Intellectual Capital for Communities

NATIONS, REGIONS, and CITIES

Edited by AHMED BOUNFOUR • LEIF EDVINSSON

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Advance Praise for *Intellectual Capital for Communities: Nations, Regions, and Cities*

"Intellectual capital has become the key source of wealth and power in our post-industrial world, as a consequence of the knowledge revolution and accelerated globalization. This is true not only for the most advanced societies but also for the poorest ones. This book offers a timely and comprehensive perspective on what it takes to accumulate and use intellectual capital, from the nation level down to local communities, primary sites for knowledge-based growth and development.
—**Carl J. Dahlman**, Program Manager, Knowledge for Development, World Bank Institute

"The study of intellectual capital has become a field of research in itself. It used to be restricted to the business sector: Thanks to the series of studies coordinated by Bounfour and Edvinsson, it now covers communities and public institutions. It was a necessary step, as knowledge is a public good, and that step gives rise to invaluable new insights."
—**Dominique Guellec**, Chief Economist, European Patent Office

"Bounfour and Edvinsson's extension of the burgeoning intellectual capital literature to communities/regions/nations is timely and very rewarding."
—**Baruch Lev**, Philip Bardes Professor of Accounting and Finance, New York University

"In the 20th century, industrial society achieved remarkable growth through the dissemination of an "integrated circuit," abbreviated to IC in every corner of industry. This book suggests that the knowledge-based society in the 21st century will be enriched through the spread of another IC, that is, "intellectual capital" in every corner of the society."
—**Teruyasu Murakami**, Chief Counselor, Nomura Research Institute

"With assets of many firms being primarily intangibles—knowledge companies—the question arises whether regions and nations are successfully pursuing similar paths. The authors have rewardingly set out to find answers on how intellectual capital is created in geographic entities and how it can be measured."
—**Jon Sigurdson**, Professor, Research Policy, Stockholm School of Economics

"... a welcome and timely overview of a new and vibrant Intellectual Capital (IC) frontier. IC started with a corporate focus, but much of the exciting work is now being done in and for the public sector as well as on governmental and national levels. The chapters ... are fresh and topical. This is required reading!"
—**Karl-Erik Sveiby**, Professor at Swedish School of Economics and Business Administration, Helsinki, Finland

"This book extends the analysis and underlines the crucial importance of intellectual capital in our economies at all levels, highlighting information and measurement challenges that have to be overcome."
—**Graham Vickery**, Head Information Economy Group, OECD

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List of Contributors

Albert A. Angehrn (pp. 299–316), *INSEAD, The European Institute of Business Administration, Fontainebleau, France.*

Jean-Eric Aubert (pp. 61–69), *World Bank Institute, World Bank Paris Office, France.*

Nick Bontis (pp. 113–138), *DeGroote Business School, McMaster University, Hamilton, Ontario, Canada.*

Ahmed Bounfour (pp. 3–18, 97–112, 337–339), *University of Marne La Vallee, France.*

Dimitri Corpakis (pp. 213–225), *Head of Sector, European Commission DG Research, Brussels, Belgium.*

Leif Edvinsson (pp. 19–34), *Lund University, Sweden.*

Hans-Joachim Heusler (pp. 265–274), *Bayerisches Staatsministerium für Wirtschaft, Munich, Germany.*

Stefanie Kares (pp. 253–264), *University of Applied Sciences, Wiesbaden, Germany.*

Lars Karlsson (pp. 275–295), *Department of Education, Lund University, Sweden.*

Mosahid Khan (pp. 37–59), *Economic Analysis and Statistical Division, Directorate for Science, Technology, and Industry, OECD, Paris, France.*

José María Viedma Marti (pp. 317–335), *Polytechnic University of Catalonia and President of Intellectual Capital Management Systems, Barcelona, Spain.*

Paolo Martinez (pp. 275–295), *Firenze Technology, Chamber of Commerce of Florence, Italy.*

Seiichi Masuyama (pp. 165–194), *Professor, Research Institute for Industry and Economics, Chuba University, Japan.*

Jean-Jacques Mertens (pp. 87–96), *European Investment Bank, Luxembourg.*

Leonard Nakamura (pp. 71–85), *Federal Reserve Bank of Philadelphia, Pensylvania.*

Klaus North (pp. 253–264), *University of Applied Sciences, Wiesbaden, Germany.*

Edna Pasher (pp. 139–149), *Edna Pasher PhD and Associates, Israel.*

Aino Pöyhönen (pp. 227–252), *Research Assistant, PhD Candidate of Knowledge Management, Department of Business Administration, Lappeenranta University of Technology, Finland.*

Ante Pulic (pp. 197–211), *President, Intellectual Capital Association, Croatian Chamber of Economy, Croatia.*

Hans Schedl (pp. 265–274), *Ifo Institute for Economic Research, Munich, Germany.*

Sigal Shachar (pp. 139–149), *Edna Pasher PhD and Associates, Israel.*

Anssi Smedlund (pp. 227–252), *Research Assistant, PhD Candidate of Knowledge Management, Department of Business Administration, Lappeenranta University of Technology, Finland.*

Jacques Van der Meer (pp. 87–96), *European Investment Bank, Luxembourg.*

Bernhard Von Mutius (pp. 151–163), *Strategic Advisor, Frankfurt am Main, Germany.*

Introduction

Ahmed Bounfour and Leif Edvinsson

Intangible (intellectual capital or IC) resources are now largely recognized by scholars and practitioners as the most important source of an organization's competitive advantage. At the corporate level, intangible investments (research and development or R&D, innovation, knowledge creation and fertilization, marketing and advertising expenditures) are now unanimously considered the most important sources of performance. Over the last 8 years, several models and approaches have been proposed and designed for the managing and reporting of intangibles. At the managerial level, these models are mainly oriented towards measuring inputs (investment in R&D, software, knowledge creation, human capital development, and so on), including the accounting level. Others tend to specifically focus on how to harmonize accounting rules, especially at the international level (e.g., via the convergence of the International Accounting Standards Board [IASB] and Financial Accounting Standards Board [FASB] rules).

However, despite these developments, we are still in need of an integrated approach to "problematizing" intangibles before reporting on them. This might be done by referencing the concept of the knowledge economy (KE) and revisiting its underlying assumptions. Indeed, if knowledge in its tacit, explicit, and hybrid forms is considered the main source for performance for organizations (regardless of if they are companies, public institutions, or associations), we need to explore new ways of viewing the world and, therefore, challenge the existing models. When examining this issue from an analytical point of view and with a long-term perspective, one of the main arguments to support this is the shift from a physical to a service (potentially intellectual/intangible) mode of producing and delivering "outputs" and values. These outputs might be of different natures: products, services, messages, and signals. They are not necessarily final outputs; they may be intermediate outputs or even outputs with an input status within the delivery process (typically a generated patent within a company designed towards use in the production process). The KE is basically characterized by the non-linear nature of generating outputs, the "combinatory nature" of the resources used, and the deep uncertainty regarding their value. The last two characteristics are important to consider when the question of assessing the value of activities and companies from a financial point of view surfaces. How can we assign a value, in terms of Euros, dollars, or whatever, to activities for which the dynamics and paths can be deeply challenged from one day to another? When considering this question, we can imagine the anxiety of financial analysts when it comes to calculating future cash flows for listed companies and their business lines.

One of the strong implicit hypotheses of the KE lies in the assumption that we are shifting from large hierarchical organizations to very horizontal, networking ones. This is an assumption that has a strong impact on the way we view and assess activities and market structures, including market competition. From the socioeconomic perspective, the concept of the KE also deals with the concept of "embededness" (as it has been developed around the work of Granovetter). Knowledge is not created, fertilized, and disseminated in a vacuum of social links, but fundamentally in contexts with specific and adapted social capital. It must be linked to the emergence of new organizational forms.

In the KE, the value of corporations, organizations, and individuals is directly related to their knowledge and intellectual capital (IC). However, if the perspective is somewhat broadened, we will begin to understand the real possibilities. Think of the public sector, as well as entire nations, as more than just traditional enterprises in the business sector. If intangibles and IC are important to private enterprise organizations, they are also important to the productivity and competitiveness of the public sector and to nations. So, how can we seek to understand the dynamics of the intangibles at work on a national scale?

Only knowledge will provide the opportunity to improve the wealth of nations. As such, we need intelligence systems to develop a new map of knowledge assets and IC—a map of regional IC—instead of the old agricultural and industrial plans so often found in regional planning offices. The key mapping and intelligence dimensions should stem from the need to locate where wealth is created in a given region/country. Could this process reveal a huge knowledge repository with a significant but idle potential for collective wealth creation in the public sector? In other words, knowledge assets and IC can be viewed as a wealth of nations in waiting. As a leadership liability, they could also be viewed as a kind of emerging public service poverty trap for the wealth of nations.

At the macroeconomic level, new growth theories already demonstrate the importance of knowledge in the performance of nations and, therefore, make the content of the so-called residual factor clearer. Networking is among those factors identified as of high importance for growth. In other words, the more connections, relationships, and interactions in a network society or organization, the higher the potential value that will emerge. This is clearly evident in the case of development of software and knowledge assets. Furthermore, the value of knowledge assets is growing while they are in use, in contrast to tangible hardware. A personal laptop, for example, is decreasing rapidly in value while in use. On the other hand, a patent can ultimately generate an infinite value.

Adding value in the KE is inextricably linked to radical change in both societal assumptions and business models. In the end, capitalism may not create value if it is obsessed with competition to the detriment of collaboration. Social values must be reconsidered in light of their value-generation potential. Allocating resources to education, health and social services, and our community infrastructure should not be based on cost but on the potential for value creation through knowledge. If employment in private industry represents only 25% of the total potential "brain value" of society, leveraging the rest more effectively depends on IC and society entrepreneurship.

A new *political leadership* agenda is evolving around the IC of nations and other communities, with the focus on how to:

- visualize the knowledge capital of nations;
- develop intelligence flows within and between knowledge capital clusters;
- cultivate efficiency and renewal of the knowledge capital of regions; and
- capitalize on knowledge capital by new innovative social systems, in terms of the collective wealth of nations.

The development of powerful intangible resources is an essential issue for companies; it is also critical for public organizations, and not only because of its impact on growth and employment. As is the case for companies, public organizations must develop innovative approaches, particularly in specific horizontal fields of action: research programs, systems of education, fiscal policies, and competition policies, among others.

As it has been stressed elsewhere, considering intangibles from the policy agenda perspective can be legitimated by the strong presence of public powers in a corporate environment and in business policy building. The debate in France in the late 1990s on the future of the Minitel system, the existence of which is considered to constitute an obstacle to the development of the Internet in France, well illustrates a problem that is simultaneously entrepreneurial (a program managed by a commercial operator: France Telecom, in association with editors and service firms) and collective (it concerns the whole French community). Examining the achievements of the program, we can easily state that the Minitel made way for an interesting set of knowledge and routines, which provided France with a unanimously recognized advantage. However, this advantage could turn into a stumbling block if innovations are not made, which would make it impossible for France to continue to be competitive from the point of view of the best practices of the moment (the Internet).

Visualizing Wealth

The IC scholars considered several of the previous issues over the last five years, and several interesting initiatives have been implemented at the national level (Sweden, Denmark, The Nordic Project, Israel) and regional level (the Ligue Arab region, with the support of the United Nations; the Pacific Islands, with the support of the World Bank; or European Union [EU] projects on KE). Several databases are now available for benchmarking national or even city knowledge performance: the World Bank and the United Nation Development Program (UNDP) databases or the Organization for Economic Cooperation and Development (OECD) databases (for cities). These instruments can be considered the first step toward understanding and subsequently improving knowledge capabilities of nations, regions, cities, and other "communities."

IC for Communities is the first tentative worldwide attempt to gather leading scholars and experts to share their knowledge and perspectives on this important topic.

This volume is structured into four parts.

Part One introduces the problems of IC for communities. It includes two chapters by the editors of this issue. The first chapter, by Ahmed Bounfour, presents the issue of community as a new perspective for understanding value creation and social link building. The second chapter, by Leif Edvinsson, presents an overview of the issue of "intellectual capital in waiting" at national, regional, and city levels, and raises the question of defining a new leadership for obtaining the best social value from such a capital.

Part Two deals with IC for nations. Here, different themes of IC are presented in detail. First, the issues of measuring IC at the national level, data availability, and the impact of gross domestic product (GDP) measurement are discussed. These are the foci of the chapters by Mosahid Khan (Chapter 3) and Leonard Nakamura (Chapter 5). These two scholars provide stimulating and complementary perspectives on two frustrating issues—how to measure the KE, and what should be the impact of further integration of intangibles in the measurement of wealth (e.g., GDP). Second, the issue of national performance is addressed, including the definition of ad hoc metrics for performance measurement. Chapter 4, by Jean-Eric Aubert, presents a global perspective for knowledge and introduces how the World Bank knowledge database can be applied. Chapter 7, by Ahmed Bounfour, presents a methodological framework for benchmarking national innovation systems in Europe and brings to the fore the unique performance of the European Nordic countries. Chapter 8, by Nick Bontis, presents a set of methodologies for measuring the performance of IC of nations; it is applied here to the Arab countries. Third, a set of chapters present different national perspectives on IC reporting. Chapter 11, by Seiichi Masuyama, provides an Asian perspective of the KE, with a specific focus on how Japan copes with this issue. The weakness of Japanese firms in networking, especially around information and communications technologies (ICT), is notably stressed. Chapter 9, by Edna Pasher and Sigal Shachar, presents the interesting experience of IC reporting in Israel and its impact, including its impact at the international level. Finally, Chapter 10, by Bernhard Von Mutius, provides a German perspective on IC and insists that it is important for Germany to "build a new leadership and learn from others." From a European perspective, this is an important issue that concerns other large countries in Europe with "average performance": France, Italy, and to a lesser extent, the United Kingdom. The following questions must be posed clearly. To what extent do large European countries have policy instruments as well as socioeconomic systems particularly adapted to the KE? To what extent are they ready to develop more "feminine" and less hierarchical organizational modes (according to Geert Hofstede's cultural parameters) for their development, since this might explain the better success of Nordic countries[1]?

Chapter 6, by Jean-Jaques Mertens and Jacques Van der Meer, addresses the issue of how to consider intangibles from a long-term perspective: the European Investment Bank (EIB) perspective. This is an important issue at both the macroeconomic and microeconomic levels. The dominance of intangibles is the KE, and their intrinsic characteristics pose important analytical problems, especially with regards to the time perspective: how to make conjectures on future cash flows for items of intrinsically volatile nature; and from a macro/meso perspective, how to calculate return on investment for these combinatory items. This chapter describes the EIB experience and indicates some insights for further research.

From a more global and geostrategic perspective, Chapters 8 and 9 are considered twins and refer to one of the most problematic questions of in the present: Under what conditions would the IC of the Arab countries complement the IC of Israel? This naturally refers to the tragic problem of unrest in this part of the world. Tragedy is never a sure outcome, however, even under present circumstances. As scholars, and more importantly as citizens of the world, we believe that IC can and should be a stimulating perspective for solving the present Isareli-Palestinian conflict. Solving this conflict in a peaceful manner and according to international law is necessary for leveraging the IC of this region both for itself and for the rest of the world.

[1] At this point, this should still be considered as a hypothesis.

Part Three focuses on the IC for regions. Chapter 12, by Ante Pulic, presents an interesting method of reporting on IC both at national and regional levels. It brings to the fore interesting lessons learned from different stakeholders, such as investors, employees, partners, and suppliers in Croatia and in other European countries (Slovenia, Hungary, Czech Republic, and Poland).

Chapter 13, by Dimitri Corpakis, describes how the regional dimension is integrated within the European programs, especially from the perspective of the Lisbon Agenda (e.g., making Europe the most competitive KE by the year 2010).

Chapter 14, which is based on the PhD research of Anssi Smedlund and Aino Pöyhönen, presents an integrated approach to IC in regions that the authors term the "knowledge system approach." This vision builds on different theories and approaches (IC, competencies, and networks approaches). A case study of a small cluster localized in east Finland is analyzed in detail. One of the main arguments developed here consists of stressing that, in order to be successful, a cluster must be able at the same time to (1) make use of existing knowledge, (2) transfer firm-specific knowledge horizontally and efficiently, and (3) create new knowledge.

Chapter 15, by Klaus North and Stefanie Kares, proposes a methodological framework for measuring regional ignorance along a set of criteria: autism versus openness, blindness versus vision, and fellowship versus cohesion. Some of these parameters are worth the consideration of policymakers in their decision process. Chapter 16 by Hans-Johachim Heusler and Hans Schedl, discusses some lessons from an interesting failed experience in Bavaria (Germany), the Virtual Marketplace Bavaria Initiative. Learning from failures creates a stimulating perspective, even with contingent factors.

Finally, Chapter 17, by Lars Karlsson and Paolo Martinez, proposes insights for cross-regional learning, building on the experience gained from a European project in three regions: Blekinge (Sweden), Komen (Slovenia), and Florence (Italy).

Part Four presents interesting perspectives on IC for local communities. Chapter 18, by Albert A. Angehrn, presents the results of an interesting project related to the changing of the collaborative work of a small town located south of Paris, France. The focus here is on how to change people's behaviors with a heterogeneous perspective, using a "learning by playing" philosophy. In the same way and by assuming a different angle, José María Viedma Marti (Chapter 19) presents the results of a project dealing with the reporting and managing of IC in a small town near Barcelona, Spain: the city of Mataró. A specific method that employs benchmarking perspective is used here.

Finally, Chapter 20, by Ahmed Bounfour, concludes this volume and provides insight for a research and policy agenda.

We hope we can arouse enthusiasm among readers for this still-emerging topic.

Part One: Modeling and Contextualizing Intellectual Capital for Communities

Chapter 1

Modeling Intangibles: Transaction Regimes Versus Community Regimes

Ahmed Bounfour, *University of Marne La Vallee, France*

Introduction

When discussing the topic of intangibles, we as scholars often do not consider the major issue of its underlying socioeconomic systems, nor do we sufficiently consider the real implications of knowledge economy (KE) as a concept or challenge its organizational dimension. This chapter will consider some of these issues by distinguishing two organizational regimes: (1) the transaction regime, under which we are living since the industrial revolution, and (2) the community regime, which is still emerging, although we cannot define it in detail. Each of these regimes is considered under adapted dimensions, and their implications are derived for intangibles reporting.

The KE is now unanimously considered a totally relevant concept, designed to describe a new or at least an emerging reality in which players and communities are supposed to behave according to a certain type of criteria. Several institutions and scholars devoted a strong effort to understanding and subsequently modeling the KE. New growth theories developed strong arguments toward the integration of knowledge and technology for the understanding of growth dynamics. These theories provided arguments towards considering research and development (R&D), education, and training as key factors for economic growth. In 1996, the Organization for Economic Cooperation and Development (OECD), for instance, put forward these arguments, along three distinct dimensions: (1) knowledge distribution, especially the role of network and learning; (2) employment, due to the increase of demand for highly skilled workers; and (3) the science system, especially via the focus of the role of public research laboratories within knowledge creation and dissemination. The role of information technology (IT), on the other hand, has been substantially discussed, especially with regards to the impact of IT investment on productivity (the so-called Solow

Paradox). The discussion here raised the major issue of identifying and measuring organizational factors.

However, beyond the economic dimension, the problem is deeper and the challenges for scholars and policy makers are even greater. Examining the problem from a global perspective, we can easily agree that the dominant system under which we are living is undergoing a deep transformation. By this, we mean that capitalism as a socioeconomic system is undergoing modification towards a set of new organizational forms that until now have been quite unclear with regards to their real configurations. However, their main drivers are mainly IT, culture, and the dominant regime ("transactional" versus "community"). Information technologies are a major driving factor since they transform behaviors and, therefore, position in terms of time and space. The impact of such a transformation has been largely and deeply analyzed in terms of networking (Castells, 1998). The impact of culture is naturally important. The concept of culture is not easy to manipulate, especially in a global context. Here, it will be used in a closer sense to what Castells named identity. Indeed, we can foresee different types of groups and "communities" behaving differently according to their level of acceptance of the new system rules, but also according to their level of their integration by the system. As the Club of Rome noticed: "*the emergence of a networked knowledge society in the next 20 to 30 years is a major paradigm shift from the industrial model of the 19th and 20th century. It can be part of the solution to our problems, or part of the problem. The hope that the dynamics of information and communication technology development within globalizing markets alone will contribute to general wealth and reduce poverty is too simplistic*... " (The Club of Rome, 2002:9). Pursuing development further, the Club of Rome recommended that "*to avoid a catastrophic "clash of civilizations" in a multi-cultural world, both cultural identity and diversity must be accepted as legitimate goals in themselves, alongside respect for fundamental human rights and identification with a common set of human values*" (ibid: 10).

The nature of the dominant order is an important dimension of knowledge capitalism. What I have named the "transaction regime" is deeply challenged by its proper managerial practices. Outsourcing practices, for instance, at least fragilizes the social links within and around organizations and, therefore, pose a problem in terms of performance realization and measurement. In the interim, several initiatives have been designed at a local/regional/national level, with the aim of building communities' sense of action and wealth. These initiatives tend to suggest that in the KE, collective sense of action might be vigorous, provided that enabling conditions are established. This tends to suggest that collective action might be built on knowledge. Indeed, it is from these perspectives that I think the potential of knowledge and, therefore, of intangible resources should be considered, at least as far as "global (local) issues" are concerned.

The Knowledge Economy: Key Characteristics

In a narrow sense, the KE can be characterized by two elements: (1) its scope and (2) its specific production mechanisms. Regarding the first dimension, the KE is characterized by the dominance of three factors (Foray, 2000:3): (1) research and education, (2) relationship to growth, and (3) learning and capabilities. We can also derive a fourth factor: the importance of change as well as of the predominance of "flat" structures and social capital. In a wider sense, the KE integrates the pure information dimension. Regardless of the adopted sense, all of these factors are intangible in nature. Hence, the frequent confusion made between the intangible economy and KE. With regards to the second dimension, knowledge is characterized by the production of strong externalities, the difficulties of enforcing intellectual property rights (IPRs), its dual (often an input and output), and cumulative natures, and the nullity of its marginal cost. (Hence, herein lies the argument of considering knowledge as a public good.)

From these characteristics we can derive than the KE is basically an unstable network of flat organizations with an unstable frontier and identity. From the transaction perspective, the KE should be dominated by a weak IPR regime and, to a certain extent, by the development of gift mechanisms within and around the communities. This led some economists to talk about "cognitive capitalism," i.e., "a regime of accumulation in which the accumulation is mainly constituted of knowledge that became the main resource for value and that became the main process of valorization" (Moulier Boutang, 2002:6). This naturally has a strong impact on the way (i.e., paradigms) we view the production and regulation of systems. The Adam Smith model, improved by Taylor, is no longer relevant under different angles, especially the economies of scale and standardization, and the importance of the tacit dimension and networking as important factors for the new performance context. Organizations, from this perspective, are mainly "hollow boxes," in charge of managing and enforcing IPRs (ibid: 11).

Theoretical Modeling: The Problems With "I," "You," and "We"

If we admit that we are in the midst of a major transition towards a system where knowledge is the pre-eminent resource, then we need to discuss—and challenge—the existing theories and models. As far as the intangible thematic is concerned, we are not in a vacuum of theories but rather in a "patch-working" context (Table 1). This tends to suggest that the newness of intangibility as a problematic issue lies mainly in its transversal nature. More precisely from a macroeconomic perspective, there are long-established theories for the intangible dimension for nations' economic growth. The human capital namely states the importance of investment in education, whereas the technical change and innovation theory establish the importance of innovation as a cumulative, and more recent, incremental process. For R&D specifically, several econometric studies attempted to explain the growth residual factor following the seminal work of Moe Abramovitz (1956), starting with Robert Solow's (1957) formal growth which concludes the estimation of the contribution of technical change to nearly 50% of growth in the U.S. for the first half of the 20th century. New growth theories demonstrated the importance of knowledge as the main source of growth, and considered several items such as human and organizational capital. The evolutionary approach places more emphasis on the learning dimension of organizations and the importance of routines. Other approaches have been included here, namely the intellectual investment approach as well as the analytical approach, the latter being focused mainly on the importance of intangible investment and its impact on the gross domestic product (GDP) (Nakamura,[1] 2001; OECD, 1992; and different national statistical offices, especially from Europe: Eurostat, INSEE, in France, 1995; CBS in the Netherlands, among others).

[1] See Chapter 5 in this volume by Leonard Nakamura.

Table 1: Theoretical approaches to intangibles

Theories of Intangibles	Main Authors/ Contributors	Main Expressed Views
The Macroeconomic Perspective		
• Human capital theory	Becker, 1975; Kendrick, 1976; Schultz, 1969, 1971; Bartel, 1991, 1992	Human capital is considered a strong complement to investment in physical capital. Individuals are considered as investors, especially in education in a long-term perspective. Human factors are important contributors to the increase in productivity and innovation via know-how diffusion.
• Technical change and innovation theory	Pasinetti, 1981; Bernstein, 1989; Solow, 1957; Arrow, 1962; Mansfield, 1968; Mansfield et al; 1977; Griliches, 1957; Sherer, 1980; Soete and Patel, 1985; Mohnen and Lepine, 1991	Technical change is a cumulative process. Recent studies underlined the incremental nature of innovation and the existence of strong differences among sectors. They also provided clear evidence of the impact of innovation on productivity.
• Intellectual investment	Caspar and Afriat, 1988; Buigues et al, 2000; Dosi, 1984; Freeman and Perez, 1988; Machlup, 1962	The efficiency of the firm is dependent upon the mobilization of intangible resources (intellectual investment). This involves the creation of a proper environment to stimulate innovation.
• New growth theories	Romer, 1986, 1990; Lucas, 1988; Grossman and Helpman, 1991; Barro and Sala-i-Martin, 1995	Knowledge accumulation is the basic source of growth. Knowledge includes several items: human capital, organizational capital, pieces of physical capital, and technical change.
• Evolutionary theories	Nelson and Winter, 1982; Dosi, 1988; Amendola and Gaffard, 1988; Carlsson and Taymaz, 1991; Carlsson and Eliasson, 1990	Routines are the central focus of a firm's behavior. Firms are governed by learning processes rather than by optimization. Innovation is a cumulative (incremental) process.

• The analytical approach	Nakamura, 2001; OECD, 1992; INSEE, 1992; CBS, 1995; other European statistical offices	Intangibles investments can be approached by considering several aggregates such as R&D, technology payment, software, market research, distribution expenditures, or vocational training. Over the last 20 years, intangibles contributed to a substantial part of the GDP, surpassing tangible investment. The underestimation of intangibles often leads to an underestimation of the level of the GDP.
The Microeconomic Perspective		
• Competence view	Hamel and Prahalad, 1990	Market expectations are volatile. Therefore, corporate strategies based on core competences are more efficient than those that are market-oriented.
• Resource-based view	Barney, 1991; Penrose, 1959; Wenerfelt, 1984, 1989; Dierickx and Cool, 1989; Grant 1991, 1996; Peteraf, 1993; Nonaka, 1994	The differences of performance within industries are more important than those observed between industries. Such differences are mainly attributed to the type of combination of resources—intangibles—necessary to a specific firm.
• Dynamic capabilities	Teece, Pisano, Shuen, 1997; Teece, 2000	Competitive advantages are decreasing in sustainability over the long-term period. Therefore, firms have to develop dynamic capabilities, i.e., ''the capabilities to astutely orchestrate non-replicable intangible assets'' (Teece, 2000).
• Intangibles/ intellectual capital views	Brooking, 1997; Mouritsen et al., 2003; Bounfour, 1998; Edvinsson, Malone, 1997; Itami, 1987; Lev, 2001; Sveiby, 1997; Stewart, 1997; Mouritsen, 2003; Buck, 2003; Paulic, 1998; Bounfour, 2000, 2003a, b, c; Itami, 1989	The importance as well the specific character of intangible resources in the knowledge economy necessitates the development and implementation of ad hoc analytical framework including the measurements of their related performance.
• Knowledge creation view	Nonaka, 1994; Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998	Knowledge creation is primarily an organizational issue. Hence, it is important to develop different conversion and conversation modes, especially between tacit and explicit knowledge.

Note: References for the four first theories are mainly based on Ducharme (1998); references for the evolutionary approach are those quoted in Clement, Hammerer, and Schwarz (1998).

