As an important part of enterprise management, enterprise safety management has a very important impact. The current safety management mode of most enterprises lack of scientific methods, still tend to experience management, so many enterprises management mode is relatively backward; for safety production and not enough, less investment; management mechanism is not perfect; the lack of leadership and staff in the enterprise safety education training, safety awareness leads to a lack of staff so as not to for the leader management, safety of the whole enterprise is reduced, prone to accidents.

As the safety management system itself has the characteristics of complex systems, so the various components within the enterprise, between the leadership and the staff and the enterprise as a whole and the outside world there are a variety of coupling between. In the process of enterprise development, the system will become more and more complicated because of these relationships. The mutual promotion and restriction between leaders and employees affect the safe production of enterprises. Which in the high-level leaders have advanced ideas in the production of safety play a leading role. Therefore, it is necessary to study the importance of leaders for enterprise safety management.

### **3 Voronoi Diagram-Based Personnel Safety Awareness Modeling**

#### **3.1 Voronoi Diagram of the Relevant Research and Application**

Voronoi grid, as the basic data structure, is a continuous polygon representation of two adjacent points connected by straight line and perpendicular bisector of straight line. Voronoi grid was introduced by the Russian mathematician Georgy Feodosevich Voronoi in 1980, named to commemorate his contributions to Voronoi. Later, due to a number of other scientific contributions to the field of research on the Voronoi diagram, it was also names Dirichlet blanket, Tyson polygon. The present research direction is very important in the field of computational geometry. From the beginning of this basic form, now can be extended to three-dimensional or multidimensional, and even extended to the generalized Voronoi diagram, weighted Voronoi diagram and arbitrary planar graph of Voronoi diagram. Because the Voronoi diagram has a specific application background [15], so some generation method it has been widely studied. Because Voronoi diagram has the characteristics of mathematics, it can reflect the influence of adjacent objects intuitively, and has the characteristics of vector and continuous blanket data model, so it can better control the management influence range.

Voronoi diagram definition and algorithm are widely spread, the application of the field is also expanding. Although these applications from a professional point of view is not the same, but the role played by the angle from Voronoi diagram, generally can be divided into the following aspects [16].

Voronoi diagram are connection between a variety of elements of media, through which information can be extracted. As an auxiliary data structure, through this data structure to carry out different objects in the shape or the relationship between adjacent computing tasks. An important means to improve the speed of some geometric algorithms. Because of the nature of Voronoi diagram, it determines the relationship between it and other different structures, so as to improve the speed of geometric algorithm. Voronoi grid plays an important role in the application of computational geometry, which is decided by the important role of Voronoi diagrams in solving the problem of distance between point set or other geometric objects. According to the properties of Voronoi diagram, the reasonable division of the region is applied to the fields of geography, meteorology, spaceflight and robot and other fields. In addition to the most basic recent search, the largest empty circle and other issues, more ore is the geometric shape reconstruction problem. According to the measured local data, the geometric shape of the study is sketched out by the properties of Voronoi diagram.

The Voronoi diagram is applied to the problem of path planning, because of the nature of the shortest path is selected as the research object of the route. In addition to possible obstacles in the process of movement as a point or a form to make it Voronoi, namely to find a collision free path full of obstacles in the environment can be described by the distance of the obstacle distance through the obstacle Voronoi diagram. The most secure path can be found, and the object can be ensured to be within a safe distance by moving along the boundary of the Voronoi diagram.

Voronoi diagram is also widely used in image processing and pattern recognition. In the image processing is generally used in the shape of the boundary contour line. And in pattern recognition is often used as a skeleton, in the form of text and body recognition process, we must first to identify the object of refinement. By its boundaries, the Voronoi diagram of the vertex or edge of the polygon is extracted, and the internal image is extracted as a skeleton to restore the original image.

### 3.2 Personnel Safety Awareness Modeling

**The Concept of Safety Awareness.** Consciousness acts as the product of the interaction of the human brain and the objective world to guide and dominate human behavior. But also the ability to guide people to meet their own needs, assess the value of things and establish communication channels. In the safety management of enterprises, the safety awareness is one of the most commonly used safety terms, the reasons for the occurrence of safety incidents are often referred to the issue of safety awareness of the weak. Safety awareness as a person engaged in productive labor in the process to avoid injury or death, property does not suffer the sum of the psychological experience. And safety awareness in people's production work, people can work on the content and

external factors have been vigilant in the state, when people, things, the environment changes can quickly identify and judge.

Safety awareness is a structured system, which contains human characteristics, experience accumulation. And it has the initiative, purpose, restriction and plasticity. Due to the structure and characteristics of safety awareness, the differences of individual safety awareness in the group, as an information exchange group of medium, far-reaching, individual safety awareness fluctuations will affect the surrounding individual safety awareness, because the mutual interaction makes itself constantly changing to adapt to the environment. Therefore, safety awareness is open and complex. Through the accumulation of safety experience, the safety environment to actively guide the main body can quickly and purposefully put into the work. Therefore, the safety awareness of employees affect the leader's safety management and thus affect the safety of production.

**Build the Model.** The enterprise environment is complex and changeable, and individual employee's safety awareness is perceived differently. The impact of the leadership of the management of enterprises are not the same. In this paper, researchers use the theory of Voronoi diagram and complexity system to establish the model approach. Researchers regard each enterprise staff as a generating element and its surrounding area as the influence of employee safety consciousness. Each employee as an individual in the enterprise, in the process of enterprise development will interact with the surrounding individuals, the leadership of the management of enterprises have a good bad influence. Assuming that the impact of employee safety awareness is inconsistent, employees understand the safety issues within their own scope of work. Therefore, for the leader, the management of different employees cannot be generalized, the need for different people's own sense of safety to the appropriate management and deployment, but also in the management of employees need to consider the overall coordination of enterprises. So that leaders must always pay attention to the situation of each employee to make appropriate adjustments to increase the difficulty of enterprise management.

So researchers can control employees by the number of safety training to adjust their safety awareness, employees can achieve an equal sense of safety, and facilitate the management of their leaders. This will not only improve the efficiency of leaders and employees, but also to improve the overall safety of the enterprise. The basic definition of Voronoi diagram is given below:

In the two-dimensional space  $R_2$ , there are  $n$  discrete generators  $p = \{p_1, p_2, \dots, p_n\}$ , where any two generators do not overlap each other, and points  $q, q \in R_2$ . Which are different in position on the plane. For a given planar space  $S \subset R_2$ , the Voronoi diagram generated by the  $n$  discrete points constitutes the partitioning of the  $S$ -space,  $V_S = \{V_{p_1}, V_{p_2}, \dots, V_{p_n}\}$ . The Voronoi diagram region for the generator  $p_i$  is:

$$V_{p_i} = \left\{ q \in R_2 \mid d(p_i, q) < d(p_j, q) \right\} \quad j = 1, 2, \dots, n, j \neq i. \quad (1)$$

with  $d(p_i, q)$  and  $d(p_j, q)$  representing the distances from  $q$  to  $p_i$  and  $p_j$ , respectively.



For the generators  $p_i, p_j$  in the Voronoi diagram, if the Voronoi diagram polygon  $V_{p_i}$  of  $p_i$  and the Voronoi diagram polygon  $V_{p_j}$  of  $p_j$  have a common edge, then  $p_i$  and  $p_j$  are adjacent, and the adjacent individuals of the generating element  $p_i$  are expressed as:

$$adj_i = \{V_{p_i} \cap V_{p_j} \neq \emptyset, i \neq j, j = 1, 2, \dots, n\}. \tag{2}$$

In any of the generators  $p \in R^2$ , each generator has its corresponding Voronoi diagram area, and is one-to-one correspondence. Let  $S > 0$ , and  $p$  is the center of the area. The areas of these Voronoi diagrams are form the whole Voronoi diagram, expressed as  $S(p)$ . The size of  $S$  in this article is expressed as the area size affected by employee safety awareness. In practical work, due to the different safety awareness of individual employees, the size of the affected area is different, therefore management challenges increase. Employees can communicate through cooperation, mutual learning and influence, making the employee’s own safety awareness changes. Employees for their own safety awareness, judgments will be unknowingly received around the impact of the surrounding staff environment, which is a common phenomenon. As the main body of the enterprise management, the leader is very important to supervise the staff’s leadership, so we make use of the staff’s influence to the surrounding groups to control and adjust the staff’s safety awareness, so that each employee’s safety awareness affects the region. Thus facilitating the leader’s management of the group.

There are  $n$  individuals,  $p_i$  and  $p_j$  are adjacent,  $S_{p_i}$  and  $S_{p_j}$  are the areas of the regions where  $p_i$  and  $p_j$  are the centers, the size of region  $S_{p_i}$  is:

$$S_{p_i} = \lambda \sum_{j=1}^{n-1} \frac{a_i + a_j}{2d_{ij}}, i \neq j, j = 1, 2, \dots, n. \tag{3}$$

Which,  $d_{ij}$  is the distance between  $p_i$  and  $p_j$ ,  $\lambda$  is the environmental impact factor of the generating element,  $\lambda = 1$  and is the safety awareness of employee  $i$  and employee  $j$  themselves.