Socioeconomic Systems and the Dominant Implicit Order

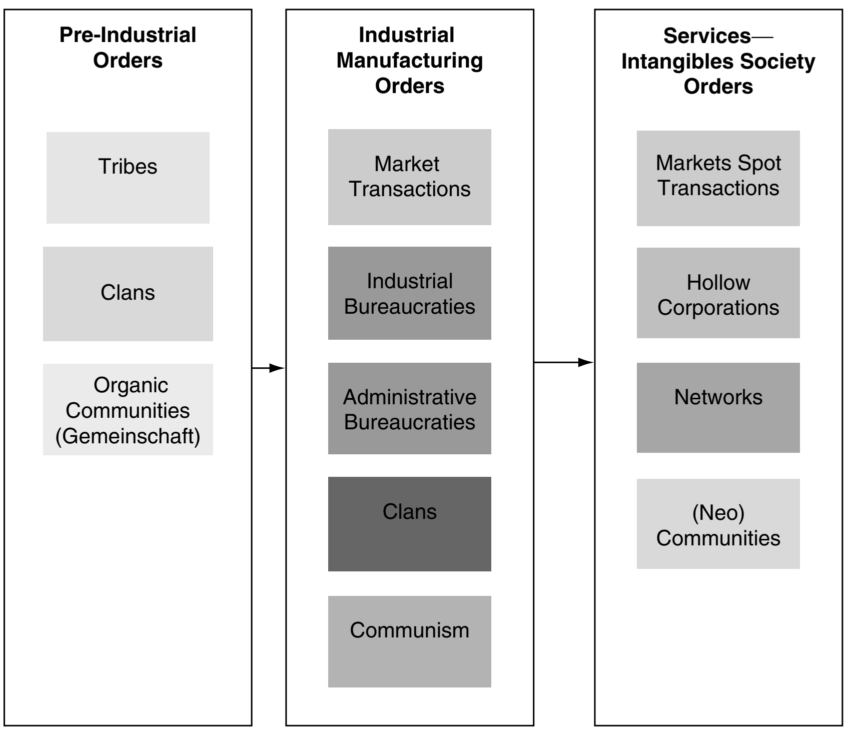
Before specifically addressing the issue of reporting and managing intangibles under the "community regime," we must consider in overall terms the dominant orders in given socioeconomic systems in a historical perspective. By order—here an organizational order—I refer to the types of socio-links and norms implicitly recognized and effectively implemented within and around organizations and more generally within given socioeconomic systems. Given the main theme of this book, I consider this issue of high criticality for any in-depth research on intangibles, under any regime, even the still dominant one (e.g., the "transactional regime").

Schematically considering this issue,, we can distinguish over the last three centuries at least three types of orders (Figure 1):

- **The pre-industrial orders**, e.g., the orders dominating before the industrial revolution and the emergence of industrial hierarchies. Three types of orders are suggested here for illustration: *tribes*, within which individual and collective behavior are submitted to specific internalized rules and hierarchies (e.g., according to groups of members' endowed resources, reputation, and honor).

Figure 1

The evolution of organizational orders from a historical perspective



Tribes, and more generally the rise and fall of the civilization, can be understood by mobilization, the concept of Al-Asabiyya (e.g., the dynamics of group relationships, suggested by the Arabic sociologist thinker Ibn Khaldun [1332–1395] [1967]). This concept helps to understand how the wealth of groups and organizations evolve and, therefore, how civilizations ("Al Umraniya") might rise or fall. Clan is a concept nearest to the tribal one; however, the difference certainly lies in its scope. Clans are less important in number than tribes, even if the concept has been applied later to Japanese groups (Wilkins and Ouchi, 1983). The community regime is taken here from the German sociologist F. Tönnies (1887), when he differentiated the concept of community *(Gemeinschaft)* from the concept of society *(Gesellschaft)*. *Gemeinschaft* refers to an absolute unit where there is an indistinctive and compact relationship between members. The conscience of members is so high that none can move without the others (Durkheim, 1889:4). The perfect form of a community is the family, but it might also be a village or an extensively small town. The *Gesellschaft* on the contrary, refers to a group of individuals who, while living peacefully, are fundamentally separated. Under this regime, the individual is the center, whereas under the community regime, it is the community, which represents the hub. As Durkheim noted, the society basically refers to the industrial society as authors such as Karl Marx or Lassal have described it.

- **The industrial-manufacturing orders** refer to the organizational forms which were born and developed after the industrial revolution. Typically, while large hierarchies—whether they are private (e.g., General Motors at the beginning of the XX century) or public (Department of Defense, Health Departments)—emerged and developed, other organizational forms have been tested and implemented: communism in Eastern Europe, China, and other parts of the world, clans in Japan, and market transactions almost worldwide. Each of these regimes corresponds to specific characteristics, but globally speaking, bureaucracies are more important than market forms.
- **The service-intangibles orders** correspond to the present situation of (knowledge) capitalism. We now have one global socioeconomic system—the "transaction regime"—applying pressure to every organization for increased performance improvement. Hence, the increase in market spot transactions (the archetype being the financial market transactions) and the emergence of hollow corporations and networks evolved. Hence, as Castells underlines, the pre-eminence of space (flux space) over time. Because of that, communities emerge as a complementary, and even under specific circumstances, and/or alternative way of implementing activities and growth. The Linux community represents the archetype of such a regime.

Transaction Versus Community Regime

If we consider the problem from a systemic perspective, two parallel and potentially conflicting views can be established:

- **The transaction perspective**: this is still a dominant nature of capitalism. Companies and collective systems are mainly driven by efficiency requirements and, therefore, any individual or collective action should be appraised from this perspective. To be schematic, a return of invested resources is the *alpha* and *omega* for the assessment of any decision and behavior. The shareholder value is the archetype of such reasoning.

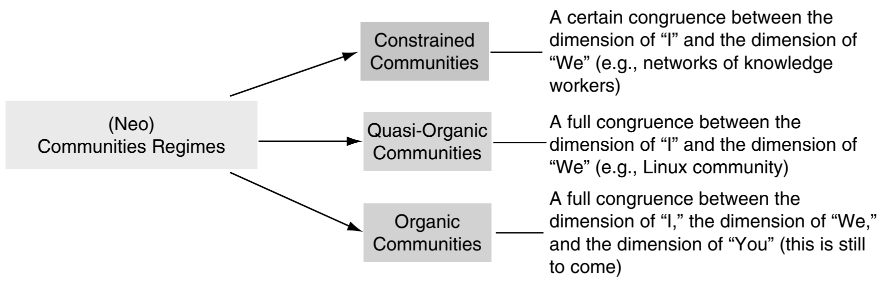
- **The community perspective**: due to its characteristics, as outlined earlier, the (cognitive) KE is probably the closest to an economy of gift. The flat structure of needed organizations, their networking nature, the high level of transaction costs, and more generally the critical nature of the organization's dimension tend to suggest that gift and counter-gift modeling is a stimulating way of viewing things in this context. The anthropologist view, as it has been developed by the French School of gift (Mauss, 1924; Caillé, 2000; Hénaff, 2002; and more recently around the French Journal-Revue du Mauss, 2000; see also several sociologist scholars such as Camerer, 1988) is certainly a starting point for reflection and action. I would argue that using community as a concept outside this perspective (for instance, in knowledge management practices) is an abuse of language.

Delving deeper, I would propose distinguishing three types of community orders (Figure 2):

- **Constrained communities,** e.g., communities in which individuals are members basically because transactions costs are high under the transaction regime. Typically, such a regime can be, and is already, perfectly applied to a network of experts or knowledge gurus. These individuals will exchange contacts, references, website citations, and reputation, in order to increase their market power. They do so because they do not have the choice, nor do they have the resources and time to afford concluding contracts.
- **Quasi-organic communities:** these communities, while under the transaction regime, develop norms and behaviors corresponding to those of communities as they have been defined by Tönnies. This is specifically the case for the Linux community in the IT area, but also for other communities of knowledge exchange. This may also apply to local communities such as districts, cities, or villages.
- **Organic communities:** these communities are yet to be developed. In the organic communities, there is full confusion between the individual and the group.

Figure 2

Typology of community regimes



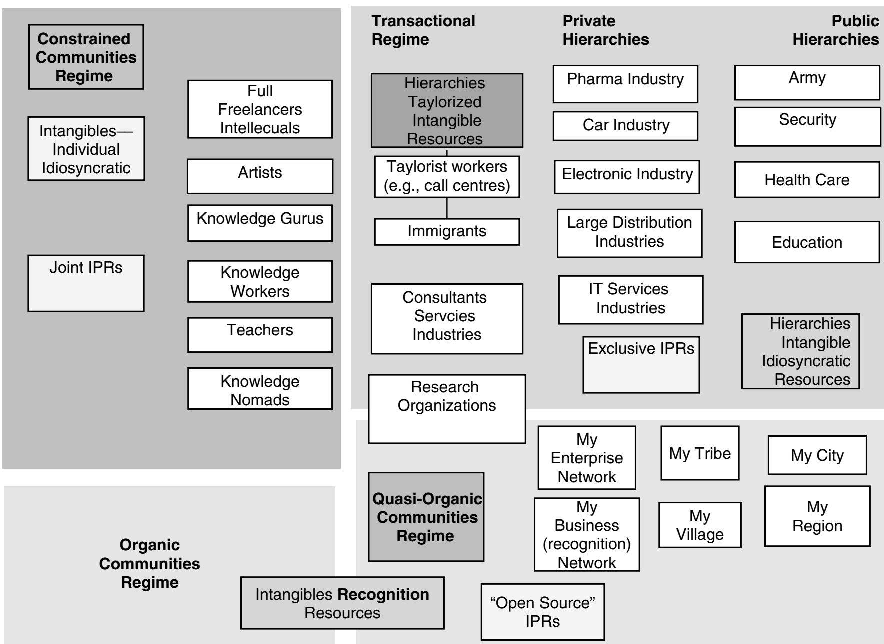
Intangible Resources, IPRs, and the Dominant Regime

Figure 3 presents in detail the component of each of these regimes, their dominant resources, and the types of dominant works concerned. Key characteristics of specific regimes can be derived from the observation of emerging practices in the KE:

- **The transaction regime** is still dominated by hierarchical organizations which are under pressure regarding networking and "leaning." Indeed, these organizations are considered less in hierarchies and more in networks (Granovetter, 1973; Jarillo, 1988). Two types of intangible resources can be distinguished for these hierarchies: 1) intangible idiosyncratic resources, e.g., specific methodologies, tacit knowledge of collaborators, patents, brands; and taylorized intangible resources, e.g., the methodologies used in production units such as call centers or factories for manufacturing products. The latest intangible resource is important to understand. It is often forgotten in the general enthusiasm for the KE: under the transaction regime, Taylor still has an important place for action. Here, exclusive IPRs are the dominating ones.
- **The constrained communities regime**: here, the main intangible resources are individual and idiosyncratic. Because of the high level of transaction costs, a joint IPRs regime is the dominant one ("I am an expert in field A, you are an expert in field B, let's join our reputation to build a joint offer").

Figure 3

Type of regimes, intangible resources, and IPRs



- **The quasi-organic communities regime**: here, the main intangible resources are those I named recognition resources. Recognition resources are important to distinguish. They are derived from the theory of gift. In quasi-organic community, the recognition principle tends to be the dominant one for behavior and "performance." Belonging to a community is based on a recognition principle. "Open source IPRs" are dominating here. However, some IPRs of exchange might be developed towards other communities.
- Finally, under **organic communities**, the main resources are fully those of recognition and no IPRs can apply under such a regime, since IPRs, by definition, mean exclusive rights.

The Issue of "I," "We," and "You"

These two parallel and, in my point of view, fundamentally different perspectives must be reassessed in the KE context. I would suggest that they be considered mainly from the ontological dimension: *the dimensions "I" "You," and "We."* By considering these three dimensions, my intent is to clarify some of the ambiguous assumptions of the so-called KE and the implications of such clarification for the reporting of intangibles.

With the dimension of "I," it is important to reconsider the place of the individual within and around organizations. Networking activities as well as the generalization of managerial practices, such as outsourcing, are important issues for individuals. However, the dimension of "I" should be considered differently and under the two proposed organizational regimes. Under the transaction perspective, if networking becomes the main way of organization, than the real intangible assets are those of individuals. In a mid-term perspective, we cannot exclude the emergence of a worldwide spot market for knowledge, supported by a strong IT infrastructure. Under this regime, individuals, as freelancers, tend to emphasize their effort on reinforcing their specific intangible assets. Under such a scenario, and in a provocative way, we might assist enterprises, except those adopting an extremely lean form.

Under the community perspective, the dimension of "I" is naturally posed differently. Individuals are members of relatively stable communities, most being of voluntary nature. Collective activities are driven basically by gift, which also has its proper norms and rationality: gift and counter-gift of knowledge, ideas, concepts, and knowledge artifacts. This does not mean, as it has been stressed by Bourdieu, the absence of any economic rationality of behavior, but economic arguments are not stressed in the same terms as in the transaction regime.

The dimension of "We" refers to the existence of collective action within and around organizations. Taking into account previous developments, it is clear that under the transaction mode, the dimension of "We" is deeply challenged: less and less people believe in their corporate strategies . . . nor they do believe in their politicians' promises and capabilities. Under the community regime, it is clear that the dimension of "We" is particularly relevant: individuals believe in their community and, therefore, they adopt behavior consistent with its main objectives.

The dimension of "You" refers to the way "others" gauge "others" behaviors and performance. For instance, this is the situation of financial analysts, who produce judgments on the performance of others. From several bodies of research, we know that financial analysts suffer from an asymmetry of information, especially with regards to the performance and measurement of intangibles. More generally, this refers to how companies and organizations are judged from external stake holders. Under the transaction regime, the dimension of "You" is basically driven by competition (cooperation) rules among the productive system. Learning processes are also to be considered, especially in the perspective of bench-learning, but such a process cannot be pushed further in a context dominated by rivalry considerations. Under the community regime, organizations behaviors are consequently and mainly driven by learning and gift and counter-gift principles.

Vertical Versus Horizontal Language: "Grammar" Or Photography?

In the post-Enron era, and more generally if we consider the ongoing crisis on performance judgment, one of the major issues concerns the type of dialogue that might be organized between the "We" and "You" layers. Under the transaction regime, if we follow the recommendations of the actual dominant paradigms, i.e., the resource-based view (RBV) of the firm, then every "We" is singular as well as every "You." Hence, the predominance of the *vertical signifying dimension* (Bounfour, 2003a). Here, the focus of any judgment should be in "dissecting" the grammar of each organization, a grammar which is necessary-specific. Intention and action are in a mutual dynamic interaction, which do not make ease the job of external analysts. The grammar[2] is more important than the photography (i.e., the horizontal dimension).

The *horizontal dimension* refers to a possible standardized language for comparing the performance of organizations. Typically an item, such as a turnover, or a set of items, such as a balance sheet, belongs to the horizontal language. This language does not provide the grammar of the organization, it only delivers its photographer. Hence, it establishes the impossibility of a naive benchmarking (Lundvall and Tomlinson, 2002) as a way of managing organizations. Regardless of the considered socioeconomic regime—transactional or community—the horizontal dimension will have less relevance. Moreover, horizontal language is mainly built on past norms and routines. It cannot explain ongoing and more importantly future and emerging routines, which are still to be built, identified, and externalized.

"I," "We," "You," and the Problem With Organizations' Boundaries

Whatever the regime under which we consider collective action, the dimensions of "I," "We," and "You" naturally have to be related to question of organizations' boundaries and therefore, the organizations' identity. As it has been stressed by several scholars in organization science, individual and collective behaviors need to be inserted under established (recognized) frontiers. We should admit here that this important requirement is deeply challenged by the daily decisions of executives and also by the increasingly weak ties between individuals and organizations. We are then in a paradoxical situation when we discuss organizational performance, whereas in practice, especially under the transaction regime, the existence of organizations, at least in their traditional mode, is deeply challenged. Therefore, the community regime may have to assume the lead, especially if what I have named the "freelance" scenario became the dominant form of collective action.

Community Versus Transaction Regimes: What Are the Possible Links?

In fact, the frontiers between the two regimes are yet to be established and clarified. Several options might be considered and three scenarios at least can be distinguished:

[2] A concept I use differently from Pentland (1995).

- **The "freelance" scenario** (e.g., constrained communities regime): In this case, most people are self-employed. Organizations will mainly be in charge of managing interstices and generated royalties from their legal assets (IPRs, etc.). Under this scenario, we may assist to the end of the "salaried form" as a way of regulating economy. Even if we are still under the transaction regime, a new implicit order must be discovered. Here, the community regime might appear as a necessity for individuals due to the high level of transaction cost they have to face. But such a scenario is not unrealistic, if we observe carefully what is happening around the organizations, including economies with strong welfare systems such as those of Western Europe.
- **A hybrid scenario** (e.g., transaction regime + constrained communities regime + quasi-organic communities regime) is characterized by the coexistence of community and transaction regime. To a certain extent, such a scenario will constitute an extension of what can be observed in different places.
- **A full community regime scenario** (organic communities regime): If this scenario occurs, it may indicate an end of capitalism as a form of socioeconomic organization.

It is important to consider this prospective dimension for reporting and managing intangibles. The subject is not as neutral as it might be considered at first glance. The (dialectical) relationship between "human capital" and "structural capital" can be considered from a different angle when we introduce the issue of the future of socioeconomic systems.

Implications for Intangibles Reporting

From my perspective, I would consider the "freelance" scenario more likely to be the dominant one among the three announced scenarios. This returns us to the question of the crisis of the organizational implicit order. Implicit order means *the recognition by most people of norms of behaviors and values which they respect in most of the circumstances without any need of constraint or explicitation*. From the theoretical point of view and to a certain extent, this question can be related to the theory of conventions as it has been developed by some French economists, such as Orléan.

Indeed, the present crisis in organizations' management brings to the forefront the way we should consider internal social links and, therefore, how to report on them. The generalization of managerial practices, such as outsourcing and networking, tend to suggest that organizations should be considered as "a set of temporary contracts" (according to the agency theory principles). If this is the case, then the problem of how knowledge is created and valorized might have to be considered from a different perspective: the individual perspective. This naturally has an influence on the type of taxonomies that should be developed and used from the intangible report.

By considering this problem of dominant socioeconomic regime, the question of reporting on intangibles can be seen from a different angle: the type of dominant organizations and the issue relating to judging their level of performance (Table 2). Here, we can see that two major issues can be derived: a socioeconomic issue related to the type of links individuals establish with organizations, and a more "technical issue" related to the possibility of horizontal comparison of performance within the KE.

Table 2: Critical issues for reporting on intangibles under the two regimes

	Transaction Regime	Community Regime
The dimension of "I"	Individual knowledge assets are of particular relevance.	To exist "I" needs to be inserted into "We's."
The dimension of "We"	"We" is decreasing in relevance. There is more focus on the "structural capital" dimension.	"We" is necessary to valorize individual knowledge assets. Methods for reporting are still to be defined.
The dimension of "You"	Asymmetry of information, idiosyncratic nature of "combinatory function," and grammar is more relevant than photography. Learning is more relevant than benchmarking.	The language of "You" is still to be defined.

Individual Organization Relationship: Impact on Taxonomies

From the previous perspective, it is clear that one of the most important criteria for analyzing intangibles lies in their level of dependency (i.e., dependency towards organizations' personnel and external stake holders); two types of intangible resources can be distinguished (Figure 4):

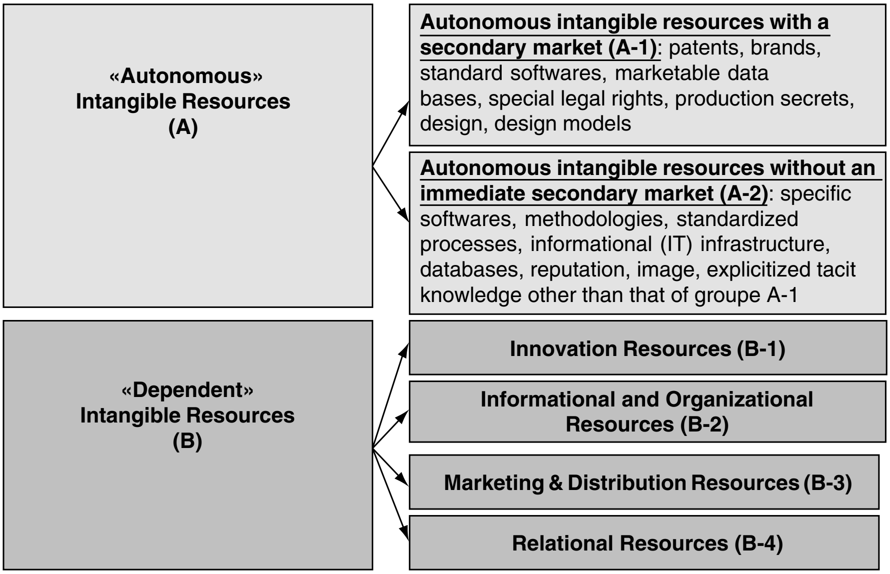
- **The "autonomous" intangible resources**, include two subgroups: those resources with a secondary market, such as brands, patents, or standard software, and those without a secondary market, such as reputation and business-specific methodologies.
- **The "dependent" intangibles resources**, include five subgroups: innovation resources (i.e., innovation investment and capabilities), informational and organizational resources (processes, structures, routines), marketing and distribution resources (customer relationship management [CRM] resources, brand's reputation with clients, clients' contacts).

The Horizontal Versus Vertical Dimension for Reporting on Intangibles

How do we report on intangibles in the KE? Answering this question necessitates a crucial trade-off between grammar and photography, i.e., between vertical and horizontal languages for reporting. From previous statements, the vertical dimension might appear as more relevant than the horizontal one. From the strategic point of view, for any organization, disclosing information is not a neutral exercise. It reduces the asymmetry of information for the user, but also communicates the intentionality of the providers (according to mathematician René Thom's concept). Using this double

Figure 4

A taxonomy for intangible resources



perspective—signifying and intentionality—I would suggest that disclosure strategies be organized (harmonized) along these two dimensions. This has been detailed elsewhere, under the IC-dVAL® approach (Bounfour, 2003a, Chapter 11).

The **signifying (horizontal) dimension** requires better harmonization, in order to reinforce the meaning of the message by strengthening its reliability and comparability. Here, present accounting tools—profit and loss statements as well as balance sheets—might be revised in order to introduce different intangible items within a disclosure perspective. The normalized part of reporting aims at satisfying the signifying dimension. Taking into account the possible emergence of a "freelance" scenario, this dimension will mainly concern "independent resources," the so-called structural capital (patents, brands, etc.). Companies and organizations will be mainly judged on the basis of their capacity to generate such resources. Under this dimension, the balance sheet will mainly include those items of independent nature.

The **intentionality dimension** refers to the necessary contingent nature of an organization's strategy and performance. In other words, intentionality translated *collective beliefs* about the present and future of the organization's products, services, culture, game rules, etc., including the introduction of innovative routines for all practices. The intentionality dimension might be illustrated metaphorically by a blank page given to people so that they might draw up their own conclusions. From this perspective, harmonization should be at a minimum. This open, non-normalized facet provides meaning to the dimension of intentionality. But intentionality presupposes certain stability in organizations' identity and frontiers. Such a requirement, as we know, is still problematic, at least if we consider the present organizational routines. Intentionality will certainly be more meaningful under a community regime.

Conclusions

Modeling intangibles, and reporting on, is a major socioeconomic issue that cannot be considered as a neutral exercise. The ongoing deep transformation of capitalism has to be integrated within our research agenda, by seriously considering the underlying socioeconomic regimes and rules. This chapter has attempted list some of these issues and their implications for reporting. These hypotheses will be refined within the author's forthcoming research.

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Chapter 2

Regional Intellectual Capital in Waiting: A Strategic Intellectual Capital Quest

Leif Edvinsson, *Lund University, Sweden*

Growing Imbalance

What is the balance today between knowing and intelligence versus not knowing and ignorance? Test your mind on the following:

> Where is value being created in your country, region, or city? Is there another value logistics/flow emerging, calling for another knowledge, active intelligence, and intellectual capital (IC) entrepreneurship? Can there be another ecosystem to shape the value platforms for the new wealth of nations, social intelligence systems, and turning the future into an asset? What is the pattern of knowledge creating of your nation for turning the future into an asset? What does the map of the nation's knowledge and IC look like? Where are the intelligence communities or cities? What major social innovations can be seen during the last five years? How will there be a growing call for a new intelligence deal for wealth of nations for communities based on society entrepreneurship, intelligence culture, and social innovations? What kind of social capital feeds an intelligence perspective for society entrepreneurship?

What we know today is that there is an exponentially growing flow of new insights, knowledge, and research that are rapidly and globally spreading among others over the Internet. The investment into digital or information technology (IT)-related packaging of knowing has never been larger or more rapid; according to some measurements it is estimated to be beyond $1 billion annually. This has led L. Nakamura (see Chapter 5) to pose the question: is a trillion dollars missing in the gross domestic product (GDP) in U.S.? Consequently, we have perceived a growing strategic knowledge chaos or challenge related to these intangibles for strategic sustainability.

Intangibles Map and Volumes

The investment among 18 countries in the Organization for Economic Cooperation and Development (OECD) in 2000, according to M. Khan at OECD, varied from 2% to 7% of the GDP, with Sweden and the U.S. at the top end. This figure is based on a narrow definition of expenditure for research and development (R&D), education, and software investments. With a broader definition, this figure would increase in the knowledge intensive economies to be beyond 10% of the GDP. Furthermore, in those countries the intangibles investments seem to be more than 60% of the total investments. Investments into innovation for both manufacturing and service sector is estimated to vary between 1.7% and 7.5% of the GDP.

At the end of 1990s, the Bureau of Economic Analysis was initiated in the U.S. with the purpose of assessing intangible investments in order to obtain a more elaborated view. The intangibles investments of domestic U.S. corporations for the year 2000 has been estimated by L. Nakamura (Federal Reserve Bank of Philadelphia) to be in the range of $700 to $1,500. In relative terms, this is approximately 10% of the GDP in U.S. that is not included in the national wealth mapping. This is probably only a fraction of the input dimensions of the value of intangibles. The aggregated value of intangibles of the U.S. economy is estimated to be larger, especially measured as output value. What is also interesting from his research is that the allocations of those intangibles investment has mainly been in software, information and communication technology (ICT), and R&D as well as advertising/entertainment which represents about 80%. Furthermore, a major proportion of these ICT and intangibles investments seem to have gone into intangible financial services development and infotainment. The R&D for the U.S. is estimated to be close to 3% of the GDP, or around $265 billion. This would further challenge the mapping and accounting of the knowledge economy (KE) wealth.

In Europe, this has also resulted in a quest for promoting the competitive investments into intangibles, also called the Lisbon agenda (from the European Union [EU] summit in Lisbon, Portugal in 2002).

The aspiration is to lift the investment of (especially) R&D to the level of 3% of the GDP for EU's 12 countries.

The total expenditure in 2000 on R&D for the countries in the OECD is estimated to $563 billion. The distribution among major regions is: U.S. 47%, EU 31%, and Japan 17%. Sweden is reported as investing 3.9% and Finland as 3.4% of the GDP. The average for OECD countries is reported to be 2.4%. Adding educational contributions to these investments would raise the amount to more than 5%. The software investment has recently grown but is still approximately 1.4% of the OECD's GDP.

This highlights both the magnitude and shift of investments into intangibles as well as lack of systematized assessment and mapping of the value creation based of these expenditures. Is the value equivalent to input, is it more in line with the output, or is the impact visible only over a longer time than the accounting cycles?

Recently, *Economist* launched the Latte index. It is similar to the more famous Burger index. It compares prices for coffee as well as earlier burgers around the world based on purchasing power parity, calculated by dividing the local currency price by the dollar price. Next to come might be an oil or energy index. The index highlights whether a currency is overvalued or undervalued. It basically shows the application value of products. How would it be with a similar index for knowledge, or intellectual capital for regions, cities, or nations? In this book, some models are outlined for further refinement and research.

Some Global IC Perspectives on Regional IC

Sweden is today statistically positioned very high on the scoring done by the OECD regarding competence; however, it is lower on financial welfare creation.

Behind this has been the investment into R&D and ICT as well as education. In the global context, there is a rapidly growing competition for talent and knowledge from a number of strategic knowledge initiatives.

- **Finland** is today regarded as the most rapidly growing investor in R&D. Sometimes also described as the Kuwait in the global ICT economy!
- In **Sweden,** Skandia was the first company in the world to prototype such knowledge intelligence by the IC reporting in the early 1990s; it is now followed by many companies, researchers, and governmental initiatives. Also see the first type of IC benchmarking and rating launched in Sweden in 1997 at www.intellectualcapital.se; it is now licensed to many countries. The prime mover model future center was inaugurated in 1996 by Skandia.
- Some years ago, **Denmark** launched a competency council on national level for more integrated collaboration between the private and public sector to take a leadership position in the KE. This led to a prime mover status for knowledge reporting and the government has a website for such IC reporting (www.vtu.dk/icaccounts). In 2001, they inaugurated the very first public future center run by the Ministry of Economics (www.mind-lab.org). In 2003, they launched a similar innovation council which pushed Denmark into the forefront on innovation. In June 2004, another semi-public mind lab was inaugurated (www.momentum-nord.dk).
- In **Norway,** several interesting initiatives have been prototyped. One is the IC rating of Larvik Kommune (www.larvik.kommune.no). Another is the IC rating of the Norwegian oil plateau. And yet another is the prototyping of a future center to nourish society entrepreneurship (IC-reporting guidelines were launched by www.finansanalytiker.no.)
- **Italy** has also been pioneering on the measurement of intangibles and in 2004 the financial launched guidelines. The AIAF (Italian Association of Financial Analysts) has elaborated guidelines and communication model of intangible assets for Italian companies. Beginning in 2005, Italian financial analysts should classify companies also on the basis of their level of "disclosure" concerning their intangible assets.
- **Holland** was also early to initiate national schemes on the KE. Now in 2004, they are amplifying their aspirations both by an IC research center at Nyenrode University as well as the public innovation center in Hague.
- Besides the KM Forum at Henley Management College, **England** has been prime mover for e-government but has recently developed prototyping public private partnerships (PPP) for leveraging idle knowledge capital and society entrepreneurship. In 2002, a special unit called Social Enterprise Unit was established.
- It is forecasted by Peter Drucker that **China** will become the world largest buyer and importer of knowledge on all levels!
- In September 2003, **Dubai** launched itself as a leading knowledge city, in sharp competition with Singapore. The human capital is focused on the support of

augmenting learning environments, so-called campus with integrated high-tech structural capital.