Suppose there is an overlapping safety awareness area between adjacent generators  $S$ :

$$S = \alpha \cdot \text{sqrt}\left(\frac{2 * c * d}{n * \text{sqrt}(3)}\right). \tag{4}$$

Which,  $\alpha$  is enterprise employee safety education training times,  $c$  is the length of the study area,  $d$  is the width of the study area, and  $n$  is the number of employees in the region.

Then at time  $t$ ,  $p_i$  regional safety awareness impact area deviation:

$$S_{it} = \lambda \sum_{j=1}^{n-1} \frac{(a_i + a_j)}{2d_{ij}} - S. \tag{5}$$

When the individual safety awareness is affected by the surrounding, move in a direction that reduces deviation until equilibrium is reached. Due to different individual initial safety awareness, we introduce the logic judgment function for autonomous motion:

$$\psi(x,y) = |\text{sgn}(y - x)| = \begin{cases} 1 & y > x \\ 0 & y \leq x \end{cases} \tag{6}$$

When the region where the individual  $p_i$  is affected begins to move, the area of the region  $S_{p_i} = (s_x, s_y)$ , the interaction rules are:

$$\begin{cases} s_x = \psi(S_{p_{ix}}, S_{ix}) * \frac{S_{ix} - S_{pix}}{|S_{it}|} \\ s_y = \psi(S_{p_{iy}}, S_{iy}) * \frac{S_{iy} - S_{piy}}{|S_{it}|} \end{cases} \tag{7}$$

Which,  $S = (S_{pix}, S_{piy})$ ,  $S_i = (S_{ix}, S_{iy})$ .

Due to  $S$  represents the size of the area affected by employee safety awareness, then

$$S_i = \max_{i \neq j} \left\{ \left( \frac{S_i + S_j}{2} \right) * \lambda \mid V_{p_i} \cap V_{p_j} \neq \emptyset \right\} \tag{8}$$

Which,  $S_i$  and  $S_j$  are the areas of the regions where the elements  $p_i$  and  $p_j$  are generated, respectively, and represent the size of the impact of employee  $i$  and employee  $j$  safety awareness.

According to this algorithm to adjust the size of the area where the generators are located, when the area of all generators in the same area, that is, the staff of the safety awareness of the basic reach of equal scope, the leadership of the staff can be unified management, to avoid management in place accidents, so as to improve the safety management of enterprises.

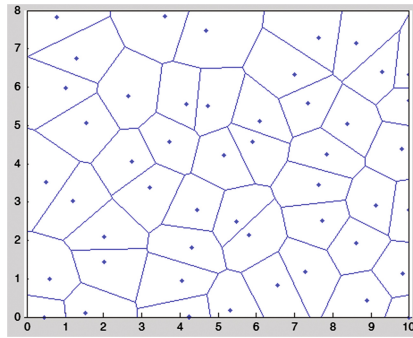
## 4 Simulation Results of Employee Safety Awareness

In order to reveal the relationship between the individual safety awareness and the management of the enterprise leaders, researchers have to verify the effectiveness of the guidance rules. In this paper, MATLAB software was used for simulating this relationships. MATLAB is not only a mathematical software, but also a high-level programming language, it has matrix operations, describing data functions, implementation algorithms, create user interface and other functions. Its characteristics are close to the natural language procedures, simple and compact, easy to use; with library functions, simple programming; special toolbox to solve the complex problems of various fields of expertise; to facilitate the independence of the drawing function, data visualization simple operator rich; flexibility, freedom of programming and so on.

### 4.1 Employee Safety Awareness Voronoi Diagram Plane Division

In order to verify the feasibility and effectiveness of the Voronoi diagram's employee safety awareness impact management, a simulation experiment is carried out and Voronoi-based group safety awareness partition is adopted.

An example enterprise of a known office area has 50 employees, and the size of this area is 10 m \* 8 m. With various cultural and environmental factors, work experience and personality of each employee, causes the employees safety awareness at the initial time difference, that is entering the office area affect the safety awareness of personal domain range the employee is different, as shown in Fig. 1.



**Fig. 1.** Employee safety awareness impact area plane Voronoi division (initial moment)

In Fig. 1, each dot represents one employee, each dot of the polygon is the size of the region of each employee safety awareness can influence the initial. As can be seen from the figure, the office staff safety awareness is irregular. Some employees have a strong sense of individual safety, the corresponding impact on the region is large, the more easily for the management of leaders. And some staff initial safety awareness is low, so the smaller the area of its impact, compared to safety awareness employees, the leaders easily overlooked its management, resulting in management loopholes caused by safety accidents, is not conducive to safe production and sustainable development of enterprises. It is not difficult to see in the initial moment, each employee safety awareness influence regional differences, the overall safety awareness is more confusion. Therefore, according to formula 5, the interaction between employees in the region to compare the proposed rules in this paper to increase the safety awareness of the weak areas of the number of staff safety education and training to adjust its safety awareness can affect the region.

The mutual influence between employees makes the staff with weak safety awareness influence the size of the region, after a period of time after the staff of different regions of the safety awareness of the region as shown in Fig. 2.

Finally after several adjustments by employees interaction times and safety training of employees, so that the safety awareness influence the size of the region approaching the same, as shown in Fig. 3.

After several adjustments through the interaction rules, from Fig. 3 can be seen, the safety awareness of employees affected areas tend to be consistent, the whole office area of the overall safety awareness stabilized. For the leader, this is convenient for unified management of all employees, reducing management blind spots, making safe

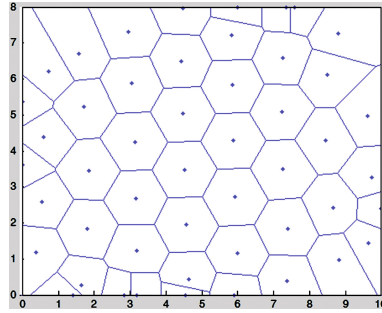


Fig. 2. Employee safety awareness impact area plane Voronoi division (middle moment)

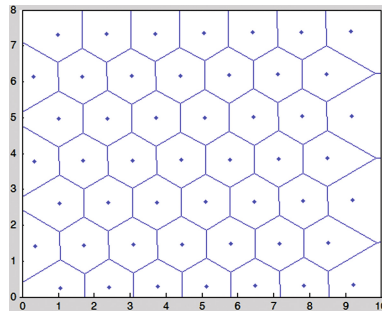


Fig. 3. Employee safety awareness impact area plane Voronoi division (final moment)

atmosphere in enterprises is increasing rapidly, can maximize, reduce and eliminate the potential safety hazards in the office area, reduce the incidence of safety accidents.

## 5 Conclusion

From the analysis of the causes of the safety accidents in recent years, the occurrence of safety accidents with respect to enterprise leaders supervision and management of employees does not constitute high relationship. From the point of view of complex system, this paper analyzed the regional size shown by Voronoi diagram.

Different levels of individual safety awareness of employees were studied leading to different levels of their management, may result in their own safety awareness of strong staff management too much, and for those who are weak security awareness of the staff is not in place. Resulting in the waste of human resources, making enterprise safety management is not in place, restricting the development and expansion of enterprises. Therefore this article through the Matlab simulation software on employee safety awareness impact area simulation and image analysis, for the leadership of employee management and employee safety awareness changes and other issues to propose solutions. According to image analysis, adjusting the number of different staff safety education training, and through mutual influence between employees, so that

employees' safety awareness affect the region tends to an equal. For the leader, this can be better for the staff of a unified management, so as to avoid ignoring some employees, but also can reduce unnecessary work to save energy, is conducive to the overall management of enterprises, improve enterprise safety, making enterprises can better and faster development.

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# Association Between Job Insecurity and Perceived Job Satisfaction and Life Satisfaction: A Comparison of Japanese and Korean Regular Office Workers

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**Abstract.** This study was conducted to evaluate the relationship between job insecurity, job satisfaction, and life satisfaction. We compared two groups of Korean workers (N = 400) and Japanese workers (N = 805). The survey was conducted by an on-line research institute registered monitor that sent questionnaire to workers. As a result, Job insecurity differ significantly by income in Japan, and it differ significantly by length of service in Korea. Multiple regression analyses find that job insecurity relates to job satisfaction in Japan meanwhile life satisfaction relates to job insecurity in both country Japan and Korea. Given these results and trends towards increasing frequency of insecure jobs, attention needs to be paid to the work well-being of job insecurity.

**Keywords:** Job insecurity · Job stress · Job satisfaction · Life satisfaction · Life employment system

## 1 Introduction

Over the past few decades, changes in industrial structure and the intensification of international competition have impacted firms' management policies, including personnel management. In a competitive, global economy, which is no longer characterized with the rapid economic growth of the past, the labor market inevitably increases its fluidity and organizations are forced to cut cost; as a result, the anxiety of losing one's job and the resulting job insecurity are on the rise [1, 2]. In particular, in today's super-aging society where aging is taking place at break-neck speed, the number of workers who keep working for a longer period in order to compensate for living longer is on the increase. Together with younger workers' job insecurity, this kind of phenomenon has caused inter-generational conflicts [3].

Job insecurity is defined as an individual's perception that one may lose their jobs in the workplace and one might be made redundant [4] or a sense of powerlessness due to the perception that part or whole of one's job might be lost in the workplace [5, 6].