- In December 2002, the Minneapolis–St. Paul region in **U.S.** was ranked as number one on the global competitive index, outpacing Silicon Valley and Austin, Texas, as knowledge regions.
- In **Taiwan,** the governmental department of industrial technology founded the Taiwan Intellectual Research Center (TICRC) to create international authoritative knowledge repository for IC and assisting to progress the IC in Taiwan.
- **Austria** adapted a law during 2002 that requires all universities and colleges to report, at the latest, their knowledge capital, in so-called Wissenbilanz as separate reporting on institutional knowledge goals, knowledge processes, and knowledge indicators. The very first prototype was done by the University of Kremz, Austria (www.donau-uni.ac.at/wissensbilanz).
- The Ministry of Industry in **Germany** is now under similar 2004 prototyping reporting initiatives for small and medium-sized companies (www.wissenskapital.info).
- The so-called knowledge cities or knowledge zones are emerging, with a very visible case in **Barcelona** and its special strategic outfit called 22@ for exploration into the future. The core of this is shaping the urban design for the KE and its knowledge workers.
- In January 2004, **Vancouver** was ranked as the most attractive city in which to live and work.

Longitude Perspective

This growing space of not knowing is demanding more strategic intelligence or knowledge navigation capability on society and enterprise as well as on the individual level. The core is the capability to perceive and relate to the surrounding context. The alternative is growing ignorance, stress, and competitive failure. We need to improve our perception and mapping of new strategic knowledge navigation perspectives.

This may be named a longitude perspective or the 3-D of strategic management beyond the time and costs as traditional perspectives of the balance sheet; it is about sustainability, ecology, and meaning-making. This calls for another ecosystem than the pure financial economy. The longitude perspective is based on the third dimensions of intangibles. This is capital-in-waiting as opportunity space and highlights the cultural context for value creation. It may even be regarded as sustainable wealth-in-waiting, addressing the issues of corporate social responsibilities! For further reading see the Edvinsson book (2002) on www.corporatelongitude.com.

The new corporate longitude is focusing on the lateral dimensions as well as time to the future. The core distinction of intellectual capital is future earnings capabilities, i.e., not historical costs, but rather futures, i.e., to think ahead. This calls for another type of leadership role than traditional management. On the basis of a research project from 2003 with the EU entitled PRISM, I developed some values chain modeling as the new theory of the firm. This modeling is highlighting the value, creating areas of the enterprising as well as the key focus area for leadership.

At the center is the "value creation space" where IC leadership faces the challenge of leveraging these longitudinal resources and creating economic value adding. This is the dialectic space or kinetics for knowledge entrepreneurship. It might lead to growth of capital on the balance sheet as well as impairment of the balance sheet. In such a situation, value destruction will occur. A critical question here will emerge: what is the knowledge navigation and leadership of today doing to avoid erosion and leverage the idle IC-in-waiting, and how do we know about this from the reporting maps?

For a nation or region to address this growing strategic competition for global competency and talent nourishment, it is necessary to develop increased intelligence and mapping systems as well as shaping new competences on individual, enterprise, and society levels. Knowledge zones of tomorrow will be shaped based on complexity/ chaos, intelligence, digital competencies, and cultivation.

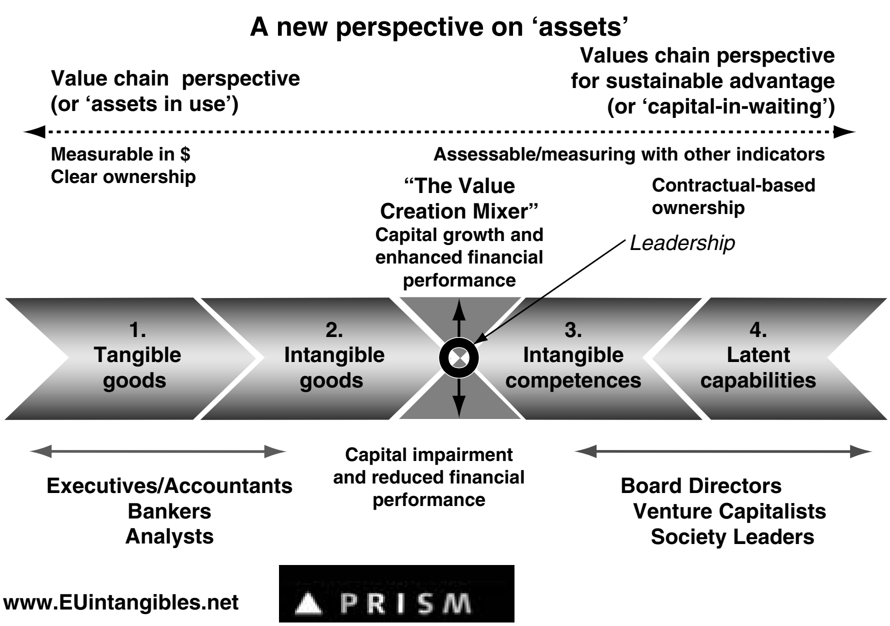
Ragusa: A City of Intelligence

Ragusa is an interesting bench-learning case of a city of IC wealth. It was both a city and a republic on the coast line of the Mediterranean, more precisely the Adriatic coastline. It had one of the highest standards of living for 500 years. It sustained its independency throughout five centuries. In the article "Ragusa Intelligence and Security 1301–1806: A Model for the 21st Century?" the late professor Stevan Dedijer, known as the "father of social intelligence," elaborated on the key success factors for Ragusa. I have rephrased them to sustainability factors for knowledge regions.

Ragusa, according to R. Harris (2003), was legendary for its diplomatic expertise, its political stamina was extraordinary, its merchant trading was huge throughout the Ottoman Empire, and it enjoyed privileges denied to other Western states. A politically skilled and commercially enterprising ruling class took every opportunity to maximize the Ragusan republic's wealth.

Figure 1

Value areas for IC entreprenurship. Source: www.euintagibles.net and Leif Edvinsson



At the end of 15th century, it had the largest fleet of merchants in the Adriatic Sea. During the second half of the 18th century, it established 60 ambassadors or intelligence offices in almost all major cities in the Mediterranean. On the Ragusan flag between 1358–1806, "Libertas" was written. Then for the first time in its history Ragusa was occupied by the forces of Napoleon, and in 1808 it ceased. Today, the city is called Dubronik in the state of Croatia.

The sustainability factors for Ragusa have been extracted in a research by one of my master students, D. Radovanovic, at Lund University in 2004. They can be summarized as follows:

- Organized strategic intelligence and security. (According to Dedijer the first European function for intelligence and security emerged in Ragusa in 1301).
- Political stamina and governmental diplomacy
- Spirit of the city and cohesiveness
- Diversity with intensive immigrations in a quest for collective wealth
- Rich cultural life, and multi-linguistic with writings in three languages
- Scientific environment and cultivated knowledge tradition
- Favorable geopolitical position and infrastructure for transports and communication

One of the most intriguing aspects of learning is this capability to develop inside as well as outside "eyes and ears" for future sustainability. Ragusa can be regarded as an intelligent city since its government used its international contacts to detect signals from the surrounding world to learn and adopt rapidly. They were among others in developing special young dragomans for the role as knowledge navigators or more formally ambassadors.

In order to gain sustainability a knowledge region or city must focus on social innovations; for that it needs intelligence. According to Dedijer, social intelligence is the capability of a society or enterprise to learn about its environment, context, and its self and to foresee the future. It is not only about being informed but rather understanding the gathered information and using it for sustainability. This might be the central part of an ecosystem for the future. The opposite is the ignorance that is illustrated by professor K. North in the ignorance meter in Chapter 15.

Intelligent City—Knowledge City

The concept of an intelligent city is a work in progress. Most of the distinctions of an intelligent city are emerging from an IT perspective.

The World Teleport Association has a special interest group on intelligent communities with an award to the most intelligent city. According to them, the following critical success factors form the intelligent community: broadband infrastructure, knowledge work force, innovation, and digital democracy. A list can be accessed on www.intelligentcommunity.org. Others on the list include Singapore, Dubai, and Osaka.

Another distinction of an intelligent city has been offered by N. Komninos (2002). He defines intelligent cities as islands and communities where the innovation processes meet the digital world and the applications of the information society. The function of an intelligent city is related to production of knowledge such as R&D, technology transfer, innovations, and networking. These functions occur in real space by human interactions and in virtual space via ICT. Three basic components of an intelligent city have been highlighted:

- islands of innovations, e.g., cluster of industries and services
- virtual innovation system including knowledge tools, e.g., science parks and telematics
- integrations, i.e., connection between real and virtual innovation systems

Another distinction that connects the concept of an intelligent city with the IC paradigm is described by G. Bugliarello, Chancellor at Polytechnic University in Brooklyn, New York. He argues that an intelligent city is one that has the ability to successfully self adapt to threats and to change and renew. It is rather close to the dimensions of Ragusa as elaborated by Professor S. Dedijer on social intelligence. Bugliarello also argues that the city must be efficient in its use of resources, and highlights the importance of education as a core element of civilization. This is very close to both the dimensions of A. Pulic on IC efficiency as well as the research of N. Bontis on IC diversity for regions that highlights the importance of R&D as the number one factor and education as the number two factor.

The intelligent city may be characterized by the following attributes as a K-recipe:

- attractor for knowledge workers and the creative class
- good geopolitical position
- mobile city with networks to various clusters and meeting places with important people
- communicative city with good logistical flow
- cooperative city with high value making through various exchanges
- healthy, fresh, and humane; offers good quality of life
- curious citizens with active interfaces towards the unexplored
- generous city with cultural capital and coherence in emphasizing values
- action intensive city with a multitude of active interfaces
- wealth-creating
- safe and peaceful

According to the research on Ragusa, three major sustainability factors can be grouped as clusters for further elaboration:

- Intelligence, being well organized to relate to the external structural and human captial
- Governmental leadership for providing structural capital as precondition for wealth creation
- Community spirit or values for bonding human capital with different structural institutional capital for the larger common good of the city

More and more cities are declaring themselves as knowledge cities, where the political agenda is developing the context or structural capital for human capital growth to collective wealth. Here is a list of some of the emerging key cases:

- Singapore
- Barcelona
- Manchester
- Copenhagen/Malmoe
- Dubai
- Melbourne
- Shanghai
- São Paulo

In its extension it may result in another emerging concept for urban design—En2Polis, the knowledge city of the future. Some of the major features might be: gateway to world knowledge, knowledge bank, knowledge exchanges, knowledge Olympics, knowledge tourism, and so on. For more, please see www.entovation.com.

Accounting and Measurement

Why is measurement so important? Simply, it is because of a lack of intelligence and communicable information which affects trust as well as the efficient supply and distribution of future resources. What is needed in a growing complexity is a clarifying supportive system to sensitize our minds to perceive the *best options*. In other words, we need mapping systems to assure us on the angle of longitude navigation into the future, as stated by Prof. Andriessen, making sense of IC.

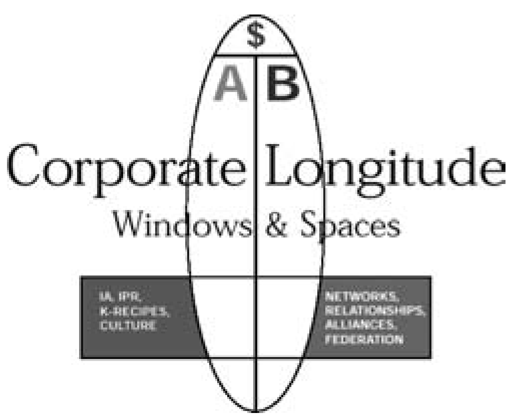
What measurement systems can support this change in orientation? Certainly the contribution from the essential associated intangibles such as trust, brain efficiency, and healthy collaboration are well beyond the scope of conventional accounting systems. The value of relationships needs to be measured as well as the contribution from knowledge recipes.

In terms of measurement, the traditional reporting model mainly represents the tangible goods sector and has begun to encroach into the intangible economy sector, based on emerging requirements from the International Accounting Standard (IAS) Board and its rule IAS-38. Furthermore, the IAS rule 1 was refined in 1999 to include more dimensions of the enablers for financial impact. However, it is not yet able to represent the full potential of the networked intangible business model of the 21st century based on IC. In large part it is restricted by the concept of ownership and confined to reporting on elements it can identify within a firm's legal boundaries. This is inadequate in the KE. What is needed is the lateral accounting perspective of the corporate longitude intangible items.

Below is an illustration of corporate longitude as a lateral dimension of intangibles inside and outside the traditional enterprises' vertical balance sheet. What is needed is

Figure 2

The corporate longitude. ©Leif Edvinsson



an intelligience perspective window for those external value-creating spaces, illustrated by the navigation colors red and green.

As the new economical value is in the longitude, i.e., lateral dimensions instead of vertical dimensions, we must develop more lateral benchmarking accounting of value creation potential of intangibles. We must acknowledge such new intangible indicators and instruct the accountants to audit those as well as annual reports that present transparency of such IC in order to navigate these new organizational value creations. One of the most refined recent IC reports closely following the experiences from my prototyping IC reporting at Skandia was made during 2002 by Alexander Welzl, then at Seibersdorf Research Center, and his IC pioneering colleagues in Austria, among them, Dr. Manfred Bornemann (see www.wissensmanagement.TUGraz.at). Furthermore, in Austria during 2003 a law was launched requiring all universities and colleges to publish an annual knowledge capital report, showing knowledge goals and knowledge processes as well as knowledge indicators. The very first prototype was done by the University of Kremz, Austria (see www.donau-uni.ac.at/wissensbilanz).

In Sweden, the very first similar prototype for R&D institutions was launched 2003 by the CMM-Center for Molecular Medicine at Karolinska (see www.cmm.ki.se), focusing on three levels (i.e., output, outcome, as well as impact).

Working with the measurement of such long-term intangible medical research, it has become important to examine the output values as well as the input costs. The key here, may be in addressing the output values and differentiating those into three categories

- output in the short-term perspective, tangible and intangible (e.g., no scientific articles)
- outcome factors in the medium-term perspective (e.g., no of patents or knowledge recipes)
- impact factors in the long-term perspective (e.g., health improvement)

Several measurement approach methods for regional IC have been presented elsewhere by Dr. Nick Bontis, Professor Ante Pulic, Professor José Viedma, and Professor Ahmed Bounfour.

The IC rating is another important assessment tool, complementary to the Standards and Poors (S&P) rating of financial capital in progress since 1997. The IC rating concerns benchmarking the perspectives of efficiency, renewal, and risks on IC components for future earnings potential (see more on www.intellectualcapital.se). It is now used by more than 200 organizations in both Europe and Japan. It seems to be especially interesting for public organizations such as schools and hospitals that do not have the public stock market as a grading reference point. This approach is now also being applied for the regional IC rating of cities and regions. The IC rating provides both a map for benchmark versus best in class, but also a platform for assessing the future earnings capabilities, thereby creating an intelligence trust for the future. As a case for a city IC rating the following might be illustrative.

It highlights the components as well as the efficiency, renewal, and risk, graded on a 10-degree scale from AAA to D.

What is visible in the above model is the low level of efficiency and thereby the high risk related to branding/attraction and relationship networking. These seem to be core strategic indicators for the regional ecosystem. A similar pattern is also highlighted in a master thesis by H. Christiansson and K. Rosengren on regional IC assessments (Spring 2004 from Lund University).

Figure 3

Regional IP ratings

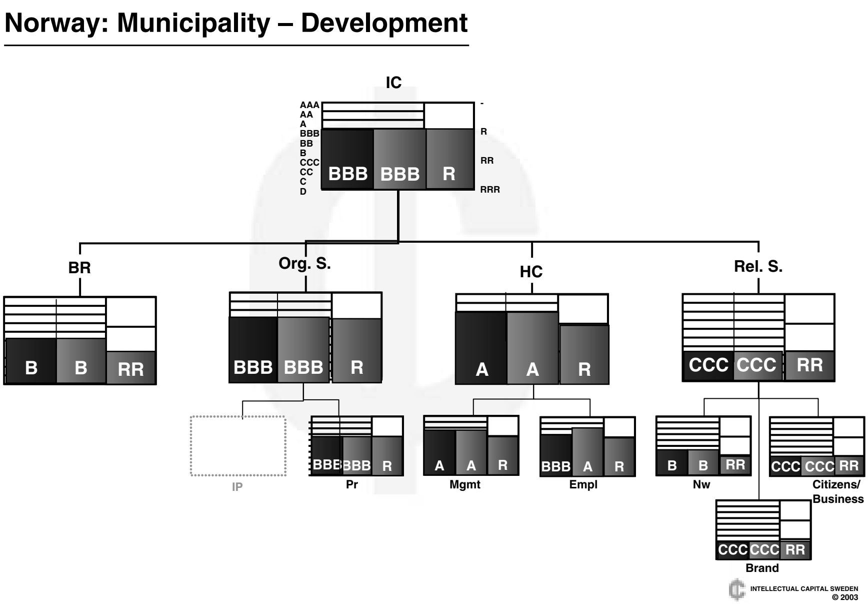
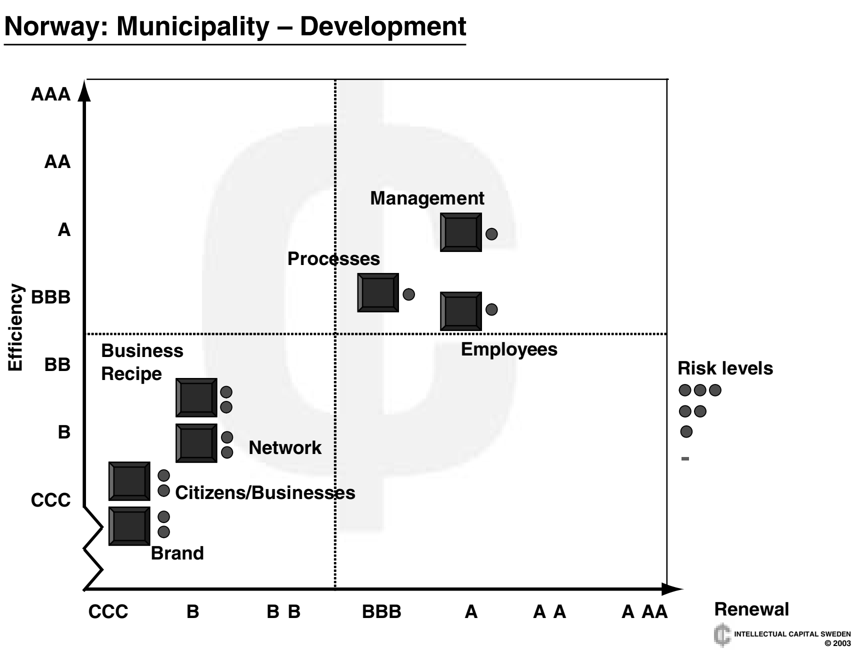


Figure 4

Regional IP action map



Growing Strategic IC: IC Multiplier

What is needed in this growing complexity is a clarifying supportive system to sensitize our minds to perceive the *best options*. In other words, we need mapping systems to assure us on the angle of longitude navigation into the future. Lack of intelligence on the performance of IC and communicable information affects trust as well as the efficient supply and distribution of future resources.

The concept of IC can be defined as the human capital combined with strategic structural capital to get a multiplier effect for the future earnings capabilities. For an individual as well as enterprise or region, it is necessary for leveraging this strategic multiplier effect.

The knowledge creating dialectics will be shaped by the new potential interactive combinations, rather than the old repetitive best-practice approach. In Edvinsson's research, it is called the IC multiplier, i.e., multiplying the human capital potential with the surrounding structural capital (SC/HC > 1). A good approximation for this is value adding per head. It shows how good the staff is in using the structural capital provided by the stakeholders. Consequently this will also be an interesting key indicator of the leadership power to release the brain power potential of the clusters of people inside and outside the firm, by the usage of ICT as challenges. Also see www.intellectualcapital.se.

Communicating these intangible interactions is crucial to attracting the right resources for wealth creation. Such creative modeling routines are highlighted by Professor Nonaka and are named *KATA* which could as well stand for IC accounting. In other words, assuring to create trustworthiness. Lack of intelligence on the performance of IC and communicable information affects trust as well as the efficient supply and distribution of future resources.

A master thesis from Lund University in 2002 (Berglund, Groenvall, and Johnson) shows very high correlations between the IC multiplier and the stock market value. This thesis shows that value adding per head up to 84% can be predicted by the IC multiplier, and up to 62% can be predicted by the stock market value. Another master thesis from the Lund University in 2003 (Dr. S. Arvidsson) showed that systematized communication in research and partnership development for sustainable earnings have a stock market impact of about 2%, but only for about 20 days.

Cultivating Leadership and Nourishing Strategic IC

Furthermore, the new unit of analysis in the knowledge era will be innovations and sense-making, which might reconnect to the ecology of the knowledge economics. It is about the roots meeting its context. It is about cultivating spaces for such meetings both to happen and when happen in order to release brainpower potential. It is about the intangible enablers for knowledge exchange and knowledge interactions by longitude leadership. Traditional offices might not be the solution, but rather knowledge cafés as the exchanges for new thought leadership may be an answer.

What is needed in a growing complexity is a clarifying supportive leadership system to sensitize our minds to perceive the *best options*. In other words, we need both mapping systems to assure us on the angle of longitude navigation into the future as well as "culture" as the third dimension. The knowledge value seems to be in *the between* people as well as organizations.

Value or IC is created in the interaction between people (human capital) and the organizational structural capital, such as R&D processes. Nonaka (1994) is referring to this as knowledge creating dialectics or *kinetics*. He also referred to them as *Ba*, which literally means a space for appreciation in Japanese. In Skandia's case, they were labeled *Future Center.* The Skandia Future Center, established in 1996, focused on the value creation by experiential knowledge exploration. It became an arena where employees could enter into the future and then return to the present with new insights.

In February 2002, the Ministry of Economics in Denmark launched *Mind Lab*, which is similar to the concept prototyped at Skandia or the Japanese concept of Ba. Mind Lab, however, is a center with the aim of nourishing knowledge management in the public sector. A similar innovation platform was shaped in 2003 and now in 2004 launched by the Dutch government in Hauge, for combined knowledge nourishment by the Ministry of Finance, Ministry of Transportation, and the Ministry of Agriculture.

In 2004, there is another such knowledge idea lab, called *Momentum*, which has been established for regional development on North Zealand in Denmark (see more on www.Momentum-nord.dk).

What seems to be one of the dimensions of intangible strength is the organizational capital, as outlined on corporate level by K-E. Sveiby in 1997. Later on, it was elaborated on by many among others including D. Ulrich and N. Smallwood in HBR in 2004. However, very few have addressed this for society development and urban design. The social construct of the firm as well as the city is emerging as key organizational capital.

Architecture and Space Design

In 1996, the Skandia Future Center focused on the value creation by *experiential knowledge exploration.* It became an arena where employees could enter into the future and then return to the present with new insights.

Furthermore, research at the University of Gothenburg has showed high importance of psychosocial dimensions. The architecture and contextual design represent approximately 20% of the health impacting factors. Recently, research in the gardening impact on health was prototyped by P. Grahhn at Lund University.

Consequently, the new ecosystem for cultivating leadership will require a combination of new accounting indicators related to values as well as spaces for value creation. In Sweden, we are now prototyping both the cultural accounting, health management, and knowledge space design for intangible strength (see www.bottomline.se).

What seems to be essential to these new spaces are:

- the creative context
- networking space
- quality of life and mind satisfaction

The creative environment has been identified by Professor G. Törnqvist by three milieus: geographical, institutional, and networking. *Europe in the Creative Age* is a title on a recent report (2004) from R. Florida and I. Tinagli. It reviews the regions based on talent, technology, and tolerance/values to nourish the growth of the creative class.

It seems the human capital meetings and interactions may be one of the essential mind dimensions. Attractive connecting spaces in a network economy must be designed. Remember then that the city once was a knowledge tool to reduce the transaction costs for trading of both goods and services.

In a 2004 award thesis, Pöyhönen and Smedlund, graduate students at the Lappeenranta University of Technology in Finland, elaborated on three major types of such networking:

- production network that creates IC through efficient implementation of existing knowledge, e.g., by in- or outsourcing of specialists in collaboration for best practice
- development networks that nourish knowledge exchange between actors and their incremental environment, like bench-learning groups
- innovation networks that create disruptive thinking and new knowledge for best option

They argue that a successful region should cultivate all three types of networking.

The core of those places is the contextual influence or cultural impact on the knowledge worker. What must be recognized as a major challenge is not technological or digital, however, to understand that e-work is usually operating with the influence of only 40% of our given senses. In virtual e-work, we are generally only using two of our senses. So the leadership challenge, for sense-making, is among others to offer cultivating context for the brainpower in a role as cultivator. A concept for this in progress is *Mind Satisfaction*, elaborated by R. Embdad at Karolinska Institute in Stockholm, Sweden. This is leading up to the need for attractive cities: mind spa for the knowledge workers. Knowledge harbors as well as knowledge tourism will be emerging concepts. R. Jensen also described this as the *Dream Society* (1999).

Knowledge Zones as Super Brains

Urban design becomes a sustainability factor for in-sourcing and retaining talent. Now in the 21st century, innovation based knowledge zones with a more amplified dimension collaborations and quality of life for its citizens are emerging. According to Dr. Debra Amidon (2003) a knowledge zone is a geographical region, segment, or community of practice in which knowledge flows from the point of origin to the point of need or opportunity. She sees an evolution from the 1980s with various academic, industrial, and governmental technology parks with training-based initiatives. In the 1990s, this was replaced by more learning-based science parks. A special knowledge recipe for such K-zones can be found on www.entovation.com.

What is evident is the clustering of talent to special places for knowledge specialization. The increasing creative e-class will migrate to knowledge centers on a global scale. This is where both financial capital and IC will accumulate. Efficient societies are shaped to attract, retain, and cultivate the brain.

This evolution of organized knowledge capital can also be viewed from emerging insights of neuroscience. During the last decade, more and more research has shown how the brain is evolving and growing to its present size and capability. Billions of connections and neurons are shaping the evolutionary biological base for IC. The society is an organized collaborative thought process. The cultural competitive process and migration of talent into superbrains is described by Professor Emeritus G.A. Karlsson. In 2002, R. Lynn and T. Vatanen published a quantitative research named

IQ and Wealth of Nations. They tried to visualize the differences between wealth and nations related to the talent base.

Strategic City Governance and Public Policy

It is now evident that in the growing complexity of intangible assets we need to highlight the transparency for the IC multiplier, or in other words look for what kind of strategic structural capital will leverage the human capital for organizations as well as regions. In 2003, Dr. Ante Pulic showed that the GDP of Europe is growing faster than its IC efficiency level. In other words, there is a growing knowledge inflation that needs to be addressed. Financial inflation is usually on the agenda of a central bank. On whose table is the question of IC efficiency and knowledge inflation?

The development of powerful intangible resources is an essential issue for companies. But it may be even more critical for society and its public organizations. As it is the case for companies, public organizations must develop innovative strategic society approaches, in particular in the functional "field" of the intangibles: R&D programs, systems of education, fiscal policies and public procurement policies as well as technological infrastructure. This will nourish the growth of regional IC, or in worst case if not done erode it. So the issue of strategic governance is applicable even more for shaping the right society context and urban design and for creating value relationships or kinetics.

It visualizes the need for strategic renewal and the futurizing of public organizations. As stated by Dee W. Hock, we are in an era of institutional failure. Supporting new strategic organizational and technology infrastructures with managerial practices constitute an important level to consider. Another consists in searching for new ways of measuring such strategic public performance.

Research on how wealth is being created in the knowledge era, Dr. Nick Bontis points to a leadership or governance agenda focused on the following order:

- R&D initiatives
- educational initiatives
- networking and trade development
- industrial efficiency

Key Message

The strategic wave of intangibles for IC is increasing. It is evolving within universities, accounting standards groups, and political and business communities. The message is that we need deeper intelligence to understand and follow the wave of knowledge economics by:

- ecosystems for knowledge sustainability
- space for attracting and shaping quality of life for knowledge workers
- relationship spaces for continuous renewal

The opportunity for not investing accordingly will shape an erosion of the national welfare. The alternative is perishing by forcing the decrease of the life cycle curve of industrial economics. It is a leadership liability not to address the potential or IC in waiting.