### 1.1 Comparison of Job Insecurity Stress in South Korea and Japan

Since Japan and South Korea belong to the same East Asian cultural and economic sphere and are influenced by Confucianism, both are seen by the Westerners to be collectivist and family-oriented cultures with an emphasis on human relationships [7]. However, these two countries do have cultural differences stemming from different geographical conditions and historical backgrounds [8, 9].

Conventionally, the employment system in Japan was characterized by long-term, stable, and lifetime employment system, seniority-based treatment (pay raises and promotions based on the length of continuous service and on the job training), and individual unions [10], but labor market reforms due to structural changes based on ideals of neo-liberalism since the 1990s have shrunk the conventional long-term, stable, and lifetime employment practices and increased labor market flexibility. Even in South Korea, the expansion of flexibility in the labor market since the 1980s was accelerated by the worldwide financial crisis in the second half of the 1990s. As a result, the loss of jobs in the form of honorary retirement (voluntary retirement in Japan) and an increase in irregular employment have become critical social problems.

The life time employment system, in Korea, there are only new graduates and retirement system in Korea, and it is difficult to judge them as life time employment system or practice [11]. Furthermore, it is reported that performance based personnel management is more prevalent in South Korea [12]. In terms of industrial relations, while in Japan, collaborative insider policies are followed and a positive method is adopted in the worker dispatch law, in South Korea As a consequence of rejecting the government's draft bill on workers dispatch, dispatch staff in manufacturing is banned and the proportion of dispatch workers in the labor market is smaller in South Korea [13]. As for restructuring, legislation on restructuring was introduced in South Korea after the IMF economic crisis, and the implementation rate is higher in South Korea than Japan [14]. Given these backgrounds, while job insecurity is one sub-factor in the Korean job stress questionnaire [15], the Brief Job Stress Questionnaire used for testing job stress in Japan (which has been used conducting job stress checking since 2015) does not contain an item on job insecurity.

*Hypothesis 1.* Job insecurity-related stress among workers in South Korea is higher than that among workers in Japan.

### 1.2 The Relationship Between Job Insecurity-Related Stress and Satisfaction with Job and Life Among Workers in Japan and South Korea

Generally, job insecurity lowers social status [16] and adversely affects health [17]. Since employment offers material value and access to psychological and social resources, unemployment and an uncertain future manifest themselves as latent role stressors in particular in cases where expected future events cannot be controlled and predicted [18, 19].

Meta-analysis carried out in the study conducted Sverke et al. [20] has shown that job insecurity adversely affects employees' attitudes in the workplace (e.g. job satisfaction and organizational commitment), health, and to a certain extent, the behavioral relationship with the organization. According to Cheng and Chan [21], there is a significant negative correlation between job insecurity and job performance, furthermore Matsuda [22] has pointed out that the husband's job insecurity influences life planning and stress among the couple [23]. These suggest that job insecurity affects not only the workers themselves but also their families and the workplace.

*Hypothesis 2.* Job insecurity has a significant influence on satisfaction with one's job and life in South Korea and Japan.

## 2 Method

### 2.1 Participants and Procedure

Participants were recruited by a registered, monitored online research institute, using snowball sampling. The Japanese survey was conducted between October 27 and November 13, 2015, and the Korean survey was conducted between September 3 and 17, 2015. Participants were aged between 20 and 65 years, and stratified sampling was used to divide participants into groups according to country of residence. Respondents were regular work of 805 in Japan and of 400 in Korea excluding short term contract labor due to reemployment among Japan respondents.

### 2.2 Measurement

All items in structured questionnaire consisted of attributes relevant to job stress, job insecurity stress, job satisfaction and life satisfaction as well as demographics and higher score indicated higher level of positive state, of respondents.

**Job Stress.** Measure of Job Stress adopted New Japan Job Stress Scale(Brief) which has all 17 items of 4-Likert scale (not at all, somewhat, moderately so, very much so) more over Cronbach alpha coefficients were  $\alpha = .84$  (Japan) and  $\alpha = .60$  (Korea). Referent to English version for Korean respondents, two expert Japanese and Korean teachers translated it into Japanese version as well as Korean version.

**Job Insecurity.** To measure job insecurity item, "My future is uncertain because the current situation of my company is unstable" among Korea Occupational Stress Scale (KOSS-33) developed by Chang et al. [15] were used, and all items have 4- Likert scale ("strong opposite: 4 point" "opposite: 3 point" "agree: 2 point" "strong agree: 1 point") more over Cronbach alpha coefficients were  $\alpha = .71$ (Japan), and  $\alpha = .78$  (Korea).

**Job Satisfaction.** To measure job satisfaction Korean version [24], Japanese version [25] of COSPOQII [26] were adopted and all items have 4-Likert scale ("very satisfied: 4 point" "satisfied: 3point" "satisfied: 2 point" "very unsatisfied: 1 point"). One example shows as below, "Regarding your work in general how pleased are you with; your job as



a whole, everything taken into consideration?”. In addition Cronbach alpha coefficients were  $\alpha = .66$  (Japan) and  $\alpha = .79$  (Korea).

**Satisfaction with Life.** In terms of life satisfaction both Japanese version [27] and Korean version [28] of SWLS [29] were adopted, and all items have 7- Likert. (“strongly agree: 7 point” “agree: 6 point” “slightly agree: 5point disagree: 1 point”). One example indicates as below, “In most was my life is close to my ideal”. In addition Cronbach alpha coefficients were  $\alpha = .83$  (Japan) and  $\alpha = .89$  (Korea).

### 2.3 Data Analysis

Data collected analyzed using SPSS21version. To compare Japanese demographic with Korean one, chi-square test was conducted. Moreover through ANOVA and post hoc Scheffe-test, job stress and job insecurity stress in both Japan and Korea were compared, and especially job insecurity stress was compared on each demographics. Finally dependent variables, job satisfaction and life satisfaction respectively were regressed on independent variable, demographics and job insecurity stress, that is, multi-regression analysis was administrated, which demonstrated effect of job insecurity stress on job satisfaction and life satisfaction. Remarkably, to compare Japan with Korea, dummy variable such as Japan = 0 and Korea = 1 was used.

## 3 Result

### 3.1 Demographics

The proportion of women in the Korean sample (34.3%) and Japan (39.4%) were similar, and Korean participants’ mean age (39.6, SD = 9.3 years) was lower relative to that of the Japanese participants (44.3, SD = 8.4 years). Most participants (Korea: 89.5%, Japan: 71.9%) lived with their families, and the proportions of participants who worked for >40 h per week were 69.8% and 66.6% in the Korean and Japanese samples, respectively.

The proportion of Japanese participants who worked for small or medium-sized companies (30.6%) was lower relative to that of Korean participants (50%). Furthermore, the proportion of Korean participants who earned incomes of <3,000 USD per month (34.0%) was higher relative to that of Japanese participants (10.4%). Mean length of services were 9.5 (SD = 7.5) and 13.6 (SD = 10.3) years in the Korean and Japanese samples, respectively.

### 3.2 Comparing Job Stress and Job Insecurity Stress by Country

Mean of job stress in both Japan and Korea was compared according to each profile and it was noted that Table 1 indicated which was compared with that of Japan Ministry of Health, Labor and welfare [30]. Mean of job insecurity score in Korea was higher than that of Japan significantly therefore hypothesis 1 was not supported ( $t = 3.958$   $p < 0.001$ ).

**Table 1.** Comparing means and (s.d.) of job insecurity and job stress by country

Primary factor	Japan	Korea	t-test	Japan National (2012)
Job insecurity	2.34(.92)	2.56(.92)	3.958***	
Job demand of quantity	2.21(.74)	2.42(.62)	4.867***	2.14(.76)
Job demand of quality	2.25(.64)	2.20(.60)	-1.43	2.16(.71)
Physical demand	3.02(.89)	2.85(.91)	3.123**	2.49(1.08)
Interpersonal conflict	2.68(.59)	2.61(.47)	-1.872	2.88(.66)
Circumstances of work	2.76(.91)	2.75(.80)	-0.306	2.78(.99)
Job control	2.55(.66)	2.75(.67)	4.701***	2.53(.74)
Skill direction	2.72(.83)	2.67(.81)	-.975	3.00(.85)
Job fitting	2.71(.83)	2.79(.78)	1.692	2.92(.80)
Meaning of work	2.58(.86)	2.78(.76)	3.75***	2.87(.87)

Note. \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

### 3.3 Comparing Job Insecurity According to Demographics

As shown in Table 2, In Japan there was significant difference among groups depending on income levels, and higher income group shows safe and secure job (p < .01). In Korea there was significant difference among groups depending on levels of length of service in the company, and length of service in the company of over 20 years feel unstable and insecure on their job (p < .01). Additionally according to gender, there was significant difference and it seems that women feel job insecurity lower (p < .05).