What is needed now is the intelligence map in the complexity space as well as a powerful strategic innovation thrust for how to leverage the knowledge base. A new type of *society entrepreneurship* might help in nourishing this longitude value, also referred to as the fourth sector! Where and how do we develop the training camps for such kind of leadership?

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www.wissenskapital.info
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Part Two: Intellectual Capital for Nations

Chapter 3

Estimating the Level of Investment in Knowledge Across the OECD Countries

Mosahid Khan, *Economic Analysis and Statistical Division, Directorate for Science, Technology and Industry, OECD, Paris, France*

Introduction

Expenditure on research and development (R&D), education and software can be considered as an investment in knowledge, which is a crucial factor in determining economic growth, job creation and improved living standards. R&D, higher education and software expenditures have in common the ability to produce new knowledge, be it technology, human capital, or computer programs. This chapter outlines a methodology to measure the level of investment in knowledge and provides an international comparable estimate of investments in knowledge for 18 Organization for Economic Cooperation and Development (OECD) countries (plus the OECD and European Union [EU] zone totals) for the period 1992 to 2000.[1] Estimating total investment in knowledge is problematic because of the lack of an internationally agreed definition, insufficient information on the overlap between the categories and limited data coverage in such areas as innovation spending, design, job-related training, vocational training, and so on.

[1] This chapter makes use of a report prepared on behalf of the OECD and the Dutch Ministry of Economic Affairs by M. M. Croes (CBS Statistics, Netherlands), "Data for Intangibles in Selected OECD countries," December 2000. However, in this chapter progress is made in the following areas: improvement of definition, inclusion of private educational expenditure, inclusion of new software data (based on official estimates), and identification and exclusion of various overlaps between the three investment-in-knowledge components. This chapter is revised version of the original article published in the *OECD STI Review, No. 27* (Khan, 2001).

Despite these measurement difficulties, as illustrated by this chapter, it is possible, at least for the OECD countries, to estimate internationally comparable figures of total investment in knowledge. The latest available data show that total investment in knowledge (based on a narrow definition: expenditure on R&D, software, and higher education) now accounts for 5.1% of the OECD-wide gross domestic products (GDP)[2], and the share is increasing over time. If education expenditure for all levels is included in the definition of investment in knowledge, total investment in knowledge would be approximately 9.2% of the OECD-wide GDP (based on a broad definition: expenditure on R&D, software and all levels of education). Within the major economic zones (the U.S., Japan, and the EU[3]), the U.S. has the most knowledge-intensive economy and total investment in knowledge amounts to 7.0% of the GDP, in contrast to 4.7% for Japan and 3.4% for the EU. Furthermore, the U.S. is moving more rapidly towards a knowledge-based economy than the EU and Japan.

The OECD aggregated level of investment in knowledge enshrouds the differences across the countries. In 2000, the investment in knowledge to GDP ratio varied from 2.1% to 7.0%, with the share being lowest in Greece, Italy, and Portugal, <2.3% of the GDP, and highest in the U.S. and Sweden, approximately 7% of the GDP. Gross domestic expenditure on research and development (GERD) is the largest component of the investment in knowledge, especially in France, Germany, and Japan where R&D components account for 60% or more of the total investment in knowledge. In addition, countries where the majority of the R&D is financed by industry tend to have high investment in knowledge.

The software component of investment in knowledge has been expanding rapidly during the 1990s, with an annual growth rate of approximately 13% during the 1992 to 2000 period. In 2000, software component accounted for 1.4% of OECD-wide GDP (excluding the overlap between R&D and software).

The share of higher education component on investment in knowledge is similar to that of the software component. In 2000, the higher education component accounted for 1.4% of OECD-wide GDP (excluding the overlap between R&D and education). The U.S. has an increased higher education component to the GDP ratio, whereas for major EU countries (France, Germany, and the United Kingdom), the higher education to the GDP ratio is between 0.6% and 0.7% of the GDP.

The data indicate that the amount of money spent on investment in knowledge has increased considerably during the 1990s, more than for expenditures in physical investment (gross fixed capital formation [GFCF]). In addition, the figures indicate that for most countries the pace of growth of investment in knowledge is higher than that of the fixed capital investment, most notably in Denmark, Finland, Greece, and Sweden.

Results of previous work in this domain were published in the *OECD STI Review No. 27* (Khan, 2001) under the title “Investment in Knowledge.” In this 2001 article, due to the limited availability of official software investment data (estimates published by national statistical agencies within the framework of system of national accounts), data from a private source (International Data Corporation/World Information Technology and Services Alliance [IDC/WITSA]) were used to estimate the software component of investment in knowledge. However, there were some concerns about the

[2] The OECD average refers to the 18 countries (minus Belgium due to missing education expenditure data for the earlier years) reported in this chapter.

[3] The European Union average refers to the 14 countries (minus Belgium due to missing education data for the earlier years) reported in this article.

overestimation of the software component. Comparison between IDC/WITSA data and the available national accounts estimates (for seven countries) showed that estimates based on IDC/WITSA data overestimate the software investment, in some cases by as much as 100%. In recent years, software investment data have become available from official sources for a large number of OECD countries. In this article, the available software investment data from the OECD capital services database is used for the estimation of investment in knowledge figures. This is an improvement from the 2001 article, in terms of reliability and international comparability of software investment data. However, it should be noted that it is only very recently that expenditure on software has been treated as capital expenditure in the national accounts, and the methodologies vary across countries (Ahmad, 2003). Statistics on investment in knowledge based on earlier methodology (Khan, 2001) have been reported in various OECD publications (OECD, 2001; 2002a; 2003); however, the figures reported here will differ from the earlier ones because of the new data for software component.

Work in this area (defining and measuring investment in knowledge) is relatively new and is being continuously developed. There are a number of issues, both at the conceptual level and the data-collection level that provide challenges to estimating internationally comparable figures for total investment in knowledge. At a conceptual level, the lack of a commonly agreed definition hampers the measurement of knowledge investment. Data availability is also a problematic area which requires further effort. For example, at present, data relating to spending by enterprises on job-related training programs and innovation expenditure are extremely scarce; hence, they are excluded from the calculation of investment in knowledge. For these reasons, the figures presented in this chapter should be viewed as presenting a partial and provisional picture of total knowledge investment.

How to Define Investment in Knowledge

While the definition of (physical) investment is well accepted (System of National Accounts, 1993 [SNA93]),[4] there is lack of international consensus on the definition of investment in knowledge. For this reason, little is known of the magnitude of investment in knowledge over time and across countries. Development of indicators for investment in knowledge is important as such indicators are closely related to knowledge-based economies and can provide a picture of the structural changes occurring in the OECD economies and the extent to which they are becoming knowledge-based economies.

Investment in knowledge is defined in this article as "expenditures directed towards activities with the aim of enhancing existing knowledge and/or acquiring new knowledge or diffusing knowledge." The output of those expenditures is the "creation or diffusion of knowledge," but the input could be tangible. R&D, education, and software expenditures can be considered as directed towards quantitative change, extension, or diffusion of existing knowledge, or acquisition of completely new knowledge. Along with R&D, education, and software expenditures, training, innovation,

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[4] Total investment data refers to gross fixed capital formation which is defined in the SNA93 as: "the gross fixed capital formation of an institutional unit or sector is measured largely by the value of its acquisitions less disposal of new or existing fixed assets. Disposals do not include consumption of fixed capital. Fixed assets consist of tangible or intangible assets that have come into existence as outputs from processes of production and that are themselves used repeatedly or continuously in other processes of production over periods of time of more than one year" (paragraph 10.26).

and industrial design expenditures should be additional components of the total investment in knowledge.[5]

For the purpose of this chapter, a narrow definition of investment in knowledge consists of the following components: expenditure on R&D, higher education (public and private sources), and software. Simple summation of the three components would lead to overestimation of the investment in knowledge owing to overlap between the three components (R&D and software, R&D and education, software and education). Therefore, before calculating total investment in knowledge, the data require various transformations in order to derive figures that meet the definition.

- The R&D component of higher education, which overlaps R&D expenditure, was estimated and subtracted from the total higher education expenditure.
- The software component of R&D, which overlaps with R&D expenditure, was estimated using information from national studies and excluded from software expenditure.
- Owing to lack of information, it was not possible to separate the overlap between education and software expenditure; however, limited information available indicates that the overlap is quite small.

A more complete picture of investment in knowledge would also include other components. Owing to lack of data availability, it was not possible to include them:

- Data relating to expenditure on the design of new goods are collected from innovation surveys (which is carried out once in every four years), but are only available for European countries along with a few other OECD countries.
- Data on spending by enterprises on job-related training programs are scarce.
- Other components, such as investment in organization, are even more difficult to estimate at this stage.

As is illustrated in this chapter, it is possible to estimate the level of investment in knowledge across the OECD countries based on either a "broad" or a "narrow" definition of investment in knowledge. The broad definition includes education expenditure for all levels (along with expenditures for R&D and software), whereas the "narrow" definition includes only the higher education expenditure (along with expenditures for R&D and software). Expenditure on higher education is included rather

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[5] Intellectual capital, investment in knowledge, and intangible investment are used to refer to the same concept, however, there is no consensus on the definition for any of them (i.e. composition of the components to be included in the definition). In literature, authors have adopted different definitions for the same concept and the decision to select one definition over another is dictated by the user needs. For example, the definition on intangibles adopted by managers will be somewhat different from the definition adopted by statisticians. For statistical purposes intangibles are defined by Croes (2000) as "expenditures for all new goal-oriented activities within a country or disembodied tools used in a country. These activities and disembodied tools are aimed at a quantitative change or extension of existing knowledge, at the acquisition or improvement of existing goods, or at the acquisition of completely new knowledge." Nakamura (2001) defines intangible investment as "private expenditures on assets that are intangible and necessary to the creation and sale of new or improved products and processes" and estimates the level in intangible investment in the U.S. using three different approaches (expenditures, labor inputs, and corporate operating margins). Expenditures approach includes R&D expenditure, software investment, and expenditure on advertising media. Webster (1999) defines intangible investments as: "all forms of enterprise capital expenditure which are not physically embodied in matter. They embrace expenditures on staff training and professional development, innovation, marketing, management expertise, and workplace relations."

than all education expenditure as it is assumed that this expenditure results in creation and diffusion of more sophisticated and/or advanced knowledge, and is similar to R&D and software expenditure. For this reason, it is preferable to estimate investment in knowledge based on the narrow definition.

Data Selection

Data for investment in knowledge can be compiled from either demand-side or supply-side data. Demand-side data include total expenditure of purchased software or total business enterprise sector expenditure in R&D. Supply-side data, on the other hand, are those such as turnover and sales figures of the computer services sector. From a theoretical point of view, demand-side data are preferred over supply-side data for measuring investment in knowledge because they provide the possibility to take into account structural differences in an economy. Furthermore, if the data are measured correctly (definition, coverage, and so on), they improve the international comparability of investment in knowledge. Another reason for using demand-side data is that they normally include internal production, whereas supply-side data exclude internal production. Therefore, using supply-side data may lead to underestimation of the investment figures.

As stated earlier, investment in knowledge consists of three components: R&D and innovation expenditure, educational and training expenditure, and software expenditure. For all three components, demand-side data are used.

R&D and Innovation

Research and experimental development is defined as "...creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture, and society, and the use of this stock of knowledge to devise new applications" (OECD, 2002b). R&D can be decomposed into three activities: 1) basic research, 2) applied research, and 3) experimental development. Technological product and process (TPP) innovations, on the other hand, are defined as "...implemented technologically new products and processes and significant technological improvements in products and processes" (OECD and Eurostat, 1997). Technological product and process (TPP) innovating activities, along with marketing for new or improved products and training directly linked to the innovative process, are counted as innovation. Parts of innovation expenditure, such as training or industrial design, should be considered as investment in knowledge. However, due to limited data availability, the innovation component of investment in knowledge is not included in the calculation of the total investment in knowledge (only the R&D component is included).

Demand-side R&D data (GERD) are taken from the OECD's Main Science and Technology Indicators (MSTI) database. The data coverage for the sample period is comprehensive; however, for a few countries there are some missing observations which had to be estimated. For example, a R&D expenditure survey is undertaken once in every four years in Switzerland and every other year in Sweden and Norway. The missing observations were estimated using a linear trend regression of R&D intensity series or an average of the two adjacent years (e.g., estimates for 1994 missing observation is the average of 1993 and 1995).

Although innovation data are not taken into account when measuring the total investment in knowledge (limited country coverage, consistent time series, and so on), some innovation expenditure data from the Community Innovation Surveys (CIS) for selected countries are presented in the following text to provide some insight into the magnitude of investment.

Education and Training

Education and training comprises three main categories: (1) public spending on formal education; (2) spending for education by private households; and (3) spending by enterprises on job-related training programs. For a correct measurement of total investment in knowledge, all of these three categories should be taken into consideration in estimating total investment in knowledge. However, lack of data means that spending by enterprises on job-related training programs is excluded from the calculation of the total investment in knowledge. Data on vocational training are available for countries that participated in the Vocational Training Survey of the EU. However, these data are not fully comparable due to differences in the definitions, coverage, and reference periods (OECD, 1998a).

Education expenditure can be separated by level of education (primary, secondary and tertiary). Although education expenditures are available for all levels, only tertiary level expenditure (International Standard Classification of Education [ISCED]-5 and -6) is included in the calculation of investment in knowledge, since it could be assumed that this expenditure results in the creation of "sophisticated knowledge"; higher education (tertiary) expenditure, therefore, is more comparable to R&D and software expenditures. Although education expenditures for all levels are not taken into consideration, they are reported in the following text to provide some insight into the education priorities of individual countries.

Education expenditure is taken from the OECD's education database. The data used here refer to direct and indirect expenditure on educational institutions from both public and private sources.

Software

Software is defined by the SNA93 as "computer software that an enterprise expects to use in production for more than one year is treated as an intangible fixed asset. Such software may be purchased on the market or produced for own use. Acquisitions of such software, therefore, are treated as GFCF. Software purchases on the market are valued at purchasers' prices, while software developed in-house is valued at its estimated basic price or at its costs of production if it is not possible to estimate the basic price" (paragraph 10.92). A common interpretation of this is that software can be defined as follows: (1) pre-packaged or reproduced software, (2) own account software—software produced in-house, not destined for final sale, and (3) customized software (Ahmad, 2003).

All software expenditures cannot be considered as investment in knowledge; those expenditures on software which are not considered to be investment in knowledge need to be identified and excluded from the total. For example, expenditure relating to software upgrades, minor modifications, maintenance and support, and so on, should not considered to be investment in knowledge and. therefore, are should be excluded from the total figure. The capitalization of software expenditure was recommended in the SNA93 on the condition that the acquisition satisfies the conventional asset requirements. In recent years, official estimates of software investment have become more widely available, at least for a large number of OECD countries. However, the methodologies used by countries to estimate the software investment vary across countries. To address the specific problems relating to measuring software investment and to improving the international comparability, a joint OECD-Eurostat Task Force was initiated in late 2001. Implementation of the recommendations made by the Task Force should improve the international comparability of the software data. A recent study on this issue has highlighted the software measurement problems and impact of harmonizing software measurement methods on national estimates (Ahmad, 2003).

Overlapping Issues

As mentioned in the previous text, there are three main areas of overlap between the different components of the investment in knowledge considered: 1) R&D with software, 2) R&D with education, and 3) education with software.

Software is not only a tool included in total R&D expenditure, it also may be the subject of R&D (software R&D). This is recognized in the Frascati Manual (OECD, 2002b), where it is recommended that if a software development project leads to scientific and/or technological advances and if the aim of the project is the systematic resolution of a scientific and/or technological uncertainty, then the project should be classified as R&D (paragraph 135). The manual further recommends that "the R&D associated with software as an end product should also be considered as R&D" (paragraph 136).

Furthermore, expenditure on software R&D may be quite high; therefore, it should be excluded when estimating the software investment component of the total investment in knowledge. Unfortunately, software R&D is not measured separately in R&D surveys, making it difficult to separate the overlap between R&D and software. However, to calculate a more "accurate" estimate of the total investment in knowledge, the overlap between R&D and software has to be excluded. Available R&D data for the computer services sector indicate that software R&D varies between 1% and 9% of the GERD. Other national studies, which include all sectors, indicate that this percentage may be much higher, between 25% and 40%.

Based on the available information from national studies, in a previous work (Khan, 2001) the overlap between R&D and software was assumed to be 25%. However, it was also stated that the assumption of the "25% overlap between R&D and software is on the high side; consequently, the total investments in knowledge reported here are a conservative estimate." Furthermore, there was some concern about the overestimation of the software data used in previous worked, and to "neutralize" the overestimation it was preferable to use a high R&D and software ratio. Recent available information from national statistical publications show that the overlap between R&D and software (25%) to be lower than our previous assumption. In addition, the (overestimated) software estimates based on private source (IDC/WISTA) have been replaced with official estimated software investment data. For those reasons, in this chapter the R&D software overlap ratio is assumed to be 15%. The main criticism of this assumption is that the size of the overlap varies across the countries. While acknowledging this point, in the absence of information on a country-by-country basis, applying this assumption to exclude the overlap is preferable than to include the overlap, as it will represent a more "accurate" estimate of the total investment in knowledge (instead of an overestimate).

Another significant overlap is that between expenditures on education and R&D. Educational expenditure includes a part of R&D expenditure already included in the GERD, namely R&D in the higher education sector (HERD). In principle, it should be relatively straightforward to estimate the overlap between R&D and education because of the availability of data in the OECD databases: one containing R&D expenditure in the higher education sector (R&D database) and the other comprising overall expenditure in the higher education sector (education database). However, for the result to be valid, two conditions must be satisfied. The coverage of the national education database and the R&D database must be identical across the countries. At present, the coverage of the two databases is not identical for all countries.

An earlier OECD study (1998b) showed that the education database and the R&D database are consistent for Germany and Sweden; however, for France, the Netherlands, and the United Kingdom, subtracting HERD from the total education expenditure results in a considerable underestimation of total public educational expenditure. Recent work in this area showed that for Australia, Denmark, and the U.S., the two databases are consistent, while for Canada, slight inconsistencies exist between the databases, and for Finland, the coverage of the R&D database collection differs from that of the education database. Unfortunately, no corrections can be made for those countries where the coverage of the data collections differs. Although subtracting could lead to an underestimation of investments in education for some countries, this method was chosen to exclude the overlap because an estimation excluding the overlap would be more "accurate" than one including it.

Finally, data on packaged software include purchases by educational institutes, thus creating an overlap between education and software. Data availability on the overlap is extremely limited; however, the available data indicate that the overlap is likely to be marginal. Therefore, no correction is made for this overlap in the estimation of the total investment in knowledge. Moreover, when expenditure on vocational training is taken into account, expenditure on training as a result of, for example, the introduction of new software might lead to an overestimation of educational expenditures. As the expenditure on vocational training is not taken into account, there is no need for data correction.

Estimation of Investment in Knowledge

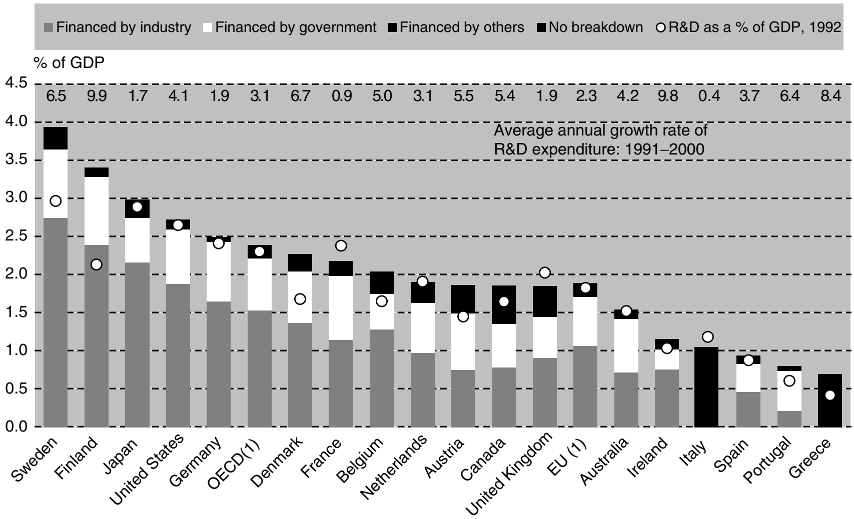
The R&D Component of Investment in Knowledge

The R&D component of investment in knowledge should include both R&D expenditure and innovation expenditure. However, in this chapter, for the reasons outlined in the previous text, only total domestic R&D expenditure (GERD) is included for the investment in knowledge estimate, including both current and capital R&D expenditures.

In 2000, total R&D expenditure of the sample countries (henceforth, OECD total) allocated about $563 billion (based on the current purchasing power parities [PPP]). R&D expenditure in the U.S. accounted for approximately 47% of the OECD total, close to the combined total of the EU (31%) and Japan (17.5%). Relative to the GDP, R&D expenditure of the sample countries ranged from 3.9% to 0.7%, with the OECD-wide average being 2.4% (Figure 1). For major OECD regions, R&D expenditure relative to the GDP trended downwards in the early 1990s. Since the mid 1990s, R&D intensity has increased continuously in Japan and the U.S. In Japan, it was mainly due to the stagnation of the GDP growth since 1997, rather than to a significant increase in R&D expenditure. In the U.S., the increase is mainly due to an increase in R&D expenditure, as the GDP grew rapidly. The share of GDP allocated to R&D is by far the highest in Sweden (3.9%), followed by Finland (3.4%) and Japan (3.0%), well above the OECD average (2.4%). Both Sweden and Finland substantially increased the allocation of resources towards R&D relative to the GDP between 1991 and 1998.

Figure 1

R&D component of investment in knowledge. R&D expenditure as a percentage of GDP and sources of R&D financing, 1992 and 2000. (1) Excludes Belgium. Source: OECD MSTI database, April 2004.



This is in sharp contrast to the large European countries (France, Italy, and the United Kingdom), where the R&D expenditure to the GDP ratio decreased over the same period. The general trend is that countries in which the majority of R&D expenditure is financed by industry tend to have high R&D intensities. Ireland is the exception, where the R&D intensities are at the lower end of the spectrum although the share of R&D financed by industry is relatively high.

The Innovation Component of Investment in Knowledge

For reasons mentioned previously, part of the innovation expenditure that is considered to be investment in knowledge is not taken into account; however, available data from CIS-2 and CIS-3 are presented in Table 1 to provide an indication on the magnitude of innovation expenditure. Innovation comprises a range of activities, including R&D. When both manufacturing and services are considered, CIS-2 data show that between 1.7% and 7.5% of the GDP are spent on innovation (for all NACE[6] branches). The CIS-3 data show that between 1.2% and 4.4% of the GDP are spent on innovation.[7] Portugal, Germany, and Belgium have high innovation expenditure to the GDP ratio (approximately 4%), compared to Greece, Norway, and Spain. Innovation expenditure in training, market introduction, and other preparation is <1% of the GDP (except Portugal), whereas innovation expenditure in other external knowledge is <0.3% of the GDP.

[6] Statistical classification of economic activities in the European community.

[7] Note that innovation expenditure data from CIS-2 and -3 are not comparable due to changes in methodology, hence the innovation expenditure to the GDP ratios of CIS-2 and -3 should not be compared.

Table 1: Innovation expenditure as a percentage of GDP, 1996 and 2000

	Total innovation expenditure, 2000	Training, market introduction	Other external knowledge	Acquisition of machinery	Total innovation expenditure, 1996
Austria	—	—	—	—	2.3
Belgium	4.0	0.8	0.2	1.2	1.7
Denmark	0.5	0.2	0.0	0.0	3.0
Finland	3.8	0.2	0.3	0.6	3.4
France	2.2	0.2	0.0	0.0	2.1
Germany	4.1	0.6	0.2	1.1	6.9
Greece	1.2	0.1	—	0.5	
Italy	2.2	0.3	0.1	1.0	—
Netherlands	2.2	0.2	0.2	0.5	2.5
Norway	1.5	0.1	0.1	0.2	1.7
Portugal	4.4	1.1	0.2	1.9	1.9
Spain	1.5	0.2	0.1	0.6	—
Sweden	—	—	—	—	7.5
United Kingdom	—	—	—	—	3.1

Source: Eurostat, NewCornos database (innovation data) and OECD MSTI database (GDP data), April 2004.

The Education and Training Component of Investment in Knowledge

Education data are collected by the OECD's Directorate for Education (EDU). For the calculation of the education component of investment in knowledge, both public and private expenditure are considered. Total educational expenditure is defined as the sum of direct public expenditure for educational institutions (including transfers and payments to private entities other than students/households and financial aid to students attributable to household payments to institutions) and net private expenditure.

Public spending for education data often refers to total payment for the whole of the educational sector—it includes investments in "teaching and education" as well as expenditures for other tasks that cannot be considered to be investment in knowledge. Some support service and maintenance is a good example of education expenditure, which cannot be considered as investment in knowledge. However, at present, it is not possible to exclude such expenditures from total education expenditure, due to lack of information.

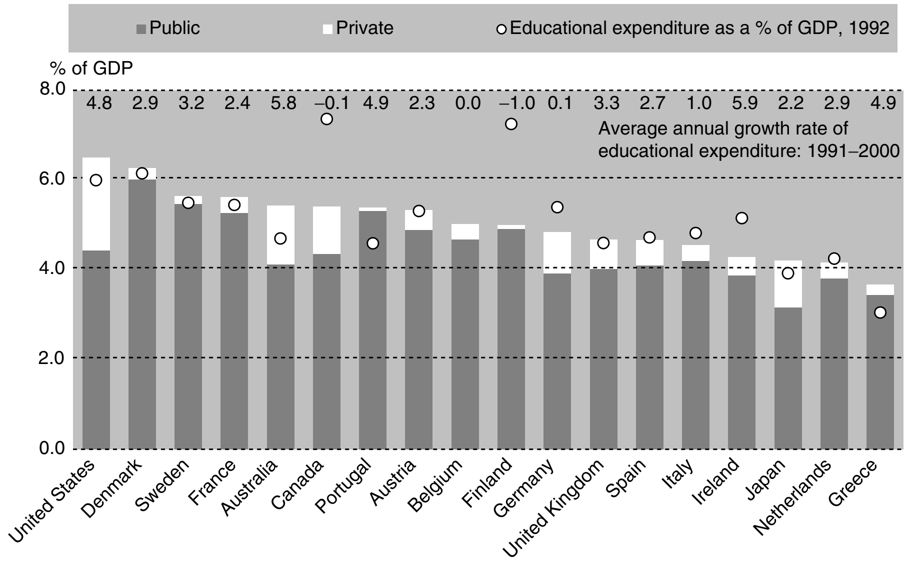
Data relating to educational expenditure are available by level of education: primary, secondary, and higher education (i.e., tertiary education). For the calculation of the total investment in knowledge, only the higher education (ISCED-5 and -6) expenditure is taken into consideration. However, data relating to all levels of educational expenditure are presented in the following text to provide some insight into the resources allocated to each level of education.

The educational expenditure data reported here is the net of the overlap between R&D and education (i.e., total educational expenditure minus higher education expenditure on R&D). Hence, the data reported in this chapter will be lower than the educational expenditure reported by other OECD publications (e.g., Education at a Glance) and, therefore, should not be compared.

Educational expenditure for all levels is quite large across the OECD countries. The majority of countries allocated approximately 5% or more of the GDP in 2000 (Figure 2). The U.S. (6.5%) and Denmark (6.3%) are the only countries where educational expenditure exceeds 6% of the GDP, far above the ratio of Greece, Ireland, Japan, and the Netherlands. Education expenditure to the GDP ratio for Finland and Canada decreased substantially between 1992 and 2000. In contrast, Australia, Greece, and Portugal increased their education expenditure to the GDP ratio over the same period. Ireland has the highest average annual growth rate of education expenditure, but the growth rate of GDP outpaced the education expenditure growth rate, hence the decrease in education expenditure to GDP ratio between 1992 and 2000. Although the education expenditure to GDP ratio provides an indication of the level of investments in education, they do not present the whole picture. Low or high percentages can be a reflection of differences in the various countries' educational systems as well as socioeconomic factors.

Figure 2

Education component of investment in knowledge (all levels). Expenditure on educational institutions as a percentage of the GDP and sources of funding, 1992 and 2000. Source: OECD education database (education data) and MSTI database (HERD data), April 2004.