**Table 2.** Job security by demographic characteristics according to country

Variables	Korea		Japan	
	M(SD)	F/t	M(SD)	F/t
Gender		2.310*		0.560
Man	2.49(.91)		2.32(.90)	
Woman	2.71(.93)		2.36(.96)	
Age (in years)		2.527		0.121
~ 29	2.86(.86)		2.34(1.01)	
30-39	2.54(.91)		2.30(.96)	
40-49	2.50(.94)		2.34(.88)	
Living area		1.572		1.494
Capital area	2.51(.93)		2.29(.92)	
Not capital area	2.68(.90)		2.38(.92)	
Family composition		1.968		1.905
Living with family	2.51(.90)		2.24(.97)	
Job type		1.731		1.782
Blue collar	2.74(.89)		2.30(.88)	

(continued)

**Table 2.** (continued)

Variables	Korea		Japan	
	M(SD)	F/t	M(SD)	F/t
White collar	2.53(.93)		2.36(.95)	
Job tenure (in years)		4.541**		1.923
<3 <sup>1</sup>	2.67(.85)		2.16(.92)	
3–9 <sup>2</sup>	2.55(.92)	†1, 2, 3 > 4	2.30(.99)	
10–20 <sup>3</sup>	2.65(.98)		2.39(.90)	
>20 <sup>4</sup>	2.03(.81)		2.40(.90)	
Working hours per week		1.921		1.433
≤ 40	2.70(.95)		2.409(.91)	
Income per month (\$)		0.328		12.107**
<3000	2.61(.87)		2.17(.93)	
3000–5000	2.53(.87)		2.14(.95)	†3 > 1, 2
>5000	2.55(.98)		2.47(.89)	
Company size		1.347		1.433
Large	2.63(.96)		2.37(.94)	
Small or medium	2.50(.88)		2.26(.88)	

\* p < 0.05, \*\* p < 0.01

†scheffe post hoc test

### 3.4 Association Among Job Insecurity, Job Satisfaction and Life Satisfaction

As shown in Table 3, Concerning Japan, to find effect of job satisfaction in Japan job satisfaction was regressed on demographic variables and job insecurity therefore family composition (beta = .18, p < 0.01), income over 5000 dollar versus income less than 3000 dollar (beta = .31, p < 0.05), and Job insecurity (beta = .17, p < 0.01) were significant. Multi-regression analysis produced significant explained variance of 22.8% (p < 0.001).

To find effect of life satisfaction in Japan life satisfaction was regressed on demographic variables and job insecurity therefore gender (beta = .10, p < 0.01), family composition (beta = .13, p < 0.01), income over 5000 dollar versus income less than 3000 dollar (beta = .33, p < 0.01) and Job insecurity (beta = .33, p < 0.01) were significant. Multi-regression analysis produced explained variance of 12.3% (p < 0.001).

As for Korea to find effect of job satisfaction in Korea job satisfaction was regressed on demographic variables and job insecurity therefore on the contrary to Japan only job insecurity (beta = .22, p < 0.05) was significant. Multi-regression analysis produced explained variance of 1.4% therefore it is not significant.

To find effect of life satisfaction in Korea life satisfaction was regressed on demographic variables and job insecurity therefore age (beta = .14, p < 0.05), income over 5000 dollar versus income less than 3000 dollar (beta = .14, p < 0.05), length of service 3y–9y group versus length of service less than 3 years (beta = .19, p < 0.01),

**Table 3.** Factors influence to job satisfaction and life satisfaction by country

Variable	Job satisfaction				Life satisfaction			
	Japan		Korea		Japan		Korea	
	β	p-value	β	p-value	β	p-value	β	p-value
<b>Demographics</b>								
Gender (standard man)	.03	.35	.07	.16	.10	.00	.36	.71
Age (standard: 40–49) female	.03	.35	.06	.35	.05	.21	.14	.02
Family composition (standard: solo)	.18	.00	.05	.28	.13	.00	.02	.63
Type of job (standard: blue collar)	.04	.17	.07	.18	.00	.97	.01	.28
Working hours (standard: <40) > 40	.03	.29	.06	.20	.00	.87	.01	.81
Company size (standard: large)	.01	.66	.03	.51	.00	.20	.08	.10
Income (standard < \$3000) \$3000–\$5000	.02	.68	.06	.32	.09	.07	.10	.08
Income (standard < \$3000) > \$5000	.31	.02	.10	.13	.33	.00	.14	.02
Length of service (standard > 3) 3–9	.00	.99	.02	.68	.02	.68	.19	.00
Length of service (standard > 3) 10–20	.09	.05	.00	.97	.00	.86	.26	.00
Length of service (standard > 3) over 20	.02	.71	.13	.05	.03	.56	.21	.00
Job insecurity	.17	.00	.22	.03	.33	.00	.30	.00
F-value		18.001		1.4		9.058		11.384
Adjusted R <sup>2</sup>		.228		.014		.123		.119
P-value		.000		.150		.000		.001

length of service 10y–20y group versus less than 3 years (beta = .26, p < 0.01), length of service over 20 years group versus less than 3 years (beta = .21, p < 0.01, and Job insecurity (beta = .30, p < 0.01) were significant. Multi-regression analysis produced significant explained variance of 11.9% (p < 0.001).