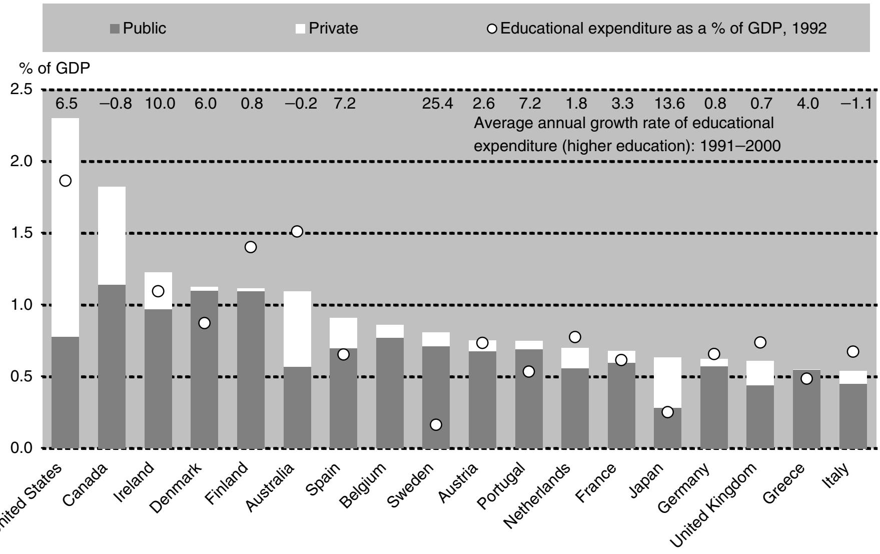
While for all the countries the majority of educational expenditure is financed by the public sector, the relative importance of a significant proportion of total education expenditure is financed by the private sector. Private expenditure accounts for a significant proportion of the total educational expenditure in the U.S. (32%), Japan (25%), and Australia (24%).

Similar to educational expenditure for all levels, educational expenditure for higher education (as a percentage of the GDP) varies across countries (Figure 3). The U.S. is the only country where higher educational expenditure amounts to more than 2% of the GDP (more than four times the ratio of Greece and Italy). Canada also has an increased higher education expenditure to the GDP ratio. There is a note of caution regarding the comparability of higher education expenditure data for Canada, Denmark, Japan, and the U.S. as the data reported in Figure 3 include post-secondary and non-tertiary educational expenditure (ISCED-4). At present, it is not possible to separate and exclude the ISCED-4 expenditure from the total higher educational expenditure, although available information suggests that this proportion is relatively small.

Comparing the ranking of educational expenditure for all levels with those of higher education provides some indication of national specificity. For example, France ranks fourth when education expenditure for all levels are taken into calculation, whereas based on higher education expenditure its ranking decreases to 13th place. The ranking of Ireland, on the other hand, improves from 15th place (all levels) to third when only higher educational expenditures are taken into account.

Figure 3

Higher education component of investment in knowledge (ISCED-5 and -6). Expenditure on higher educational institutions as a percentage of the GDP and sources of fund, 1992 and 2000. Source: OECD education database (education data) and MSTI database (HERD data), April 2004.



The share of expenditure from private sources for higher educational is double the share of expenditure from private sources for all levels of educational expenditure. Higher educational expenditure from private sources accounts for the largest share of total higher educational expenditure in Japan (59%) and the U.S. (53%). Private sources account for about one-third of total higher educational expenditure in Australia, and around one-quarter in Spain and the United Kingdom.

For the majority of the countries, the share expenditure from private sources for higher education is small relative to the total expenditure (public plus private). The exceptions are the U.S., Japan, and Australia, where higher educational expenditure from private sources accounts for a significant proportion of total expenditure. In 2000, higher educational expenditure from private sources accounted for two-thirds of the total higher educational expenditure in the U.S. and around one-half in Japan and Australia. In contrast, expenditure from private sources accounts for <10% of the total higher educational expenditure in Denmark, Finland, Germany, Greece, and Portugal.

Other Expenditures on Education and Training

As we have shown, public expenditures on education are high. However, investments in education and training are underestimated as they should also include training efforts undertaken by firms (vocational training). The resources allocated for vocational training by enterprises are of a similar level to private payments to educational institutes. Unfortunately, data on firm-based training are scarce, although the available data suggest that firms spend about 1.5% of total labor costs on vocational training. The second European survey of continuing vocational training (CVT) in enterprises shows direct cost of courses as a percentage of labor cost varies from 1.7% in Denmark and the Netherlands to around 0.5% in Belgium and Spain (Eurostat, 2002). Relative to the GDP, direct costs of CVT varies from 0.1% (Greece and Portugal) to approximately 1% (United Kingdom) (Table 2).

The Software Component of Investment in Knowledge

As previously mentioned, availability of software investment data from national statistical institutions was somewhat limited. However, in recent years national statistical agencies have started to compile and publish software expenditure data within the framework of national accounts. The software investment reported here are from OECD's capital services database, which in most cases includes software investment data that are provided by national statistical agencies; however, in some cases data are estimated by the OECD. Analysis of software investment data have shown that at present methodology for treating software expenditure as capital expenditure vary across countries which to a certain extent hampers international comparability (Ahmad, 2003).

The software investment data presented in Figure 4 excludes the overlap between R&D and software (assumed to be 15%); hence, the data reported does not represent the total software investment, but only the net software component of investment in knowledge. Sweden, the U.S., and Denmark have a high software investment to GDP ratio whereas for Ireland and Portugal this ratio is low. Between 1992 and 2000 software investment to GDP ratio increased for all the reported countries; however, the rate of increase varied across countries. The largest increase in software investment to GDP ratio occurred in Sweden, Denmark, and the U.S., where the ratio increased by 1.4, 0.8, and 0.8 percentage points, respectively. This is in contrast to the trend in

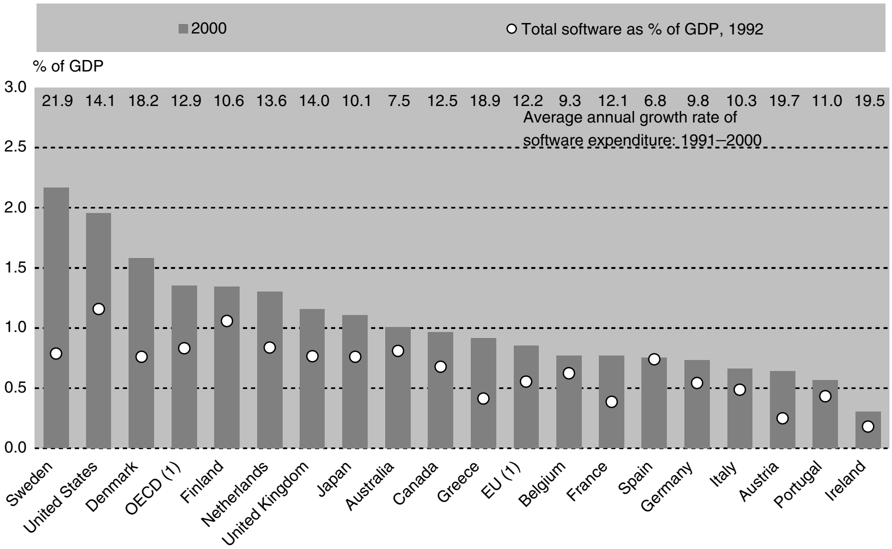
Table 2: Expenditure for training for selected OECD countries

	Direct cost of CVT courses as % of GDP
Austria	0.22
Belgium	0.17
Denmark	0.87
Finland	0.34
France	0.27
Germany	0.26
Greece	0.05
Ireland	0.24
Italy	0.21
Netherlands	0.51
Portugal	0.14
Spain	0.15
Sweden	0.45
United Kingdom (1)	1.04

Cost of CVT as a percentage of the GDP, 1999. (1) Data is not comparable with other countries. Direct cost of continuing vocational training courses include: 1) fees and payments to organizations for the provision of the courses, 2) travel and subsistence payments, 3) labor costs of internal trainers, and 4) cost of premises, equipment, and material. Source: Eurostat, the Second Survey of Continuing Vocational Training in Enterprises (CVTS-2).

Figure 4

Software component of investment in knowledge. Software investment as a percentage of the GDP, 1992 to 2000. (1) Excludes Belgium. Source: OECD capital services database, April 2004.



Ireland, Portugal, and Spain, where the software investment to GDP ratio increased by <0.25 percentage points.

Towards a Knowledge-Based Economy?

To what extent are the OECD countries becoming "knowledge-based" economies? To obtain an indication of the extent, total investment in knowledge is estimated for 18 OECD countries for the period 1992 to 2000. The three components of investment in knowledge (R&D expenditure, higher educational expenditure, and software investment) are combined after adjusting the data to exclude overlaps in estimating the investment in knowledge figures. Furthermore, the education component of the investment in knowledge only includes the higher educational expenditure (ISCED-5 and -6).

Figure 5 provides data for total investment in knowledge as a percentage of the GDP for 18 OECD countries for 2000, using both a narrow and a broad definition of investment in knowledge. If investment in knowledge is defined in a broad sense (which includes educational expenditure for all levels along with R&D and software expenditure), total investment in knowledge for the OECD-18 would amount to 9.2% of the GDP. The investment in knowledge to GDP ratio for Sweden, the U.S., and Denmark would exceed 10%, almost twice the ratio of Ireland and Greece.

However, for the reasons previously mentioned, it is preferable to define investment in knowledge in a narrow sense, which includes R&D, software, and higher educational expenditure. Figure 6 shows total investment in knowledge using a narrow definition divided into components. In 2000, total investment in knowledge for the

Figure 5

Investment in knowledge, based on broad definition (including all levels of education) as a percentage of the GDP, 2000. (1) Excludes Belgium. Source: OECD capital services, education, and MSTI databases, April 2004.

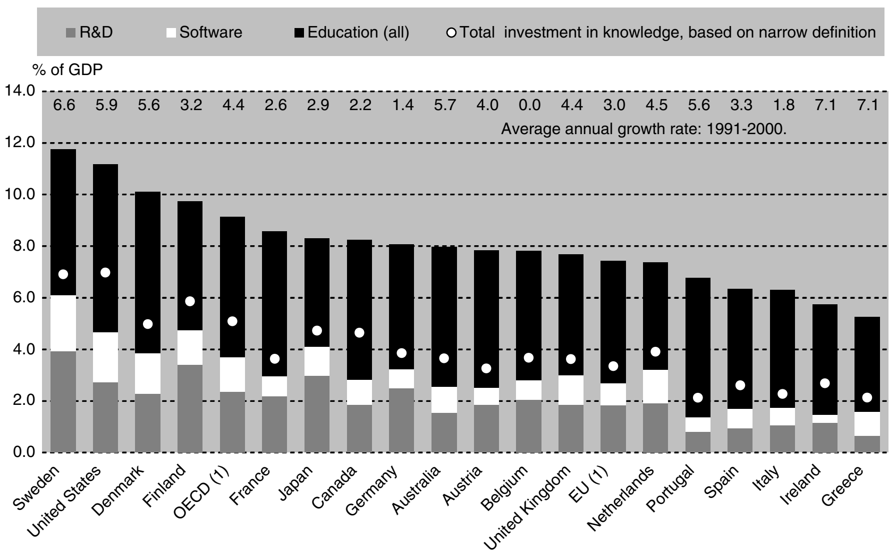
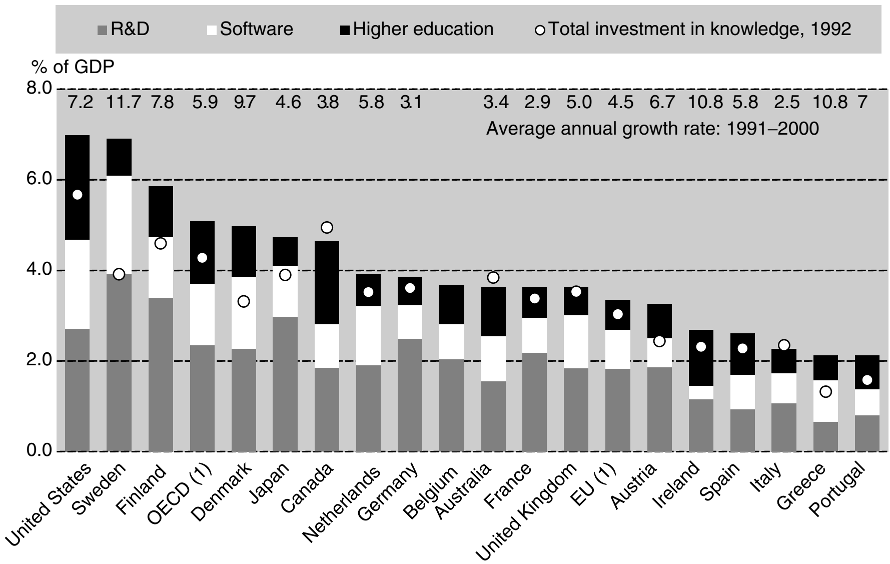


Figure 6

Investment in knowledge, based on narrow definition (including higher education only) as a percentage of the GDP, 1992 to 2000. (1) Excludes Belgium. Source: OECD capital services, education, and MSTI databases, April 2004.



OECD-18 area amounted to about 5.1% of the GDP (Figure 6). Of the major economic zones, the U.S. is the most knowledge-based economy, with an investment in knowledge to GDP ratio of 7.0%, compared to 4.7% and 3.4% for Japan and the EU, respectively. Along with the U.S., Sweden and Finland also have high investment in knowledge to GDP ratios, whereas the southern European countries have some of the lowest investment to GDP ratios.

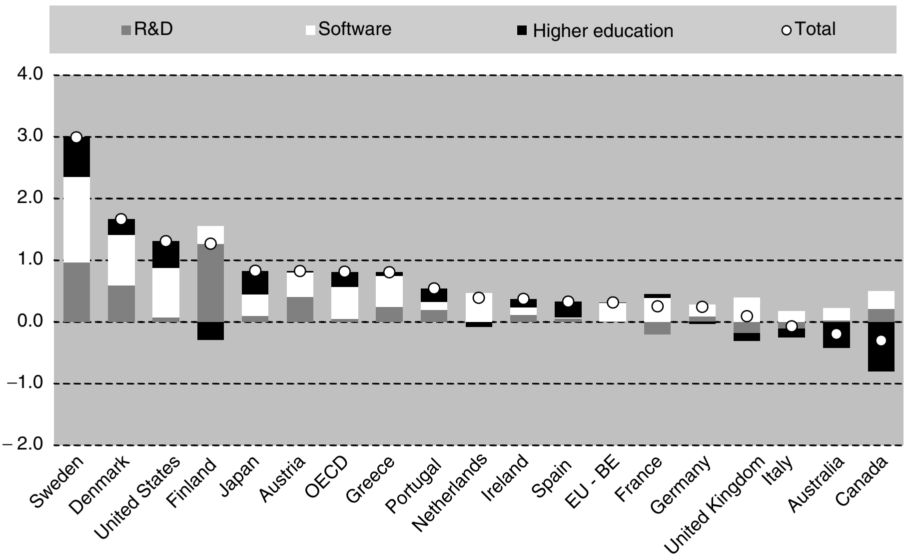
Analysis of overall investment in knowledge by components provides additional details of the structure of the investment in the countries studied. In France, Germany, and Japan, R&D expenditure is the major component of total investment in knowledge, accounting for more than 60% of the total. For Greece, total investment in knowledge depends mainly on software investment, accounting for approximately one-half of the total. Total investment in knowledge in Ireland, on the other hand, depends on higher educational and R&D expenditure, which accounts for approximately 45% each of the total.

During the 1990s, the investment in knowledge to GDP ratio increased significantly in three Nordic countries (Sweden, Finland, and Denmark) and the U.S., while decreased in Australia and Canada. However, it should be noted that this decrease in the investment in knowledge to GDP ratio is due to higher growth in the GDP rather than to a decrease in investment in knowledge (total investment in knowledge in Australia and Canada increased annually by 3.4% and 3.8%, respectively, during 1992 to 2000).

For most of the countries, the source of increase in investment in knowledge during the 1990s is the software component; this is most notably the case in France, Italy, the Netherlands, and the United Kingdom (Figure 7). In both Canada and Australia,

Figure 7

Source of change in investment in knowledge during 1992 to 2000, as a percentage of the GDP. Difference between 1992 and 2000 ratios. (1) Excludes Belgium. Source: OECD capital services, education, and MSTI databases, April 2004.



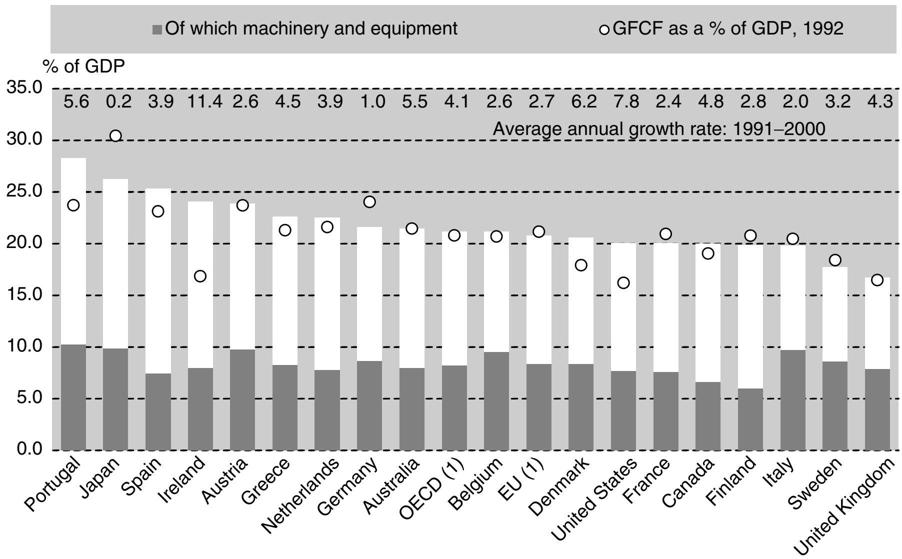
software investment relative to the GDP increased slightly, but the increase in the software component was outweighed by the decrease in higher education expenditure, resulting in an overall decrease in investment in knowledge. The source of the total increase in investment in Finland is the R&D component. In Finland, growing R&D expenditures accounted for the majority of the increases in investment in knowledge.

Comparing the evolution of investment in knowledge with that of GFCF over the 1992 to 2000 period shows that the majority of the OECD countries have been moving towards a knowledge-based economy. The average annual growth rate of investment in knowledge was higher than that of fixed capital for majority of the sample countries. However, in Australia, Canada, Ireland, and the U.S. the rate of growth of GFCF was above that of investment in knowledge. The general trend is that countries with high investment in knowledge to GDP tend to have low GFCF to GDP ratio and vice versa (Japan and Italy are the only two exceptions). For example, Portugal and Spain have high GFCF to GDP ratios (Figure 8) and low investment in knowledge to GDP ratios.

The evolution of investment in knowledge in the smaller OECD countries (Denmark, Finland, Greece, Ireland, and Sweden) has been extremely dynamic, whereas in large European countries (France, Germany, and Italy) the evolution has been static. For all of the countries, the growth rates of investment in knowledge during the second half of the 1990s was higher relative to the first half of the 1990s (Figure 9). During the 1990s, for most countries, the rate of increase of the index of investment in knowledge was higher than that of the GFCF. The notable exceptions to the general trend are Australia, Canada, and the U.S. (Table 3).

Figure 8

GFCF as a percentage of the GDP, 1992 to 2000. (1) Excludes Belgium. Source: Annual National Accounts of OECD Countries and OECD Economic Outlook, June 2003.



Conclusions

The data reported in this chapter provide some insight into the magnitude of knowledge investment in the OECD countries, and the structure of investment in knowledge and GFCF, and the dynamics over time. Investment in knowledge accounts for a significant proportion of the OECD-wide GDP (5.1%) and the share is increasing over time. During the 1990s, the investment in knowledge to GDP ratio increased significantly in three Nordic countries (Sweden, Finland, and Denmark) and the U.S. A significant gap exists between the U.S. on the one hand and Japan and the EU on the other. The level of investment in knowledge, as a percentage of the GDP, of the U.S. is more than double that of the EU and the gap has been increasing over time. This is reflected in the higher average annual growth rate of the U.S. compared to the EU: during the 1990s, investment in knowledge of the U.S. increased by 7.2% annually, compared to 4.5% of the EU. The level of investment in knowledge undertaken by large European countries (France, Germany, Italy, and the United Kingdom) is low relative to that of the United States and Japan. As a consequence, the EU has a low investment in knowledge to GDP ratio. The investment in knowledge to GDP ratio of the Nordic countries, on the other hand, is similar to that of the U.S.

To close the gap with the U.S., EU countries have to substantially increase their R&D, software, and higher education expenditure. Examining the ranking of the three components of investment in knowledge provides some additional information about the performance of European countries. France and Germany have a high ranking in the R&D (to GDP ratio), but a low ranking in higher education and software expenditure (to GDP ratio). The United Kingdom has a high ranking in the

Figure 9

Evolution of investment in knowledge (narrow definition), 1992 to 2000. (1) Excludes Belgium. Source: OECD capital services, education, and MSTI databases, April 2004.

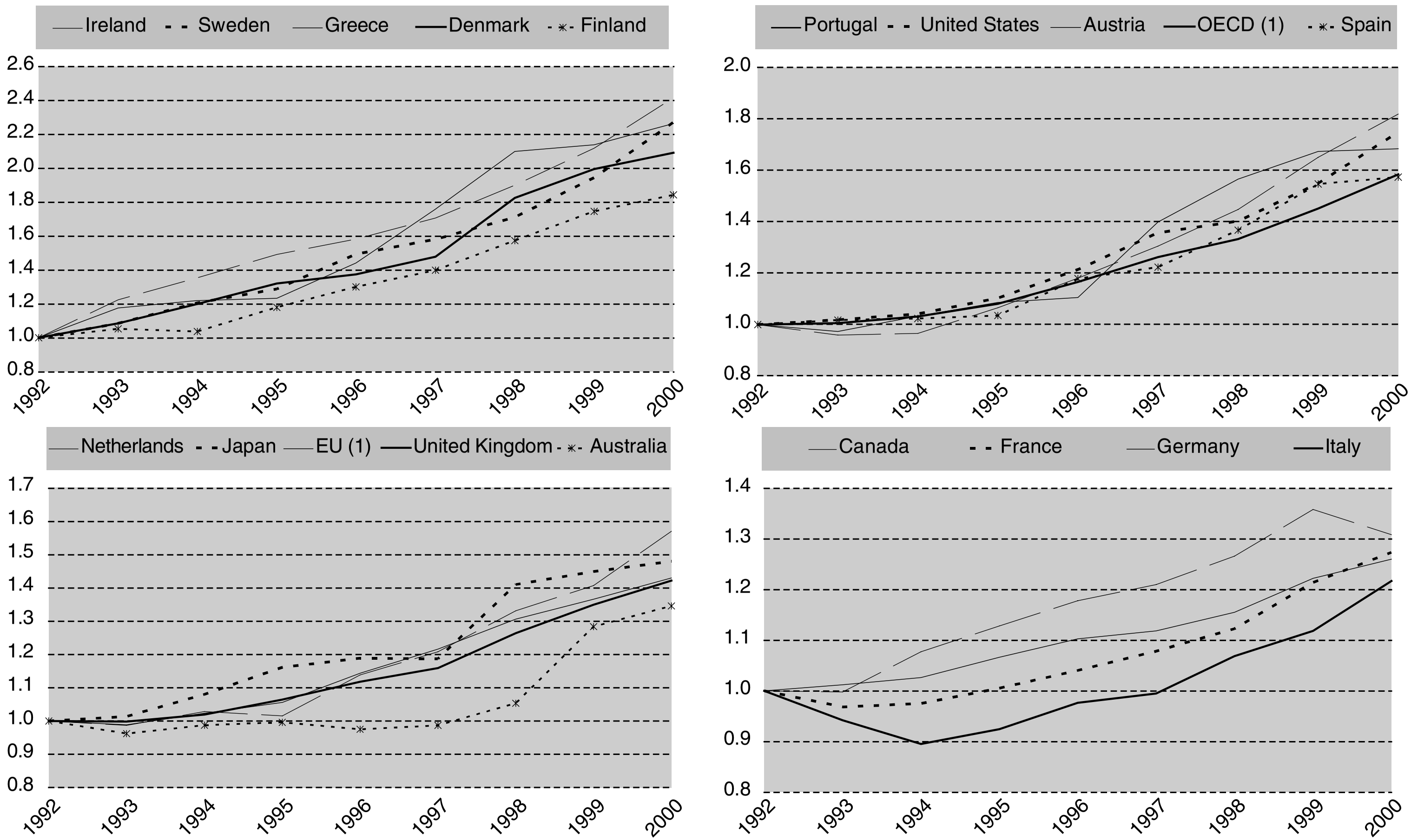


Table 3: Evolution of investment in knowledge (narrow definition) and GFCF

	Investment in knowledge, 1992=1				GFCF, 1992=1				Difference			
	1994	1996	1998	2000	1994	1996	1998	2000	*1994*	1996	1998	2000
Australia	1.1	1.2	1.3	1.3	1.2	1.3	1.5	1.5	*−0.1*	*−0.1*	*−0.3*	*−0.2*
Austria	1.0	1.1	1.6	1.7	1.0	1.1	1.1	1.2	*0.0*	0.0	0.4	0.5
Canada	1.0	1.0	1.1	1.3	1.1	1.1	1.3	1.5	*−0.1*	*−0.1*	*−0.2*	*−0.1*
Denmark	1.2	1.4	1.8	2.1	1.0	1.2	1.5	1.6	*0.2*	0.2	0.4	0.5
Finland	1.0	1.2	1.4	1.8	0.8	1.0	1.2	1.3	*0.2*	0.2	0.3	0.6
France	1.0	1.1	1.2	1.3	1.0	1.0	1.0	1.2	*0.1*	0.1	0.1	0.1
Germany	1.0	1.0	1.1	1.3	1.0	1.0	1.0	1.1	*0.0*	0.1	0.1	0.2
Greece	1.2	1.4	2.1	2.3	0.9	1.1	1.2	1.4	*0.3*	0.4	0.9	0.8
Ireland	1.2	1.5	1.7	2.3	1.1	1.4	1.9	2.4	*0.1*	*0.1*	*−0.2*	*−0.1*
Italy	0.9	1.0	1.1	1.2	0.9	1.0	1.0	1.2	*0.0*	0.0	0.0	0.0
Japan	1.0	1.1	1.3	1.4	1.0	1.0	1.0	1.0	*0.1*	0.1	0.3	0.4
Netherlands	1.0	1.2	1.4	1.6	1.0	1.1	1.2	1.4	*0.0*	0.1	0.2	0.2
Portugal	1.0	1.3	1.6	1.8	1.0	1.1	1.4	1.5	*0.1*	0.2	0.2	0.3
Spain	1.0	1.1	1.3	1.6	0.9	1.0	1.2	1.4	*0.1*	0.1	0.2	0.2
Sweden	1.4	1.6	1.9	2.4	0.9	1.0	1.1	1.3	*0.4*	0.5	0.8	1.1
United Kingdom	1.1	1.2	1.4	1.5	1.0	1.1	1.4	1.4	*0.0*	0.1	0.0	0.1
United States	1.0	1.2	1.4	1.7	1.2	1.3	1.6	1.8	*−0.1*	*−0.1*	*−0.2*	*−0.1*
EU (1)	1.0	1.1	1.3	1.4	1.0	1.0	1.1	1.2	*0.1*	0.1	0.1	0.2
OECD (1)	1.0	1.2	1.3	1.6	1.0	1.1	1.3	1.4	*0.0*	0.0	0.1	0.2

(1) Excludes Belgium.
Source: OECD capital services, education, and MSTI databases and the Annual National Accounts of OECD Countries and Economic Outlook.

software investment (to GDP ratio), but a low ranking in R&D and higher education expenditure (to GDP ratio). Italy has low ranking in all three components. The EU has set a goal to turn itself into the most competitive knowledge-based economy in the world, and one identified objective for achieving this status is to increase the R&D and innovation expenditure to 3% of the GDP (EC, 2002). To achieve the proposed target of 3% (R&D to GDP ratio) by the year 2010 from the current level of 1.9%, EU countries have to considerably increase the R&D expenditure. According to the estimates by Sheehan and Wyckoff (2003), EU countries have to increase their R&D expenditure by an additional $164 billion by 2010, which is roughly twice the 2000 level.

In 2000, investment in knowledge of the OECD countries amounted to $1,206 billion (based on current PPP) and it has been increasing by 6% annually (during 1992 to 2000). Investment in knowledge of U.S. amounted to $681 billion, compared to USD 310 billion and $156 billion of the EU and Japan, respectively. Inclusion of investment in knowledge components in the calculation of the GDP data will increase the GDP for all countries, but the increase in GDP will be less than the total investment in knowledge estimates reported here (5.1% of OECD-wide GDP). This is because the software component of investment in knowledge is already included in the GDP estimates (the capitalization of software expenditure was recommended in the SNA93). The R&D and education components (3.8% of OECD-wide GDP) are not included in the GDP estimates, however, work is being conducted at the OECD by the Canberra II Group on the measurement of non-financial assets to study the possibility of capitalizing R&D expenditure in the national accounts. According to the estimate by the Australian Bureau of Statistics (2004), capitalization of R&D expenditure will increase the Australian GDP by 1.1% to 1.2%.

As mentioned, various issues relating to the calculation of the total knowledge investment indicators require further efforts in order to estimate figures according to the definition adopted here. The availability of data relating to training expenditure by firms is currently scarce. Available information shows the expenditure in this area to be quite substantial; therefore, efforts should be made to include those data in the total knowledge investment calculation. The availability of innovation data is also extremely limited and in some cases not available at all (e.g., Japan and the U.S.). Innovation data are available for the countries of the EU; however, there is a lack of time series data. Estimates presented in this chapter show a partial picture of total investment in knowledge. Once data for other components (such as spending by enterprises on job-related training programs, part of the innovation expenditure, and so on) become available they should also be included to obtain a complete picture of the level of investment in knowledge across the OECD countries. Hence, it is necessary to collect international comparable data for training expenditure by enterprises and innovation expenditure on a regular basis. Other components (such as marketing expenditure, organizational process, and so on) are not considered for inclusion because the definition adopted in this chapter is restrictive in the sense that it only focuses on expenditures directed towards the creation of "sophisticated" knowledge.

The overlap between higher education and R&D was corrected for by subtracting the higher education R&D from the education expenditure. However, studies in this domain have shown that this approach may result in underestimation of education expenditure for some countries as the education and R&D databases do not have the same coverage. In this area, further work is required to make the databases compatible.

Furthermore, data relating to the overlap between education and software need to be excluded from the calculation of the total knowledge investment; however, due to the lack of information, it has not been possible to exclude this overlap. It is hoped that in the future this will be remedied.

The overlap between R&D and software was estimated and excluded based on limited available information. Further work in this area is also required, specifically with regard to the collection of information on the magnitude of overlap between the two components.

In recent years, a major improvement has been made in the availability of software investment data. For a large number of OECD countries, software investment data is being collected within the framework of national accounts, but further efforts are required to improve the cross-country comparability of such data.

Annex A: Data Availability and Estimation Method

R&D Data

The OECD has been collecting R&D data from member countries on a regular basis since the early 1960s. The database contains the full results of the OECD surveys on R&D expenditure and personnel from the 1960s. The MSTI database provides a selection of the most frequently used annual data on scientific and technology performance of OECD member countries and eight non-member economies. The R&D variable reported in this chapter refers to the GERD, which covers all R&D completed in a national territory in the year concerned. For further information, see www.oecd.org/sti/measuring-scitech.

The R&D data availability for the reported countries is fairly comprehensive for the period 1992 to 2000. However, for a few countries, some data points were missing because an R&D survey is carried out once every two years (e.g., Sweden). The missing data points were estimated using either a linear trend regression of R&D intensity series or an average of the two adjacent years. In the absence of an R&D-specific deflator, a GDP deflator is used to calculate R&D expenditure at constant prices.

Education Data

The OECD education database provides internationally comparable data on key aspects of education systems. The OECD member countries cooperate in gathering the information, developing and applying common definitions and criteria for the quality control of the data, verifying the data, and providing the information necessary to interpret the submitted data. For further information, see www.oecd.org/edu.

Public expenditure is calculated as the sum of direct public expenditures for educational institutions, plus transfers and payments to private entities other than students/households, plus financial aid to students attributable to household payments to institutions. Private expenditure is calculated as the sum of private expenditure, minus transfers and payments to private entities other than students/households, minus financial aid to students attributable to household payments to institutions.

Availability of direct public expenditure for educational institutions for the sample countries between 1992 and 2000 is quite comprehensive; however, few data points were missing, which were estimated using either a linear trend regression or an average of the two adjacent years.

Data relating to private expenditure, transfers, and payments to private entities other than students/households and financial aid to students attributable to household payments to institutions, are available from 1993 onwards for the majority of the sample countries. The missing data points were estimated using the available information and/or linear trend extrapolations. The GDP deflator is used to calculate the education expenditure at constant prices.

Software Investment Data

Software investment data included in this chapter is taken from the OECD's capital services database. The software investment data available in this database include either the official data supplied by national statistical agencies or OECD estimates. Software investment data for all the reported countries is available on the capital services database. Software specific deflator is used to calculate software investment at constant prices. For further information about the sources and methods, see www.oecd.org/statistics/productivity.

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Chapter 4

Knowledge Economies: A Global Perspective

Jean-Eric Aubert, *World Bank Institute, World Bank Paris Office, France*

From the Industrial Revolution to the "Knowledge Revolution"

To understand and discuss the implications of the current transformations occurring throughout the world because of the ongoing "knowledge revolution" and the related globalization process, it is useful to assume a long-term perspective and to return to the conditions in which the countries have coped with the industrialization process.

Based on a market economy pattern, it began in Western Europe and then spread to America. Meanwhile, the Soviet system embarked on a collectivist approach which proved to be a dead end. After the Second World War, East Asia beginning with Japan and followed by Korea and Taiwan, entered the world competition by specializing in mass productions, initially of a low-tech nature and gradually escalating in quality and sophistication. Their economic model apparently borrowed greatly from the Western market economy principles. However, there were strong societal differences, most notably regarding the role of the state which was more directly active in the economy and the organization of the financial markets which was less transparent. Meanwhile, the Third World of a quite diversified nature was blocked in its development, as a result of inappropriate education investments and institutions, deriving from geographical closeness or historical traumas such as the colonization (Diamond, J. Guns, Germs, and Steel, 1998).

These differences in development capabilities and specializations of countries or world regions, have deep socio-cultural roots (Aubert, 2002). In fact, the scientific orientation of the West, as well as its institutional basis, can be traced as far back in history, including up to Sumer 5,000 years before Christ. They relate to a specific posture in the relationship to reality which can be characterized as a posture of "distancing." This is precisely what has made possible the exercise of science as a reflexive process theorizing on observations and the establishment of a formal contract as the basis of the relations between people, both features which have been essential in the development process of the Western civilization. In contrast, the East Asian societies have adopted a posture of "immersion" within the reality. This makes them more technology-oriented, with a pragmatic approach and also explains the informal relationships on which they have based their sociopolitical and economic system characterized by a relatively strong integration between the economic actors and the political powers.

The consequences of these differences can then be found in the shape taken by the global division of labor at the world level and its evolution over time. The West has produced the scientific and technology bases of the industrialization process. The East Asian economies have become major industrial powers in adopting western-developed technologies, in making the best use of relatively low labor costs with a well-educated and disciplined population. China has followed Japan and Korea in such a strategy to become the leading world factory. Meanwhile, the Soviet model has crumbled because of its intrinsic inefficiency.

We are entering a decade or so in a post-industrial era. The fantastic progress of microelectronics leads to a generalization of automation. Manufacturing activities are being reduced in the economy, while services are increasing. Scientific advances are dramatically changing the conditions of exploitation of life, matter, and energy. The extraordinary development of telecommunications, which is sustaining the globalization process, creates a true world-wide competition.

More than ever, the success of countries, enterprises, and individuals depends on the mobilization of mind capabilities. Intangible investments in education, research, and software are becoming more important than traditional investments. These investments matter more than investments in capital and other physical assets (Easterly and Levine, 2001).[1] This explains about the discussion of a "knowledge age." This term is often used excessively. Mankind has always progressed in making use of knowledge. However, it may be useful to examine the development processes with a knowledge lens and discuss current trends in the world economy through such a lens.

The questions that should be asked are: to what extent are the conditions of the world competition being changed since information becomes accessible to all through information and communication technology (ICT) developments worldwide and the globalization process? To what extent do some countries or world regions currently leading in development accentuate their advance? To what extent does the knowledge age offer new opportunities to countries that have missed the Industrial Revolution? To what extent will the effects of those societal factors, which have so far affected countries' development, persist?

Benchmarking Countries and World Regions

In order to understand how countries cope in this knowledge-based competition, there is a need for a methodological framework. The framework proposed by the World Bank (World Bank Web Site)[2] includes four pillars, of which the simultaneous presence

[1] In economic terms the intangible addition to economic development brought by knowledge is measured by the total factor productivity (TFP). It does explain in the production function the growth which is not related directly to the accumulation of production factors, both labor and capital. Note that in the past decades, growth differences among countries were largely explain by differences in the TFP, a feature which demonstrates clearly that the role of knowledge in economic development is not new. For statistical evidence about the relative importance of the TFP in the growth of economies throughout the world since several decades, see Easterly W., Levine R. (2001). World Bank Economic Review, number 15.

[2] This methodological framework has been elaborated by the Knowledge for Development Program at the World Bank Institute, led by Carl Dahlman. The program, derived from the World

conditions the receptiveness or readiness of a country to a knowledge-based economy. Those pillars are:

- an educated and creative population
- a dynamic information and telecommunication infrastructure
- an efficient innovation system by which science and technology interact with the business world
- an economic and institutional regime which facilitates adaptations required by this new economy, and in fact which conditions the profitability of investments made in the three other pillars

Indicators have been collected to measure a country's performances in the four pillars, and to compare benchmark countries to each other (World Bank Web Site). A number of variables are collected in order to assess a country's achievements in each pillar. About 80 variables are gathered from existing databases. Three indicators are selected for each pillar constituting a "basic scorecard":

- Economic and institutional regime: trade openness (tariff and non-tariff barriers), the rule of law, and the quality of the regulatory framework
- Education pillar: the literacy rate, the enrollment rate in secondary education and the enrollment rate in higher education
- ICT infrastructure: the level of telephone equipment (in both mobiles and fixed lines), the rate of equipment in computers and the Internet use
- Innovation system: the number of R&D personnel per million population, the rate of scientific publications per head, and the rate of patents deposited in the U.S. patent office per head.

The combination of these 12 variables allows the computation of a "knowledge economy" index. A total of 120 countries are ranked according to this index. It is interesting to note a certain correlation between this index and the level of development of countries measured by the gross domestic product (GDP) per capita as seen in Figure 1. However, correlation does not mean causality. The more a country is developed, the more it is able to invest in knowledge-related infrastructure such as education, information technology (IT), and so on, as it is able to invest in highway miles, number of hospital beds, and so on.

A Global Overview

The relative evolution of a number of countries and major world regions over time is depicted in Figure 2 which shows changes over the period 1995 to 2002. Countries and world regions appearing above the 45 degree line have improved their relative ranking among the 120 countries included in the database.

Several important features can be noted:

- There are clearly four groups: a first group is constituted of the advanced countries and regions, a second group is made of developing countries in East

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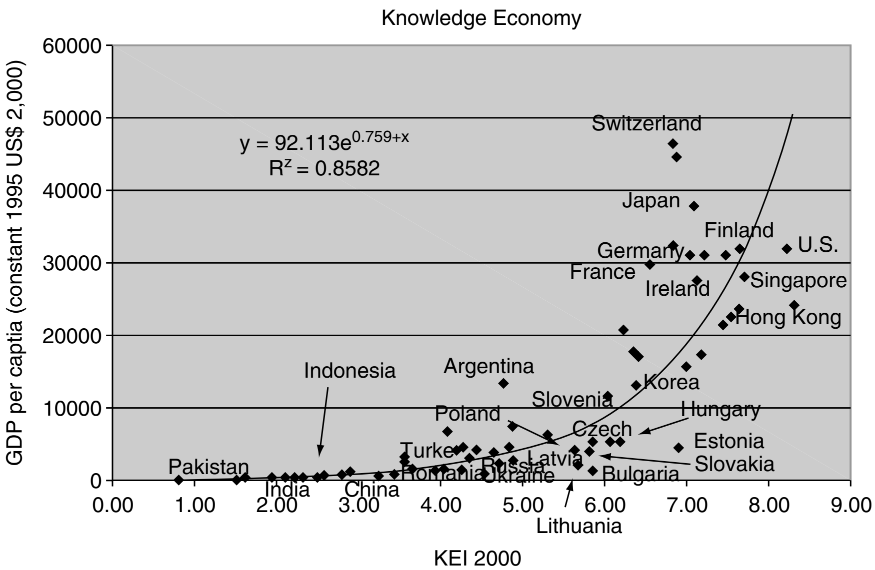
Development Report of 1988/1999 entitled "Using Knowledge for Development," has pioneered the work on knowledge economy at the World Bank making country studies, multi-country conferences, and so on. The work has then spread throughout the Bank regional departments by taking the form of specialized studies as well specific Bank projects (loans). K4D activities and outcomes can be consulted on the Web site http://www.worldbank.org/wbi/knowledgefordevelopment/, which also gives access to the database and benchmarking methodology previously explained.

Figure 1

Strong correlation between GDP per capita and knowledge economy



Asia (China being excepted) and countries of transition in Eastern Europe, a third group comprises Latin America with Middle East and North Africa; and a fourth group consists of South Asia and Africa.

- To a large extent, these positions reflect the legacy of the industrialized era. However, a 'catching up' process is noticeable, to the extent that a number of less advanced countries and regions are improving their position relative to the most advanced ones. Thus, a significant progress has been made by Africa—an encouraging trend which goes against traditional pessimistic views concerning this continent, although there is still a long way to go.
- Within each region, there is an important dispersion; this is noticeable particularly for the Middle East and North Africa region and the Europe and Central Asia region (the former Soviet bloc in the World Bank categorization).

The U.S. seems to be taking the most advantage of these new conditions of development and it is distancing itself from Europe. This is materialized by an important difference of productivity gains and GDP per capita.[3] Reasons for this seem to lie principally in a more flexible economy, with notably less rigidities in labor markets. It has also much to do with the capability of attracting an important flow of educated migrants who have been formed in their countries of origin and find opportunities of

[3] In 1980, the EMU GDP per capita was $9,000 and the U.S. GDP per capita was $13,000. In 2000, they were $24,000 and $35,000, respectively.

employment and innovation in the U.S. university system, which remains the best and most dynamic of the world. The American innovation system is also characterized by an agility in taking advantage of brand new technologies and embryonic industries, as a result of both huge federal investments in defense, space, and health, and a very dynamic process of initiations supported by a vibrant venture capital market. The U.S. government has also been able to create the most appropriate conditions for the IT and internet revolution in facilitating the development of information highways as early as the year 1992. Note that this innovative dynamism has gone also with increasing inequality within the American society and this may affect the long-term sustainability of the growth process.

The development of Western Europe benefited from the constitution of the European Community, and then EU, which helped in the trade integration as well as in support provided to depleted areas though mechanisms such as the "structural funds" which have funded up to 50% of research infrastructure in less developed European regions. The knowledge economy concept was identified by European leaders as the driving force to propel Europe as the most competitive world leader by 2010 (Lisbon Declaration, 2000).

But Europe presents a diversified picture, with very dynamic parts, such as the Nordic countries, Ireland, and the United Kingdom. Among the less dynamic ones are France and Germany who have shown difficulties in adjusting to the new conditions of world competition, and notably in proceeding to the necessary reforms of their education and industrial systems. This European diversity is being increased by the entry of the new EU countries from Eastern Europe. There are important differences of adaptability and performances among those—Estonia, Hungary, and Slovenia have notably taken the lead. The question posed to Europe is two-fold: How do you take advantage of the diversity of cultures and traditions which makes it so special? And, how do you cope with the rigidities that derive from political traditions and an advantageous welfare system?

Russia which used to have a very important science and technology capability and a highly educated population has not been able to make great use of these assets, largely because of the inappropriateness of its institutional and economic regime affected by bureaucratic issues, inefficient judiciary procedures, corruption, and so on. Economic growth has been fueled by the exploitation of the natural resource base, benefiting of high oil prices. To a large extent, other Commonwealth of Independent States (CIS) countries are facing the same challenges as Russia.

Affected by a long-lasting financial crisis and a strong de-localization process, Japan, however, has maintained its science and technology effort and potential, and remains a world knowledge power (as demonstrated, among other things, by bibliometric indicators which are gauging scientific productions). Korea has followed the growth path of Japan based on export of mass productions with gradual improvement of quality and sophistication. Impacted by the financial crisis of the late 1990s, it has decided to resolutely embark in a knowledge-based development process and made a number of important reforms and investments in this direction (OECD/World Bank, 2000).

In China, beginning with the coastal special zones where foreign direct investment (FDI) was attracted, the modernization process is gradually spreading to the rest of the territory, stimulated by government policies facilitating important investments in ICT, R&D investments by the private sector and in higher education (Dahlman and Aubert, 2001). There is still a margin to exploit with low labor costs compared to the industrialized world.

Among other East Asian countries which have shown a strong dynamism, it is important to note that: Taiwan has taken advantage of a strategy well focused on electronics production and of a clever policy of linkages with the Chinese diaspora in the U.S.; Malaysia has built a strong manufacturing base to attract foreign subsidiaries; and Vietnam has recently and rapidly grown.

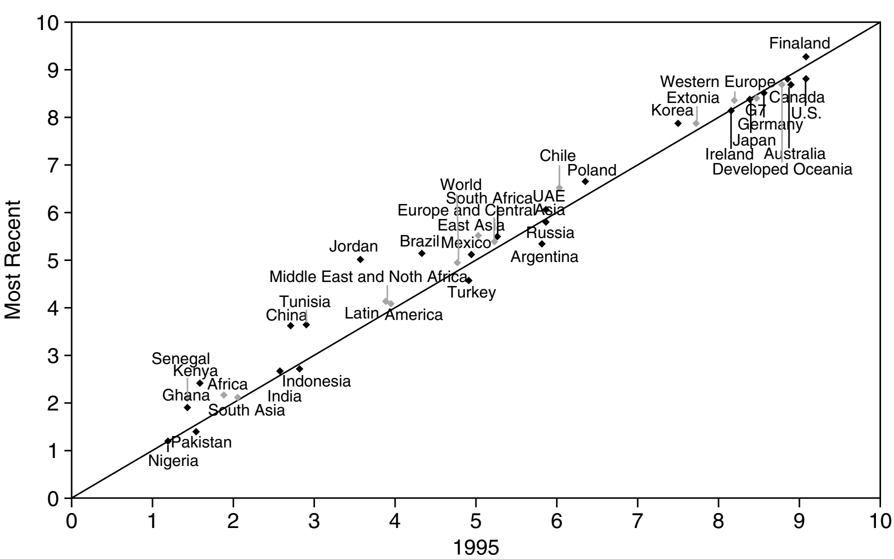
India has made considerable progress, in part to the liberalization reforms beginning in the early 1990s. It has taken advantage of investments in top quality higher education (notably in engineering and science). Since then spots of competitiveness vigorously developed, notably in the IT services, in specific regions such as Bangalore. Based on this success, the Indian government has announced its intention to become a "knowledge super power" and planned to invest massively in IT infrastructure and education in this perspective. In fact, as seen by the data presented in Figure 2, India is still lagging significantly on the knowledge index behind other major powers, most notably China.

In Latin America, Chile appears in an outlier position, being much advanced compared to other countries of the region. Brazil appears to have made an important improvement. This is due notably to a very significant effort in education. Argentina, on the other hand, has seen its situation considerably deteriorate as a result of a financial crisis they have been confronted with. It is interesting to note that Mexico's relative position has not improved much since the mid 1990s, despite being part of North American Free Trade Agreement (NAFTA).

In Middle East and North Africa (Aubert and Reiffers, 2003), the United Arab Emirates show the best performance, far ahead of other countries, a performance due notably to Dubai which has created from scratch an Internet and media city with world class standards. Among countries which have demonstrated a significant improvement,

Figure 2

Global view: knowledge economy index



it is worthwhile to note that Jordan and Tunisia both have undertaken courageous reforms of their economy, invested heavily in education, and developed actively their ICT and/or electronics industries.

In Africa, South Africa distinguishes itself from the rest of the continent, appearing in the middle of our picture. Not very far is Mauritius, which does not appear in the figure. Nor does appear Bostwana which enjoys a high level of income, thanks to an ordered exploitation of its diamond wealth. Among the lower income countries, significant progress is noticeable with Uganda, Senegal, and Mauritania—the latter being classified in Africa in the World Bank map.

Success Stories

From this quick survey it is clear that some countries are able more than others to take advantage of the current change, either for accentuating their advance or for catching up more rapidly. What is in common among China, India, Korea, Finland, Ireland, Estonia, Hungary, Slovenia, Chile, Vietnam, Jordan, Tunisia, Mauritius, and Mauritania?

Foremost, there has been the capability to gather energies and resources at a national level with a vision of the future based on a knowledge/information society, clearly articulated by an enlightened leadership. Thus, it has been possible to break resistances and vested interests working for the status quo and against structural reforms. Sometimes this has been accelerated by a feeling of deep crisis, as in Korea with the Asian financial crisis, in Finland after the loss of the Soviet market in the early 1990s, or in Ireland in the late 1980s with a strong public deficit combined with huge unemployment.

Another feature of a successful country is the ability to build on their sociocultural specificities. Although all successful economies apply general principles of the market economy model, they still find a way to accommodate these principles with their specific ethos and governance traditions. Among Western economies, models differ considerably from one culture to another. The success of the Nordic model draws heavily upon a solid social capital with strong communitarian traditions. The success of the East Asian model owes much to the capability to accommodate modern management methods with authoritarian and paternalistic traditions. Similarly, it has been convincingly demonstrated that the success of Botswana, a clear exception in Africa, has been largely due to the grafting of modern principles of democracy on traditional governance structures which had been preserved from destructive effects of colonization.

Successful countries are also particularly capable of taking advantage of their specific resources. Here are two European examples to illustrate this point. Finland, for instance, has exploited the wood-related cluster (furniture, pulp, and paper industries) to a maximum in investing strongly in design, marketing, and technological research. Ireland has used its peculiar position at the Western end of Europe, with an English-speaking labor force of low cost, to build a competitive advantage, gradually increased by judicious educational investments (technical colleges and universities which were actively developed in the 1970s and 1980s).

All countries must find a way to tap actively into global knowledge and technology. Either by attracting FDI—which has a considerable impact in small economies—or in accessing foreign capabilities through an active license policy such as Korea, or in taking advantage of human connections such as India for developing its software industry.

The question, however, is the sustainability of these policies. Practically all the countries mentioned above are facing this issue. Among the most advanced, Finland must go beyond Nokia's success and further diversify its innovation base. Ireland, which has founded its growth on the attraction of foreign investments, should now develop an indigenous innovation capability and is investing heavily in research infrastructure to do so. Korea has to diversify its innovative capability while maintaining its competitive edge in high tech mass productions which it is currently dominating (micro-chips, memory drives). Chile is trying to expand its innovation system beyond successful niches developed in primary-related sectors such as wine and fish industries. Malaysia is actively investing in IT and infrastructure (Media Super Corridor) in order to diversify an industrial base which is rapidly eroding. Among the less advanced countries, such as Jordan, Tunisia, and Mauritania, the question is how to derive wealth and employment benefits from the huge investments they have made in ICT and related activities.

And finally, there is the case of China and India. For China, growth prospects are excellent. However, the long-term sustainability of China's growth and competitiveness can be questioned. It depends on the answers to two questions. First, to what extent can this rapid economic growth be pursued without further reforms in the economic and institutional regime, with still a huge sector of inefficient public enterprises and a strongly indebted banking system? To what extent is China able to develop a really powerful indigenous innovation capability, the results achieved so far being not much convincing? In fact, both of these questions relate to those anthropological factors which we were mentioning at the beginning of this chapter that concern the "immersion" posture. It is quite possible that because related behaviors are deeply entrenched in societal and mind patterns, they cannot be changed easily. At the same time, it provides the country with extraordinary agility and reactivity and facilitates its insertion in the global economy.

What about India? India does not seem confronted to the same type of anthropological issues. The capability of India to develop an indigenous innovation capability seems quite good, with strong research and higher education infrastructure and good interactions with industry, at least in specific spots. Further improvements in the institutional framework, trade openness, regulatory streamlining, and so on, are gradually spreading throughout the economy. At the end of the day, it may be more a matter of unbalanced development, with increasing inequalities and differences between the richest states and poorest states. The key will be the literacy policy. A majority of the Indian population is still illiterate.

What about change in other less developed regions of the world? An important factor of change is the process of emulation created by those countries who are acting as pioneers. They demonstrate that progress is possible, that the information revolution combined with globalization offers possibly unique opportunities, and that these can be captured with appropriate investments and reforms. This is important, and it has to be encouraged by all means in developing a culture of both quality and innovation in the concerned regions to facilitate the adoption and sustainability of related models. It is also crucially important to recognize that success will depend on the appropriate grafting of modernity features on more traditional structures, as previously discussed, and then to facilitate the reactivation of such structures.

Conclusions

Building a knowledge economy depends primarily on investments and reforms made in those four pillars previously mentioned: the institutional and economic framework, education and training, information and communication infrastructure, and the innovation system. Although one can argue on differentiated priorities and possibilities of sequencing among the four pillars, there is a need for a systemic approach.

However, it is clear that each civilization, nation, and even region within a nation, has its own specific characteristics and a peculiar development process that it will follow. There is not one single model that applies to all. There is not one-size-fits-all. Consequently, we have to make a strong effort to better understand a country's peculiarities and specific strengths and weaknesses. This would also imply that we make significant progress in understanding the "political economy of change." It would also be useful to improve indicators and monitoring instruments to have more precise information on performances achieved in knowledge-based development processes, related job and wealth creation. New types of surveys need to be designed.[4]

Despite the alarming discourse on the digital or knowledge divide, it is not clear that the current trends at the world level make the situation of the less developed countries more problematic than it used to be until recently. In fact, the "knowledge revolution" offers new opportunities in a more open world with new fields of activities to invest. On the other hand, it creates harder conditions of competition for all. This is also challenging for the advanced parts of the world and, for instance, we have seen that some European countries are indeed strongly called on for reforms.

In the long term, the main challenge on the global growth process may well come from ecological issues, such as the global warming. Then populations, from both the North and the South and the West and the East, will be truly and deeply challenged in their adaptability and innovation capabilities. They will be pushed to rediscover some knowledge which they have forgotten for generations: knowledge for survival!

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[4] Such as the innovation surveys developed by the OECD and the EU commission.

Chapter 5

Investing in Intangibles: Is a Trillion Dollars Missing From the Gross Domestic Product?[1]

Leonard Nakamura, *Federal Reserve Bank of Philadelphia, Pennsylvania*

Writing *David Copperfield* in 1849, Charles Dickens put these rueful words into the mouth of the feckless Mr. Micawber: "Annual income twenty pounds, annual expenditure nineteen, nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty ought and six, result misery."[2] The inability to save leads to the poorhouse, as Dickens well knew, since his father's debts had done just that to his family. But in the 1990s Americans have saved less and less, according to official U.S. statistics. Yet far from being miserable, they became wealthy at an astonishing rate.

What underlies this paradox of a small saving rate in tandem with increased wealth? The short answer is: capital gains. Specifically, saving and wealth gains diverge because of a convention in the U.S. income accounts that makes a good deal of sense. Because capital gains are so volatile, the national income accounts include only part of investment income: dividends and interest payments.[3] Capital gains are excluded, yet capital gains from the stock market have been responsible for about one-half of the increase in the net worth of American households in the past two decades.[4] This rise in capital gains has occurred because firms can reward shareholders with either dividends or

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[1] First published in the Federal Reserve Bank of Philadelphia Business Review, 4th Quarter 2001, reproduced with permission.

[2] Micawber's money is in pounds, shillings, and pence. There were 20 shillings to a pound and 12 pence to a shilling.

[3] See the article by Peach and Steindel (2000) for an interesting discussion of this problem and the importance of realized capital gains (capital gains that investors have received by selling their investments and, thus, can be used to pay for consumption).

[4] The market value of domestic corporate equities rose \$12 trillion, from \$2 trillion at the end of 1979 to \$14 trillion at the end of 2000, in 1996 dollars. During that time, the total net worth of

capital gains, and U.S. corporations have been retaining more of their earnings in the form of intangible investment and not paying them out in dividends (Fama and French, 2001).

The official measure of U.S. household saving, the personal saving rate, is like all economic statistics—a compromise between a theoretical ideal and the practical limitations of existing data.[5] Ideally, we expect key statistics, such as the saving rate, real GDP growth, and consumer price inflation, to convey important information as clearly as possible. In this ideal, a very low saving rate should not be compatible with substantial and sustained creation of wealth.

Look at the Mr. Micawber example again. If he has a steady income of 20 pounds a year and no capital assets, determining his income is simple: 20 pounds. And regular income, such as paychecks, are generally what our statistics measure. But what if Mr. Micawber owns some stock? Then measuring his income is no longer so simple. If his stock rises in value from 10 to 11 pounds, should Mr. Micawber's income be calculated as 20 or 21 pounds? And how should Mr. Micawber report his income when his paper profits disappear and turn into a paper loss? A key question then for Mr. Micawber's budget problem is: given that stock prices fluctuate, how much of the gain can he rely on and, thus, how much can he afford to spend?

If we include capital gains in personal saving, then the U.S. saving rate, properly measured, has generally risen rather than fallen.[6] But improving our statistical measures is by no means straightforward. Why? Fortunately for our economic well-being but unfortunately for the credibility of our statistical measures, economic activity is increasingly concerned with the creation of new products. This type of economic activity is difficult to capture accurately in our economic measures. In fact, given how we construct the personal saving rate for the U.S., a low or even negative saving rate is likely to coexist with substantially accelerated creation of wealth.