## 4 Discussion

### 4.1 Comparing Job Insecurity Stress of Japan with that of Korea

If answer on question such as “My future is uncertain because the current situation of my company is unstable” was examined carefully, 53% of Korean workers said that they felt unstable whereas 56.9% of Japanese workers did, which was more than that of Korea actually (t = 3.958, p < .001). Generally one of advantages of lifetime employment system provides stable and secure job for laborer and another advantage indicated that employer could ensure secure workforce and mutual progressing cooperation could be encouraged. Nonetheless, as contradictory to hypothesis which would suggest mean of Korea will be higher without life employment system, findings of the study show that mean of Korea on job insecurity stress is lower than that of Japan.

This illustrated that liberal labor market under industry structure change and global economic environment should be necessary. If business and company seek for interest through rational management, it seems that unique findings of current study might reflect on increase of unemployment and part time laborer due to downsizing policy that profit of business and company takes priority over most of all. Interestingly employee in conglomerate to which lifetime employment system was applied might have chance to change job or get reemployment whereas in case of small and medium size businesses especially sometimes subcontractor was directly and straight forwardly struck by major company which has lower performance and break up a business.

Additionally another difference between job conditions of Japan and Korea includes type of union. Individual union of Japan was independent of industry whereas union type of Korea depends on that. Moreover fundamentally union in Korea could play the role of protecting right of laborer relatively and could suggest solution against labor problem, on account of which it is expected that laborer might feel safe and secure on their job [14, 23, 31].

With demographics and job insecurity stress, in Japan group which has higher income than any other seems to assume safe and secure in employment, whereas in Korea significant difference appears depending on length of service in the company [21]. Noticeably group of length of service in the company of over 20 years seems to feel unstable and insecure in their job. In Japan under life job system the job could be changed into affiliate of original company or could be shifted into part time worker based on his own intent after retirement age.

In Korea because of higher retirement age of 55–59 year old as well as restructuring and performance based bonus some business such as financial company could express high level of job insecurity of long serving employees. As well, finding in current study which shows that mean of women's job insecurity in Korea is significantly higher than that of men, which could support the result in Richer, Silla, et al., Kinnunen and Mauno [32–34]. Matsuda [22] reported that job insecurity of husband would be factor which can elevate wife's stress as well as that of husband, as such it reflected man might tend to focus on responsibility and respect his honor as head of householder [35].

## **4.2 Relevant to Job Insecurity Stress, Job Satisfaction and Life Satisfaction**

Findings that job insecurity is significantly related to job satisfaction in both Japan and Korea are consistent with result in study of Sverke, et al. [20], Yokoda [36], Silla, et al. [37]. However nevertheless, based on result of multi-regression analysis significant association such as explained variance of 22.8% on job satisfaction and of 12.3% on life satisfaction was found in current study. On the contrary in Korea explained variance of 1.4% on job satisfaction is no significant and 11.9% on life satisfaction is significant.

Furthermore in terms of association between job satisfaction and job insecurity, association in Japan at significant level of 0.01 is significant whereas association in Korea at significant level of 0.05 is significant, which demonstrated that Korea showed

lower level of association than Japan. Consequently Japan shows higher and larger extent of association between job insecurity and job satisfaction than Korea.

In the Study of Chang and Cho [38] in which they compared job attitude of Japanese laborer with that of Korean argued that Japanese laborers might be more devoted to job owing to cultural factor ( $t = -6.24, p < .001$ ). In the same line Shin [39] also reported that Japan could be more committed to job, which supported findings in current study.

**Limitations.** Our study has several limitations. First, the cross-sectional design of the study precluded inference of causal relationships. A longitudinal design would facilitate comprehensive evaluation of association of job insecurity and job satisfaction–life satisfaction. Second, the use of a single item to assess job insecurity limits the accuracy of the exposure measurement. The meta-analysis conducted by Sverke, et al. [14] suggests that the use of single items to measure job insecurity compared to multi-item questionnaires is likely to result in an underestimation of the association between job insecurity and outcome.

Despite these limitations, the findings are meaningful because they clarified current differences in job insecurity issues, and ethnicity between employees in Japan and Korea. Given the important practical implications of job insecurity for job satisfaction–life satisfaction, which were clarified in the current study, additional research is required to examine this topic further.

## 5 Conclusion

On the ground of result in this current study we suggest that both Japan and Korea should prepare appropriate plan against job insecurity. As well with respect to ambiguous labor issue we purport that constant and continuous cross-culture study between Japan and Korea should be needed and facing to global market it is necessary that future study should not only focus on joint business of Japan and Korea but also provide more useful and available information.

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