The purpose of this chapter is to shed some light on this paradox of diminished saving and increased wealth and why it's difficult to eliminate.

Resolving the Paradox

Why did wealth accelerate? Were we lucky? Or were we actually saving more, but miscounting it? To the extent that saving was undercounted, we should expect wealth gains to be sustainable in the future. But if all the gain was due to good luck, we must reduce our consumption relative to our incomes if we want our wealth to continue to grow over the long run.

What we save can be measured as the resources we as a society put toward the future—the labor and capital devoted to new investment rather than immediate consumption. But investing is often risky: an investment sometimes returns a multiple

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U.S. households (which hold almost all of domestic equities) rose $23 trillion, from $15 trillion to $38 trillion. By contrast, real estate holdings of U.S. households rose by about $6 trillion during this period.

[5] Reports about saving usually focus on household saving, that is, personal saving. Personal saving is defined as disposable (that is, after-tax) personal income less personal outlays (personal consumption expenditures plus transfers abroad). Personal income includes dividends and net interest payments from corporations, but not capital gains. It also includes wages and salaries, employment benefits like health insurance, non-corporate income such as proprietors' income and rental income, and net transfers from the government, such as social security benefits.

[6] I argue this case in my forthcoming working paper, "What Is the U.S. Investment in Intangibles? (At Least) One Trillion Dollars a Year!"

of the original investment, but sometimes much less. When estimating the GDP, we can calculate investment by measuring how much we invested or by measuring the outcome of the investment, that is, the net wealth generated.

Recently, in fact, the dot-com bubble provided an object lesson in the difference between resources invested and wealth created, since much of the investment made in this sector has come to naught. This outcome, unfortunately, is all too typical when we attempt to create new products. The risk intrinsic to investing in new products means that the outcome of the investment and the dollars invested are very likely to be different.

Intangible assets are primarily derived from the property rights to which firms become entitled when they create new goods and services. If we use the analogy of cooking to divide economic activities into the creation of new menu items (creating recipes) and the actual production of food ready for the diner (following recipes), intangible investment is the creation of recipes, and the intangible asset created—the result of the recipe—is the patent, copyright, trade secret, or brand name that protects the creator's right to exclusively reproduce, or use the recipe. When a private corporation uses this right to sell new items, it can charge a monopoly price to consumers and, thus, if the new item is highly desirable, earn outsize profits on these assets, profits that repay the cost of creating the item. In turn, once private investors recognize the value of the creation, the corporation's stock market value will rise, causing its shareholders' wealth to increase.

Even if we include the effects of the recent downturn in the stock market, in the past two decades, the wealth of U.S. households has increased dramatically, and much of this increase has taken the form of these stock market capital gains due to successful investments in intangible assets.

Taking account of this investment has become more pressing because investment in intangible assets has become a bigger part of the U.S. economy. In the past, most business investment took the form of tangibles: equipment such as trucks, computers, and typewriters; and structures such as office buildings, shopping malls, and homes. But in the past 20 years, accelerating investment in intangibles—investments that result in patented discoveries like Viagra and Celebrex or copyright-protected products such as Windows 2000, Pentium, and Harry Potter—has increasingly driven U.S. firms and raised their economic value. However, investing in intangibles is much riskier than investing in tangibles, and taking that riskiness into account is not easy.

There are two different approaches we can take: measuring outcomes or measuring more intangible investment. And each approach provides a different answer.

If we measure outcomes, we ought to include stock market capital gains as part of the income. This gives us a measure that is useful in tracking wealth. However, including these capital gains in our definition of income makes income much more volatile than other measures of economic activity, such as employment.[7] Also, if we include capital gains in income, the personal saving rate, on average, would have been much higher over the 1990s, but also more volatile.

An alternative is to include more intangible investment as measured by the cost of the inputs—the resources used in this investment—rather than counting capital gains, which are a measure of the success of the investment. If we adopted this approach,

[7] Some of this volatility reflects fundamental volatility in the economy, while some of it reflects uninformative noise. Disentangling the two sources of volatility is very difficult, particularly over short periods.

measured corporate retained earnings and private gross saving would be larger, but the personal saving rate would likely remain low.[8]

Classifying Output and Measurement

Measuring economic output entails a fundamental issue: how to avoid double-counting it. For example, when a consumer buys two scrambled eggs at a diner, we count the tab as part of output. We do not want to count separately the feed that the hen ate because the cost of feed is part of what the consumer paid for. The feed is an intermediate output used in producing the final output, scrambled eggs.

This same rationale might be used to exclude saving and investment from measures of the national income. We *could* treat investments as intermediate goods because ultimately they are also incorporated into final consumption goods. After all, a truck's value to consumption derives from its role in production: hauling goods that are ultimately consumed. Similarly, without a stove, a short order cook cannot make scrambled eggs.

Two Good Reasons for Counting Investment as Part of Output

But one reason we may wish to count investment as part of output is that we could have used the resources that went into investment to simply increase consumption today. By its very nature, investment takes resources that might otherwise have been consumed to create a product whose value will only be fully realized over time. If we fail to include investment as part of output, we undercount the potential productivity of our existing resources and omit the opportunity cost of the investment, that is, what else we could have done with our inputs.

A second reason for counting investment as part of output is that it represents a store of value. Investing in a truck or stove is valuable because these items can be used to help us create more consumables in the future. By counting these investments as part of output, we recognize that when investments succeed, our wealth increases. Our wealth, in turn, will enable us to consume more in the future. Not counting additions to wealth ignores the future output that this wealth could produce.

But Intangibles Have Not Been Counted

Historically, in the U.S. national income accounts, only tangible investments in equipment and structures have been included in our measures of investment. Until very recently, investment in intangibles has been ignored. Intangibles have traditionally been treated as if they are intermediate goods and services that need not be counted because they are subsequently incorporated into final goods and services. But because intangible investment uses resources to create products whose value is not immediately realized, failing to count it understates both our current ability to produce and our assets. When we incompletely count assets whose purpose is to increase future production, we will be surprised by the extra income earned subsequent to the investment, and profits will grow faster than anticipated.

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[8] Total national gross saving includes personal saving, corporate gross saving, and government saving. Corporate gross saving includes retained earnings and depreciation allowances. As we include more intangibles in gross investment, both measured retained earnings and depreciation allowances will rise. Only when dividends rise (shifting saving from the corporate sector to private households) to fully reflect increases in corporate profits will the personal saving rate return to its longer run average.

Beginning in 1998, the Bureau of Economic Analysis (BEA) has included software as the first intangible investment in its measure of the GDP. Between 1998 and 2000, measured business investment in software rose from $140 billion to $183 billion, in current dollars.

Other investments in intangible assets, such as research and development (R&D), movie and book production, designs and blueprints, and the advertising associated with the new products produced, could also be included in output. Because these are important sources of wealth creation, it seems likely that the BEA will eventually do so. In the meantime, official statistics in the U.S. will continue to understate output and saving.

Measurement Problems: Greater Because Intangibles Are Riskier

A substantial difference between tangibles and intangibles is that the production process for tangibles is much less risky than that for intangibles. When a truck or a stove is produced, the outcome—and its value—are highly predictable. Mass production, by its very nature, churns out multiple, identical copies of the same product. If a firm spends $10 million to equip a factory, the value of that equipment is relatively easy to document.

Mass-produced equipment often has a second-hand market in which the value of the used equipment can be determined. Indeed, in some cases, such as cars and trucks, standard estimates of the value of "pre-owned" equipment are published. Moreover, accountants and auditors can verify the existence of the asset. If the equipment loses its value in the second-hand market and the purpose for which the equipment was bought turns out to be worthless, the accountant is supposed to write off the investment, deducting it as an expense.

When firms invest in intangibles, on the other hand, the product of the investment is unique and often hard to evaluate objectively. In fact, the product often turns out to be worthless. When a firm invests in producing a design, movie, or drug, it hopes to attain something sufficiently original so that it will have, at least for a time, a monopoly of some segment of the market. For the monopoly to have substantial value, the intangible asset must offer something no other product on the market offers. But efforts to produce what no one has been able to make before can often misfire. For example, many drugs that are promising in theory and work well in the laboratory or on animals become unsafe or ineffective for human patients in clinical trials. Other drugs may be worth tens of billions of dollars. A large pharmaceutical company may have dozens of drugs in its development pipeline. Generally, less than 1 in 10 will earn back more than its cost, but that one success may well justify all the failures and make a company's overall research program a success.

Frederic Scherer and Dietmar Harhoff's research on patents issued in the U.S. and Germany showed that the most valuable 10% of patents accounted for between 81% and 93% of the total value of the sets of patents studied.[9] In their sample of 772 German patents, for instance, the top 5—less than 1%—accounted for 54% of the value of the pool. Thus, a disproportionate part of the value of all projects is included in a few successful projects.[10]

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[9] The studies that Scherer and Harhoff survey include corporate patents, university patents, and pharmaceutical patents.

[10] Technically speaking, these sorts of risks are said to have highly skewed probability distributions.

A firm making a $10 million investment in each of 10 new products may end up with an asset worth nothing 9 times out of 10, but the 10th time may produce an asset worth $100 million. Realizing the long odds against success in intangible investment, accountants have opted to write off intangible investments, acting as if they were intermediate products that did not result in wealth creation. And if the samples in Scherer and Harhoff's study are an adequate guide, writing off the investment will be the right thing to do in most instances. But the right thing to do most of the time is, on average, the wrong thing to do. Why? Because the few investments in intangibles that do succeed may well be worth more than all other investments put together. In the example above, the firm's 10 investments turn out to be—in all—worth $100 million. So if the firm had written off none of its investments, it would have much more accurately represented its total investment than if it had written off 9 out of the 10—or 10 out of 10, as is current practice.

A Successful Investment in Intangibles: An Example From Pharmaceuticals

As an alternative to current practice, what about measuring inputs? Consider a pharmaceutical company that does research to discover a drug that will cure a previously incurable disease. For example, in June 2000, Eli Lilly announced its belief that Xigris, its treatment for septic shock, would pass its final trials and that its application to the Food and Drug Administration would be successful.[11] Test results indicated that Xigris would save perhaps 20,000 lives annually and earn Eli Lilly as much as $1 to $2 billion annually in profits over the next decade.

Eli Lilly's expenditures on Xigris, including the research that went into discovering its use as a treatment for septic shock, the clinical trials to establish the safety and efficacy of the treatment, and efforts to publicize and market the drug to doctors and medical systems around the world, are investments that will bear fruit in the form of substantial profits over an extended period.

However, our national accounts do not include these expenditures as investments. Instead, these expenditures are treated as expenses—as if they were part of the inputs into products Eli Lilly is currently selling. To draw a parallel, consider two other types of expenditures Eli Lilly might make. One is the purchase of equipment for mass producing a drug. This equipment is considered an investment because it will continue to produce output well after the year of its purchase. Another type of expenditure is the purchase of ascorbic acid, which will be used in a chemical process to make a particular drug. The ascorbic acid will be almost completely used in the year it is purchased, and it is one of the costs that Eli Lilly rightly expenses in making that particular drug. Similarly, by calling R&D an expense, we are in effect saying that when the R&D is finished, Eli Lilly does not possess a valuable asset. And that is surely not the case.[12]

[11] Specifically, Eli Lilly released an announcement that the trial would be closed to new patients earlier than planned.

[12] This represents a fundamental problem in accounting for investment in intangible assets, one probably not entirely solvable using standard accounting treatment of investment. Tangible investments are capitalized, then depreciated. That is, when the expense is first incurred, it is charged to the capital account and not deducted from current revenues. Then, over time, as the tangible asset declines in value, the depreciation is subtracted from current revenues, or expensed. By contrast, since accountants do not want to include as investment assets that cannot be concretely evaluated, intangible assets are expensed when incurred rather than over time. As

On the day Eli Lilly announced the likely success of its drug (no previous septic shock treatment had been successful), its stock market value increased $16 billion. Will the profits of Xigris justify this increase in value? Given the size of the potential market for the drug and the number of lives it could save, analysts who follow Eli Lilly judged that this single product could well be worth $10 billion or more.

However, Eli Lilly did not invest $16 billion to produce Xigris. Indeed, from 1980 to 1999, Eli Lilly's entire R&D budget, not adjusted for inflation, was $15.1 billion; carried forward to 2000, this investment had a present value of about $40 billion. Because of its unusual success, Xigris alone appears to have justified much of Eli Lilly's R&D investment for the previous two decades.[13]

This example demonstrates that from the perspective of reporting to shareholders as well as for internal corporate operations, there should be a strong presumption against the premature expensing of intangible investments because doing so understates the profitability of current operations. For example, a corporation might capitalize and depreciate intangible assets according to a predetermined schedule, just as it would a tangible investment. Only when it is clear that a whole group of intangible investments has failed would the corporation write them off as an expense.

Furthermore, this example shows that the resources that go into a risky intangible investment rarely equal its product. The economic resources used in producing an intangible asset will rarely be approximately equal to the market valuation of the results of the new product development.

By contrast, in a mass production economy, input almost always equals output. That is, any given input will almost certainly result in a salable product. As production of intangible assets becomes a more important part of the U.S. economy, this tight, contemporaneous relationship between input and output weakens. Whether any given input will lead to a salable output becomes difficult to predict for individual firms.[14]

Intangible Investments: Hard to Measure, But Not Impossible

Another important difference between tangible and intangible investing is that the firm that makes tangible capital goods is typically different from the firm that will use it. For example, the firm that will use—that is, invest in—computers will generally buy them from another firm rather than making them itself. This makes the investment highly visible: a transaction has occurred, and money has changed hands to attest to the investment's value.

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corporate investment shifts away from tangibles toward intangibles, current profits become understated. See my 1999 *Business Review* article.

[13] In addition to Xigris, Eli Lilly's research has also produced Prozac, an antidepressant, and Zyprexa, a treatment for schizophrenia, whose market values were even greater than that of Xigris. In measuring Eli Lilly's investment in developing new products, it is not obvious that failures should be written off, since the successful few were expected to make up for these losses. Certainly Eli Lilly's intangible assets are greater than its total R&D investments. And on average, accountants have found that R&D expenditures result in future profits that justify these investments (see the articles by Chambers, Jennings, and Thompson, 1998; Lev and Sougiannis, 1996; and Nissim and Thomas, 2000.)

[14] Output and employment are also closely associated in mass production economies—so much so that economic forecasters have summarized the relationship in Okun's law. A recent formulation of Okun's law states that a decline of 2% in real output will be reflected in an increase in unemployment of 1 percentage point. (See the article by Glenn Rudebusch.) This relationship would not hold if income included capital gains.

By contrast, intangible investment is generally done in-house: Intel's chips are designed by its engineers, Microsoft's software is designed by its programmers, and Eli Lilly's drugs are developed by its biochemists. So the outlay made to create intangibles is harder to verify. Moreover, while some expenses are clearly aimed at creating intangible assets, other expenses are harder to determine. For example, it is difficult to know how much of a chief executive's time is devoted to producing intangibles and how much is devoted to coordinating production.

But it is not impossible. Some corporations attempt to allocate expenses to current production or to future projects. Such corporations require their employees to report work hours on a project-by-project basis. These projects can be classified into those that contribute to current production and those that produce intangible assets. Thus, it might be possible for a corporation to divide money spent on sales and general and administrative needs into expenses for current production and intangible asset production. Doing so might well provide a corporation with a measure of the resources that comprise an intangible investment and would be of substantial value to its shareholders. If this practice became widespread, statistical analysis would then be possible to evaluate which proportion of these expenditures result in the creation of an intangible asset.

There are cases in which the intangible investment yields a salable asset. When Chrysler designs a new car, or Eli Lilly develops a new drug, or J.K. Rowling writes a new Harry Potter novel, the design, or the drug, or the novel is a product that could be sold to the highest bidder for a fixed sum. Indeed, this sometimes happens. A design firm such as Pininfarina can design a car for a manufacturer; a small biotech start-up may sell a new drug to a major pharmaceutical company; and a writer may be commissioned to ghostwrite a book. In these cases, there is no real problem in classifying each of the sales as either income or output.

But with intangible assets it is more difficult. Most of the time, there is no direct transaction to distinguish the intangible asset's real worth. Transactions that indicate the value of intangible assets are capital transactions: the buying and selling of the equity shares of firms that have invested in and produced the intangible assets. So, our only way to measure the success of the vast majority of investment in intangible assets are by changes in the stock market value of firms, which are highly volatile.

Measuring Income and Output Through Inputs and Outcomes

Are there practical ways to measure the major *inputs* that go into producing intangible assets? If there are and if most of our investment outcomes are the result of such inputs, we will, over the long run, account for most wealth creation without the sharp ups and downs of the stock market overly influencing our statistics. We do have reasonably good measures of investment in R&D, advertising, and software. But the discussion in this section underscores the difficulties in measuring production of most intangible assets, and the estimates noted are generally conservative estimates of investments in intangibles.

Consider the various input costs that go into making a new good or product available to consumers. In the case of a prescription drug, a disease must first be targeted and an approach to its control or cure must be established. Then a chemical compound must be discovered or constructed that effects the required control or cure. Next, the chemical compound must undergo animal trials and then human clinical trials. Initial clinical trials establish that the compound is safe and effective. A third round of clinical trials involving large numbers of patients and doctors must determine the range of symptoms for which the drug is effective and the appropriate dosages. These data must be presented to the Food and Drug Administration for approval; a process for mass production for the compound must be designed; and teams of sales personnel must instruct doctors and nurses around the world in the use of the compound. The company may further directly inform patients through print or broadcast media advertising.

Costs of R&D, administration, marketing, and media advertising all enter into the intangible investment. The firm making these investments must believe that these fixed costs will at least be repaid, on average, by the returns to successful intangible assets.

R&D

According to National Science Foundation estimates, in 2000 U.S. corporations spent $181 billion of their own funds on R&D. This expenditure represented 3.3% of the gross domestic product of non-financial corporations and 1.8% of the total GDP.[15] By contrast, in 1978, such corporate R&D expenditures were 1.8% of the non-financial corporate GDP and 1% of the aggregate GDP. Both of these figures probably underestimate R&D expenditures. Firms that invest in R&D typically have to make additional expenditures to support product development, including marketing, consumer testing, and executive decision making, that are not part of the engineering and scientific expenses that account for most of what the National Science Foundation calls research and development.

Advertising

According to the advertising agency McCann-Erickson, firms spent $233 billion on advertising in 2000. This expenditure represents 2.3% of the GDP, an increase from 1.9% in 1978. However, the McCann-Erickson data reflect the market for advertising agencies; they do not include many other marketing expenses that firms incur, such as the sales forces of pharmaceutical companies or fees paid to public relations firms and athletes—marketing expenses that have been increasing faster than agency fees. To the extent that firms spend this money to inform consumers about new products, advertising and marketing expenditures should be counted as investments in intangible assets because the information supplied to consumers through these avenues will generate profits over a sustained period.

Software

One area in which the national income accounts have come to terms with measuring investment in intangibles is software. According to the BEA, in 2000, private businesses invested $183 billion in software, or 1.8% of the GDP, compared with 0.3%

[15] In addition, the National Science Foundation estimates that U.S. governments, mainly the federal government, spent $62 billion on R&D in 2000, while universities, colleges, and other non-profit organizations spent an additional $12 billion. In all, $265 billion is estimated to have been spent on R&D, or roughly 2.6% of the aggregate U.S. GDP. Expenditures by private industry are counted here because all of this expenditure has as its purpose the creation of private intangible assets. Moreover, the public expenditure on R&D is already included in the GDP as part of government expenditures. It is also the case, however, that increasingly universities, colleges, and other organizations and individuals take advantage of research sponsored by the federal government or non-profits to license new product development, thereby creating intangible assets.

in 1978. This software investment comes in three types: (1) prepackaged software, (2) custom software, and 3) own-account software.

Prepackaged software ($61.4 billion in 2000) is sold at arm's length, that is, the company that invests in the software is different from the company that makes it. Sales of prepackaged software to *consumers* have always been counted as consumer expenditures. But such sales to *firms* were counted as expenses, not investment, until the BEA changed its method in 1998. Note that as part of the investment in new software, firms must also train their employees in the use of the software (Yang and Brynjolfsson, 2001). Thus, purchases of software underestimate the total resources firms must allocate when they invest in new software.

The software investments of firms that purchase prepackaged software do not include the intangible investments made by the producers of the software. A company's investment in creating software is separate from the purchasing company's investment in software. For example, Microsoft's investments in producing the Windows operating system and Office suite of products are separate from the investments that corporations make when they buy these programs. Microsoft's value as an ongoing concern resides primarily in the intellectual property rights it holds for the software it has created and is separate from the value created by other firms' investments to acquire licenses to use Microsoft Windows and Microsoft Office.

Custom software is also purchased, but like custom clothing, it is uniquely adapted for the buyer ($57 billion in 2000). In some of these cases, the rights to the software are sold to the buyer. In other cases, a substantial proportion of the software rights remain with the software producer. When property rights remain with the producer, custom software sales data may understate the value of the producer's investment.

Own-account software is made by employees of the user ($64 billion in 2000). To measure investment in own-account software, the BEA examines how many programmers are employed at firms that do not sell software and estimates how much of their work goes into developing new software (investment) versus maintenance and repair of existing software (expense). The most recent study of this division, which was published in 1982, found that 62% of programmers' time was spent on creating new programs.[16] The BEA estimates that since then, programmers have become more involved in repair and maintenance. Therefore, the BEA counts 50% of programmers' time as new software investment, a figure it describes as underscoring the arbitrariness of such measures.

Other Industries' Data are Sparser

Expenditures on R&D, advertising, and software do not exhaust, by any means, firms' expenditures on intangibles. For example, most financial corporations do not report their expenditures to develop new products as R&D expenses. Yet, financial corporations have been making a large and growing investment in financial innovations, including investment vehicles like derivatives and mutual funds, electronic payment systems, ATMs, and credit and debit cards. They have also invested large sums in customer databases and in customer relationships associated with these new instruments.

Almost no data are collected on financial corporations' expenditures on intangibles (Hunt, 2001). However, financial corporations' non-interest expenditures have been

[16] Thus, this study comes from the era before the widespread use of personal computers and computer networks.

rising rapidly. For example, in 2000, non-interest expenditures for commercial banks were $215.5 billion, or 2.1% of the GDP, up from 1.6% of the GDP in 1978. Non-interest expenditures include commercial banks' innovations and marketing expenses, but they are only an *indicator* of banks' investment in intangibles because they also include expenditures for tellers and bank branches. The market value of financial institutions has recently averaged more than 20% of the market value of non-financial corporations, compared with approximately 11% in 1978. If financial corporations spend proportionally as much on R&D as non-financial corporations report spending, this would add another $50 billion to R&D. Commercial banks alone have added more than $50 billion in non-interest expenditures in this same period. And that neglects the innovative expenditures of mutual funds, insurance companies, real estate firms, other depositories, or investment banks.

Writers, artists, and entertainers make additional investments in intangibles, and these investments are not recorded as part of R&D. In 1997, according to the U.S. economic census, the publishing, motion picture, and sound recording industries had a total revenue of $221 billion. Associated with this stream of revenues are investments in creativity and in finding, developing, and publicizing artists and their work (Caves, 2000).

Much of the investment in movies, television, and other media pays off quickly as is evident in movie-theater ticket sales or videotape rentals. Other programming costs, such as many television network broadcasts, are paid for by advertising. However, as Caves (2000) points out, television series are produced at a loss—the network's payment for first broadcast rights does not cover the production costs of the series. What producers hope for is that the series will run long enough (three to five seasons has usually been the minimum) so that reruns can be profitably syndicated. Syndication will sometimes pay substantially more than the initial broadcast rights. Similarly, a movie series like "Star Wars" can become a multibillion dollar property, since sequels, video games, toys, and clothes based on the series can be sold.

All told, it can be argued that when the inputs that comprise intangible investment are measured more accurately, domestic U.S. corporations' investment in intangibles is likely in the range of $700 billion to $1.5 trillion.[17]

Stock-Market Capital Gains: Using Outcomes to Measure Income

The official measures of household income include dividend payments but not stock market capital gains. The measured personal saving rate is low because stock market capital gains are high and dividends are low. Personal saving in the U.S. was low throughout the 1990s, but the net worth of Americans increased from $20 trillion to $41 trillion from the end of 1989 to the end of 2000. Adjusting for inflation, this figure represents a real increase, in 1996 dollars, of $14 trillion (from $24 trillion to $38 trillion).[18] During the three decades before 1990, the U.S. personal saving rate (the ratio of personal saving to disposable personal income) averaged 9%. From 1952 to 1989, the annual personal saving rate never fell below 6.9% (Figure 1).

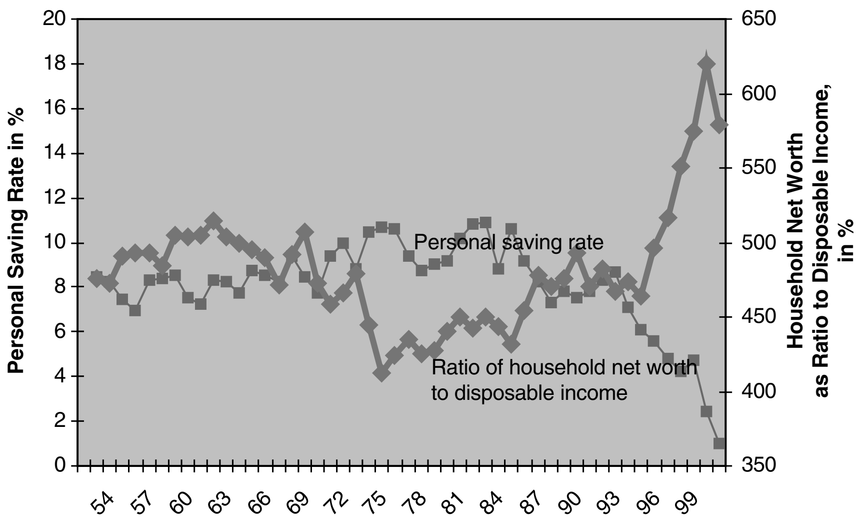
By contrast, in the 1990s, the saving rate averaged much less, 6%, and fell during the course of the decade, from 7.8% in 1990 to 2.4% in 1999. In 2000, it was 1%.

However, during the earlier period of relatively high saving rates, Americans did not become rich, and as measured saving decreased during the 1990s, Americans' wealth

[17] Further discussion of a variety of data that suggest this is in my working paper.
[18] Specifically, we have used the GDP deflator to eliminate the effects of inflation.

Figure 1

Saving and wealth



increased dramatically. This puzzle remains whether we measure savings and wealth in nominal terms or in real terms.[19]

During the 1960s and 1970s, stock market capital gains were 0.4% of the GDP. During the 1980s they were 3.7% of the GDP, and in the 1990s, 16.0%.[20] If we use these averages over decades to smooth growth, then from the 1970s to 1980s, the nominal and real growth of the economy, including stock market capital gains, may have been 0.3% higher than reported, and from the 1980s to the 1990s, about 1.2% higher.[21]

If we attribute this rate of capital gains to intangible investment, then intangible investment must have been quite large. As measured by inputs, investments in

[19] In nominal terms, during the three decades before 1990, the net worth of American households as a proportion of after-tax income actually fell slightly, from 504% to 493%. So with the lower saving rate of the 1990s, we might have expected a still lower net worth. Instead, net worth rose to 620% of after-tax income at the end of 1999, before falling to 579% by the end of 2000. Alternatively, in real terms, net worth, measured in 1996 dollars, rose from $8.4 trillion at the end of 1959 to $23.4 trillion at the end of 1989—a $15.0 trillion increase over 30 years and a compound annual growth rate of 3.5%. By the end of 1999, net worth rose to $38.1 trillion—a $14.7 trillion increase in just 10 years and a compound annual growth rate of 4.8%. Thus, whether we compare increases in wealth with nominal incomes or with consumer price inflation, households' wealth grew more rapidly in the 1990s than in previous decades.

[20] From the end of 1959 to the end of 1979, capital gains on equities of domestic corporations, according to the Flow of Funds accounts, averaged just $12.8 billion a year in 1996 dollars, while the real GDP averaged $3.6 trillion. From the end of 1979 to the end of 1989, yearly stock market capital gains averaged $209 billion while the real GDP averaged $5.6 trillion. From the end of 1989 to the end of 1999, annual stock market capital gains averaged $1.2 trillion while the real GDP averaged $7.6 trillion.

[21] Thus, if we add capital gains to output, much of the productivity slowdown after the mid 1970s may disappear.

intangibles add up to $1 trillion a year (Nakamura, forthcoming). If so, this can help explain why capital gains have been so large.

Some Consequences of Excluding Capital Gains

Excluding capital gains from our measure of household and national income has several disquieting consequences. First, the household saving rate is very low and likely to remain so as long as stock market capital gains remain strong. Since these capital gains are founded on very large investments in intangible assets, there is little reason to think they will not continue, on average. Of course, volatility will continue, as the recent stock market downturn reminds us.

Second, if stock options continue to rise in importance as a form of reward to employees, employee compensation will increasingly depend, at least in part, on stock market capital gains. This compensation can be measured in terms of the market value of the option when issued or in terms of the realized value of the option when it is exercised. How to properly measure this compensation in our accounts is a question that is yet unanswered. At present, most employee stock options are included in personal income when they are exercised, not when they are granted. Recently, personal income for 2000 was revised upward, in large part because the amount of stock options exercised was larger than initially anticipated. As a result, measured personal saving rose from a negative to a low positive number.

Third, when stock options are exercised or when stocks are sold and capital gains are realized, tax obligations are accrued. These capital gains taxes have been an important element of the surge in personal income tax payments in the late 1990s that has continued into the new millennium. As a consequence, tax payments as a proportion of measured household income have risen. Thus, even if we ignore capital gains in our income and compensation measures, they have an important impact on government finance and measured household saving, since increased personal tax payments raise government saving and lower household saving.

Finally, the income of financial intermediaries often feeds off capital gains. For example, firms that manage investment funds often earn a proportion of the capital gains they accrue on behalf of their clients, and an investment bank may make a substantial fraction of its income from capital gains. How to include such earnings in the national accounts is not easily determined, but since such corporations account for a one-fifth of all stock market equity, they are an important part of the economy.

Conclusions

Changes in the U.S. economy have made U.S. economic developments inherently more difficult to analyze. In particular, production becomes riskier as more of our efforts are devoted to producing intangible assets. Measuring this effort is hard, and measuring its outcome is even harder. Yet making the effort to measure these investments is surely preferable to ignoring them, even though the outcome is not entirely satisfactory.

If we were to include increases in households' net worth in the GDP, the variability of these capital gains would overwhelm that of the rest of income. In 1999, real household net worth rose by $4 trillion (in 1996 dollars); in 2000 it fell about $2 trillion. Since the real GDP was roughly $9 trillion in 1999, the real GDP including these capital gains was about $13 trillion; in 2000, it tumbled to $7 trillion.[22] Thus, the

[22] To be more precise, if we use the GDP deflator to convert net worth into 1996 dollars, in 1999 households' net worth rose $4.2 trillion and in 2000 it fell $1.9 trillion. In 1999, the real

GDP growth measured this way was negative by more than 40%! That decline is the amount we would generally associate with an economic catastrophe like the Great Depression. Yet the unemployment rate scarcely changed between 1999 and 2000; in fact, it fell slightly from an average of 4.2% to 4.0%.

It may well result that excluding capital gains from our measures of national income and living with a spuriously low personal saving rate may be the best alternative. However, we might wish to add another measure of household income and saving that does include capital gains. Indeed, we might want to have one measure that includes capital gains that have been realized, that is, where the investor has taken the profit by actually selling the stock, and another one that includes all stock market capital gains, realized and unrealized.

It may not be possible to use a single standard of the GDP as our sole measure of U.S. economic progress. Nevertheless, we should continue to improve our measure of the GDP. The BEA has taken an important step by including software investment in the GDP. Other items the BEA should consider in the future include R&D and advertising.

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Chapter 6

Intangibles and Intellectual Capital in the European Investment Bank Project Appraisal

Jean-Jacques Mertens and Jacques Van der Meer, *European Investment Bank, Luxembourg*

Introduction

With the shift from tangible toward intangible capital as a major driver for economic value creation, financial institutions are challenged to find new ways to value and finance investments in capital. Banks are especially challenged in this area with their need to see their investments securitized. Also the European Investment Bank (EIB), in its role as catalyst in financing projects that create sustainable wealth for the European Union (EU) citizens is also adjusting to this new economic state.

The EIB, the EU financing institution, was created by the Treaty of Rome in 1958. It is owned by the EU Member States and its objectives are to contribute towards the integration, balanced development, and economic and social cohesion of the EU Member Countries. To this end, it raises on capital markets substantial volumes of funds and directs it on the most favorable terms for financing capital projects that match the objectives of the EU. Outside the EU the EIB implements the financial components of agreements concluded under European development aid and cooperation policies.

Over the last five years (1998–2003), the EIB signed loans totaling over EUR 156 billion (about USD 187 billion)[1] for projects in EU member states. Out of these, 32% went to communications, 10% to industry and services, 10% to water management

[1] Throughout this chapter, a conversion rate of 1 EUR = 1.20 USD has been adopted.

and sundry, 8% to energy, 5% to health and education, and 39% to small industrial enterprises (SMEs) or infrastructure investments through intermediary institutions.

Given the importance of intangibles in a firm's value creation and with the increasing emphasis on financing intangibles, their management of intangibles and the process of creating, monitoring, and using knowledge and intellectual capital (IC) have become a key issue in EIB's assessment of lending proposals. The most well known and systematically documented source of intangible capital valuation relates to research and development (R&D). However, the valuation of other elements that comprise intangible capital remains to be developed. The aim of this chapter is to shed some light on the characteristics of intangibles in the EIB project work. In particular, it intends to provide a perspective on: (1) which intangible investment can be considered in a project as eligible for the EIB finance, (2) which elements of these eligible investments can actually be financed by the EIB, and (3) whether and how intangibles are managed by the client organizations. The early experiences of the EIB in these areas are also summarized.

Importance of Intangibles

By the end of the 20th century, the western economy had changed significantly from that of the 1950s. Intangible capital has become the main asset and investments in this area often have a greater influence on growth and productivity than investment in capital and equipment. Thus, on a corporate level, intangible assets, like human capital, have replaced fixed assets as the main driver of wealth. Even today, after the stock markets' decline and the collapse of the dot.com bubble, the market value of many corporations exceeds the book value of their physical assets. In the past, businesses primarily invested in tangible means of production, like buildings and machines. The value of a company was at least somewhat related to the value of its physical capital; to grow bigger a business had to build new factories roughly in proportion to the increase in its sales. But now businesses increasingly invest in intangibles. Many academics and professionals have stated in recent years that management, investment, and credit decisions made on the basis of financial statements that do not reflect the intangible determinants of corporate value, may result in significant economic losses not just for the firms and their suppliers of goods and services but also for the suppliers of capital. Thus, measuring, managing, and monitoring of a firm's intangibles is an essential task for drawing efficient estimates of future benefits and risks associated with investment opportunities.[2]

There is a serious risk of substantial underinvestment in intangibles in the economy, mainly due to their very nature. There are three reasons for this:

(1) Compared to investment in physical assets, investment in intangibles bears higher commercial risk. Investment in intangibles is always long term and usually far away from "market application" (e.g., R&D in pharmaceuticals which takes more than ten years from the initial idea to market launch).
(2) Investors are, in most cases, unable to prevent competitors from using parts of an intangible asset (e.g., patent) mainly because of incomplete protection through intellectual property rights. For example, successful innovations are likely to be imitated by others (e.g., through "reverse engineering"). Thereby,

[2] The thoughts presented here were inspired by the works of Bounfour (2000), Buygues et al (2000), Lev, Roberts, and Vckery. Discussions within the Meritum and E*know-Net working group were very useful, as was a private communication from Zambon. Discussions with Roberts and Taug proved instrumental in developing our methodology.

potential profits cannot be fully reaped by investors, but are involuntarily passed on to competitors.

(3) As trading of intangible assets is still in its infancy. Therefore, it is unlikely that their true and fair value of an intangible asset is reflected when sold in the market.

Europe's Increased Focus on Intangibles

For Europe, these evolutions have an important impact. If the EU as a whole is currently underperforming in the knowledge-driven economy in relation to some of its main competitors, this is due partly to an overall level of investment which is comparatively low in intangible capital, particularly by the private sector. In comparison to the EU,[3] the business sector effort in R&D is 70% higher in the United States (1.85% of the gross domestic product [GDP] compared with 1.08%) and two times higher in Japan (2.23%), according to the European Commission (DG-RTD). The Lisbon European Council held in March 2000 called upon the member states to produce "*a substantial annual increase in the per capita investment in human resources*," acknowledging that "*the European Union is confronted with a quantum shift resulting from globalization and the challenges of a new knowledge-driven economy*" and set the EU a major strategic goal for 2010 "*to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.*" In March 2003, the Brussels European Council invited member states "*to take concrete action to promote increased business investment in R&D and innovation, moving towards the Barcelona objective of approaching 3% of GDP.*"[4]

To support the objectives of the knowledge-based economy, the EIB group[5] is financing intangible investments and IC. In the wake of the conclusions of the Lisbon European Council (March 2000), the EIB launched its Innovation 2000 Initiative (i2i) with a view to foster the development of an innovation- and knowledge-based European economy. "i2i" centered upon investments like R&D, information and communications technology (ICT), dissemination of knowledge, and human capital formation. Evaluating its initial results, the Council of EU Finance Ministers in November 2003 requested the EIB to continue this initiative. The EIB's objective is to finance a total of up to EUR 50 billion (about USD 60 billion) by 2010 under its i2i.

Intangibles in EIB Project Work

The EIB grants loans for investment projects that are long term, welfare-generating, and economically productive (of goods or services)[6] and support priority EU objectives. Investment projects involve expenditure related to the allocation of economic resources in one period with the expectation of generating inflows of economic benefits in subsequent periods (e.g., revenues, cost savings, or other social or environmental benefits). An investment project is a coherent whole, comprising all elements of a

[3] EU is EU-25, the EU enlarged to 25 counties.

[4] Its recommendations were based on the Commission's Report (2003) "*Choosing to grow: knowledge, innovation and jobs in a cohesive society,*" COM, 5 final.

[5] The EIB Group consists of the EIB as a source of long-term loans and of the European Investment Fund (EIF), its venture capital and SME guarantee arm.

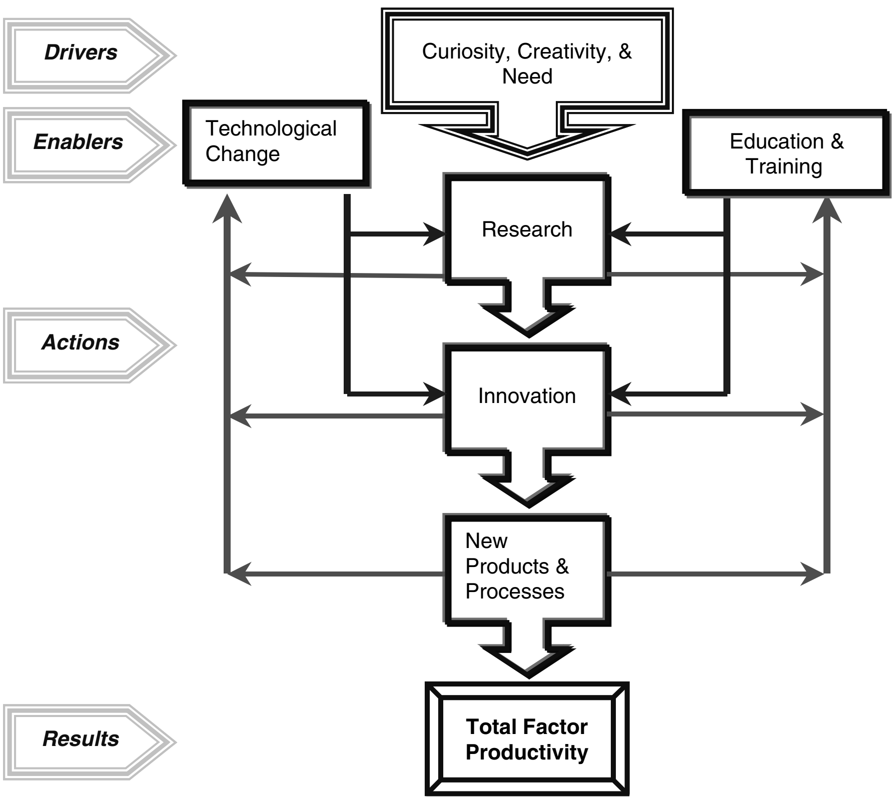
[6] Simple capital transfers, pure trading operations, real estate acquisitions, or financial investments are not considered eligible projects for the EIB.

permanent nature (whether tangible or intangible) that are necessary for the technical and economic objectives and the sustainable production of the goods or the services that the project is designed to deliver. This defines the *boundaries* of the project. An investment project normally comprises the preparation and the implementation of an investment, as well as its operation[7] throughout a defined period (often its useful life) and any possible disposal or decommissioning. An investment is considered beneficial when the future inflows of economic resources in whatever form are greater than the expenditure of economic resources needed to achieve them, after allowing for any differences in timing of outflows and inflows. For some time, the EIB has financed the expenses related to immaterial investments where such expenses are directly related to a fixed investment to the extent that they form an indispensable complement to realize its economic purpose and where their durability justify long- or medium-term financing, e.g., R&D costs, start-up costs related to training, royalties, and so on.

With the shift to a knowledge-based economy, the EIB sees its role as funding the formation of productive physical capital, increasingly routed towards the financing of

Figure 1

EIB's knowledge net



[7] "Operations" throughout this note comprises "maintenance."

expenditures related to the formation of intangible capital. Total factor productivity (TFP) is not merely the result of the traditional, static Cobb-Douglas function between labor and physical capital but an interaction between "intellectual"[8] and physical capital. As the increase in these components result in TFP growth, the EIB is focusing on the development of both physical capital, through investments in technological change, and of human capital, through education and training, which it considers as the enablers for economic growth and social cohesion. Good research is obtained by curiosity, creativity, and need as drivers, and is made possible by two major enablers: technological change (now ICT, nanotechnologies in the future) and skills enhancement which is obtained by education and training. In return, these two enablers are enhanced by research, innovation, and new products and processes that it generates. The "Knowledge Net" map encapsulates this concept.

Whereas the left part of the diagram refers more to tangible investments, the right part refers to more intangible investments. To better understand the nature of intangibles, it is useful to have a closer look at intangible capital or investments and what they entail. *Intangible capital* consists of investments in *intangible resources* and *intangible activities*. The definition of *Intangible resources* is much wider than that of *intangible assets*, recognized by accounting rules (e.g., IAS 38). Intangible resources can be qualified as non-monetary and non-physical means, *owned and controlled by an organization,* which enable it to add economic value to its activities and employed capital to reach its objectives. Intangible resources include items such as brand names, patents, licenses procedures, goodwill, trademarks, or management system (information technology [IT], quality control). *Intangible activities*, such as research, training, marketing, developing software, writing books or music are all *activities that reinforce or create intangible resources*. In the diagram, technological change is an activity that modifies the tangible resource physical capital, while education is an activity that modifies the intangible resource human capital.

In order to identify possible intangible resources and activities, it can be useful to bear in mind Porter's value chain model (1985). Albeit slightly outdated, it describes how an organization creates value by its *primary activities*, consisting in the production of "marketable" products and services. The primary activities are:

- Inbound logistics: concerned with the receiving, storing, and internal distribution of the imputs to the product/service
- Operations: transformation of the "inputs" into final "marketable" products and services
- Outbound logistics: concern the collection, storage, and distribution of the product
- Marketing and sales: links the product to the client
- Service: enhance and maintain the value of the product/service, including installation, repair, after-sales, and customer training

These activities are linked to *support structures (resources) and activities:*

- Firm infrastructure: management systems concerning planning, finance, inventory control systems, budgetary management, and quality management such as ISO 9000 or ISO 14000, and so on.

[8] IC can be defined in several ways. Here we retain the definition of the Meritum Guidelines [2002], where IC is described as consisting of human capital, structural capital, and relational capital.

- Human resources management: relates to "people management" and encompasses recruitment, training programs, job description, evaluation and remuneration systems, pension plans and schemes, image of the company a good employer, job satisfaction, team spirit, and so on.
- Technology development: R&D and product and process engineering, software and information systems and networks, development of company-specific IT such as intranet or extranet sites, e-commerce, and so on.
- Procurement: relates to the process for acquiring resources for the different primary activities.

Whereas 10 years ago a project in the industry and services field typically comprised around 15% of intangibles, mainly as design expenses, it now comprises on average approximately 40% of intangibles, by inclusion of organizational features and related research. Some projects now comprise up to 75% intangibles, as in the case, for instance, of the reorganization of the e-economy of wholesale distributors, of tourism services providers, and when financing investments in research and innovation.

Cost-Eligibility of Intangible Inputs

The EIB can finance intangible investments that: 1) can be considered complementary and indispensable for the realization and the economic success of an underlying investment in assets or resources (either material or immaterial), and 2) contribute to the strategic goals of the EU, such as strengthening international industrial competitiveness, human capital formation, job creation, and greater social cohesion.

The EIB can usually finance up to 50% of a project's cost. However, not all elements of the investment relating to a project can be financed by the EIB, even when they are part of the project's cost, as an essential element of its implementation.

Criteria for defining whether an intangible investment can be considered as eligible for EIB finance related to whether the investment has a public resource character, whether it has been generated by human hands and brains, whether it possesses an inherent productive capacity, and/or whether it is a sheer transfer of a property right.

While resources like air frequencies, land, water, and mineral deposits have a public resource character, they are not considered inherently productive, and they are not generated by human means. In such cases, their purchase would not be eligible to EIB finance, although it would be considered as part of the project's cost, being indispensable for the project's implementation. Similarly, a patent acquisition is a sheer transfer of a property right and would not qualify for finance, although a chemical process license fee would since it has an inherent productive capacity. However, the intangible activities linked to the development of these resources (use of air frequencies, deposit exploration, mine planning, water use, land development) would qualify.

License costs, mineral rights, franchises: Such intangibles encompass resources and activities aimed at the production of goods and services. License costs, such as telecom license fees, mineral exploration licenses, mineral rights, or patents acquisition are non-eligible, given that they are non-generated public resources and a sheer transfer of property rights. Yet, they are a necessary cash cost to the promoter and, hence, form part of the project investment cost. However, activities such as mining studies and operations development are required to assess and develop a concession or the acquisition of license fees related to generated intangible assets with a productive capacity (such as a chemical process license fee) are eligible investment expenditures. Film rights fall into the same category, as would the acquisition or the development cost of software that supports the organization's primary activities or the acquisition of externally developed customer-specific applications such as Quality Control Systems and Certification expenses, as to acquire ISO 9000/14000[9] status)

Start-up costs are incurred during the initial stages of project operations, and are necessary to proceed with the project. They may be one-off (test runs) or recurring (launch advertising campaigns). While start-up costs are operating costs, parts of them are usually capitalized. Rules for capitalization differ by country and fiscal regime and cannot be used as an absolute reference for project cost. For the EIB, the project investment cost includes all pre-operations costs incurred before commercial start-up, and initial non-recurrent costs included during the first year of commercial operation. They are also eligible, although during initial operations only costs in excess of normal operating costs are considered.

Logistics: the development of intangible assets that relate to logistics can be eligible. Included under this item are not only information systems that optimize warehousing (order processing) and logistic transport (global positioning system [GPS] for road haulage), but also the acquisition and development of virtual warehouses and logistic systems, grouped under e-business.

Marketing costs: (including market research) are normally expensed, except when they relate to the launch of a new product or process that has been the object of the investment. In such cases, they can be included in the investment cost and are entirely eligible. Franchises, as being non-generated assets, are part of the total investment cost but not eligible for financing. The acquisition of existing brands and trademarks (intangible resources) is a transfer of property rights, and as such is not an eligible investment cost. If necessary and instrumental to the project's implementation or operation, however, these are costs to be sustained and, therefore, part of the project cost.

Research, innovation, and patents: Investments related to R&D and engineering of marketable innovation that adds economic value and contributes to EU objectives are in principle eligible for EIB financing. In terms of intangible resources—the costs of deposing intellectual property rights, patents and licenses, and government approval and concessions—the acquisition of special software are eligible. In terms of intangible activities, R&D and engineering, testing and prototyping, pre-industrial production costs, the costs of attending specific training and seminars, participation in and development, of research networks, in-house development and the acquisition of software and data networks can all be considered part of the investments costs.

Audio-visual: the expenses to the purchase and development of a script, the production costs (such as the costs of the writer, the line producer, the director, director of photography, the development of the soundtracks and animation software, i.e., special effects), the costs of editing, the costs of producing the sequel, the remake, spin-off and merchandising rights, costs to obtain copyrights, producers' service fees, completion guarantees, and legal fees can all be included under the project investment costs.

The expenditures on education project comprise investments and operating costs. Only those operating costs that specifically relate to the preparation and launch of the education program under consideration, this meaning those costs that are additional to normal running costs, can be included in the project cost and considered as eligible.

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[9] ISO: International Standards Organization.

Intangible resources and activities improving structural and relational capital: The image of an organization in the market and in society, relations with suppliers, development of a dealer network, and development of websites and of e-commerce are resources that translate the organization's capacity to create economic value. They can be improved by intangible activities. Likewise, the development of internal management systems (e.g., inventory control systems, budgetary management, quality management, data and communication networks [intranet], corporate strategy and vision) can be considered as organizational assets that help an organization to realize its economic objectives.

Issues for Project Appraisal

When appraising intangible-intensive projects the appraisal team clearly identifies and characterize the intangibles that are vital for the project.

Regarding project eligibility, the team ensures that the projects' intangibles and, therefore, the part of the project that complies with the EIB's criteria for eligible costs are well characterized and identified.

The evaluation of an organization's management of intangible resources are an important aspect of any appraisal in order to assess their effective use and the realization of their full potential. Not only is their valuation considered, but also their organization, monitoring, "maintenance," and efficient allocation (value creation). With respect to their auditing and monitoring, simple recording of intangible stocks (number of PhDs, patents, and licenses) is not enough. Knowledge management—enabling people from different parts of the organization to work together constructively—is more important. An example is to mesh top management's strategic vision with customer requirements fed in by marketing, and to translate them into innovative products and process through the R&D and manufacturing/production functions. These activities need planning and monitoring. A good reference is the system developed in the Meritum guidelines, that is now being spread by the E*Know-Net network, with support of the EU commission.

To assess an organization's concern with intangibles, answering the following questions is useful:

(1) What are its critical intangibles? (2) How does the organization measure them? (3) Does the organization control their evolution and manage them? (4) Does it have training in intangibles management? (5) Does it report on them? (6) Do key performance indicators include intangible-related indicators? (7) How is intangible output valued?

Concerns with the profitability of an intangibles enhancing project can be another important issue. In most cases, the potential cash flow that results from an intangible investment will be difficult to evaluate, and relying on any usual profitability evaluation method would be fraught with uncertainties. The difficulties to value the output of an intangibles-generating project can be overcome by different approaches:

- Research performed by a company or institution/organization can show a consistent track record, of which a probability of success for a research portfolio can be derived, as is the case for pharmaceutical research, for instance, where a probability of success can be linked to the research phase the project is related to.
- Targets can be set at the outset, which, if reached, will determine the success of the project, even if monetary flows cannot be defined.

A further point is that variations in the evaluation by different analysts can be managed reasonably well, while harmonizing criteria among professionals assessing an organization's management of intangibles, is less straightforward.

Finally, more convergence is needed between the different appraisal systems, as they often have different goals (for instance, see Nordic Industrial Fund, 2001; Zambon et al.).

Given the widening importance of the financing of regional development programs in the EIB's operations and the emphasis given on IC enhancement in these, the development of IC indicators to assess the outcome of these programs is gaining attention. Efforts are now being directed towards the definition of such sets of indicators.

Conclusions

An increasing share of corporate investment in the industrialized countries will be in intangible, rather than physical assets. In its support of the balanced development of the EU, the EIB is attentive to this development. Intangibles are now considered a separate investment category besides investment in physical assets.

By its very nature, investment in intangibles generate long-term benefits. This feature is obvious in the case of R&D, notably basic research, but also applies to the build-up of brands, customer loyalty and, of course, human capital. When capital markets are weak, long-term debt financing might be needed to keep up investment levels.

Inherent risks, non-transparent and illiquid markets as well as lack of full profit appropriation lead to serious underinvestment in intangibles both at the corporate and macroeconomic level. Support of these investments through competitive funding, such as those provided by the EIB, is consistent with the EIB's policy and priorities, notably those aiming at the development and consolidation of the knowledge-based economy in the EU. Consequently, the EIB has developed a consistent set of useful criteria for assessing intangible investment, which has helped it increase the ratio of intangibles in the projects it finances.

The main problem of investment in intangibles remains the lack of adequate valuation methods and measurement of inputs and outputs. The impact of intangible investment is usually difficult to predict. Usual profitability evaluation methods have to be replaced by other means of assessment.

Similarly, since project cash flows are difficult to predict, alternative loan repayment means have to be secured.

The assessment of how firms and organizations value and manage their intangibles is becoming an increasingly important issue in appraising projects and assessing the longer-term staying power of organizations.

Securing a homogeneous appraisal by the different analysts is a challenge that requires attention, given the more volatile and interpretative nature of the underlying theoretical bases. Examples are an essential part of the discussion and learning process in translating coherent approaches to the staff.

In a wider environment, standardization of the systems that have been developed so far remains a challenge.

A further development will be that intangible or IC indicators will play an increasing role in ex-post-evaluation of the progress of regional development programs financed by the EIB.

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Chapter 7

Assessing Performance of European Innovation Systems: An intellectual Capital Indexes Perspective[1]

Ahmed Bounfour, *University of Marne La Valle, France*

The development of powerful intangible resources is an essential issue for companies; it is also a critical one for public organizations, and not only because of its impact on growth and employment. As it is the case for companies, public organizations must develop innovative approaches, in particular in the functional "fields" of the intangible: research and development (R&D) programs, systems of education, fiscal policies, and public procurement policies.

Indeed, the management of intangibles clearly questions public policy at different levels: in its relationship with "productive" sectors and organizations (companies and sectors of activities), but also with regards to the intangible capacity of public organizations themselves. One can even state that the perspective for companies that has been suggested and developed here can also apply to public organizations. For example, one can point out that the development of evaluation and monitoring tools is an important option to be considered. It reinforces the capacity of training and anticipation of public organizations: international organizations, such as the World Bank or the IMF, European Institutions, and national or regional administrations. Each of these organizations is now under high policy pressure to increase their policy and output transparency (this is one of the main aims of the policy governance concept in Europe) and building their reputation.

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The Microeconomic Perspective

The recent developments of the strategic management literature particularly underlined the growing importance of intangible factors for corporate competitiveness. More generally, various factors explain: the growing interest of scholars and analysts in intangibles resources: the strong growth of services activities; the dematerialization of the manufacturing activities themselves; the recognition of knowledge and its infinite combinations as a major source of value creation within organizations; and the empirical demonstration of the determining character of intangibles (R&D, image, relative quality of the products and services) in the acquisition of durable competitive advantages on the business unit levels (PIMS Associates, Irish Institute of Management 1994).

Intangible Resources in the Strategic Literature

The work of Porter (1980, 1985, 1990) has contributed to the definition and implementation of an interesting analytical framework from which to consider competitiveness. The concept of competitive advantage is at the heart of such a development, on the basis of an analysis of the dynamic of competitive forces within market structures. However, Porter's model of the 1980s is now largely challenged by new approaches to competitiveness, especially those focusing on resources (mainly those of intangible nature), as a main source for competitive advantage.

Indeed, as I have underlined elsewhere (Bounfour, 2000), during recent years different approaches have been developed focusing on the corporate intangible resources, competences, and capabilities, as the main lever of creating competitive advantage. In opposition to Porter's view, these approaches, taking into account the fact that the differences of performance are more important within individual industries than between industries, consider that such differences are to be attributed to the type of combination of resources, mainly intangibles, developed by firms, than to industry structures. The strategic approach developed includes different analyses that explicitly stress the importance of intangible resources (assets) as a lever for competitive advantage. Within this approach, we can include different types of works:

- Approaches based on resources (the resource-based view) (Barney, 1991; Collis, 1991; Penrose, 1959; Wenerfelt, 1984, 1989; Dierickx and Cool, 1989; Grant 1991, 1996; Itami and Roehl, 1987; Itami, 1989; Peteraf, 1993, among others) and intangible resources (Bounfour, 1995, 1998a, b, c, 1999; Hall, 1993; Lev, 2001);
- Approaches based on core competences (Prahalad and Hamel, 1990)
- Approaches based on knowledge creation dynamics (Nonaka, 1994; Nonaka and Takeuchi, 1995)
- Approaches based on competences as 'organizational routines' (around the work of Nelson and Winter, 1982; Winter, 1987)
- Approaches based on IC management and reporting (Brooking, 1996; Dierickx and Cool, 1989; Edvinsson and Malone, 1997; IFAC, 1998; Stewart, 1997; Sveiby, 1997).

All of these approaches can be considered as contributions to the foundation of a strategic paradigm for intangibles.

The IC-dVAL® Approach

The Importance of Establishing the Link Between Internal and External Perspectives

The review of the literature as well as of organizational practices suggest that it is possible today to build corporate strategies of IC, including within sectors of activities not pertaining to high technology. The whole of the processes have to be improved and reinforced in particular by integrating a link between the financial value of assets and the internal performance of companies. I have named this approach "the dynamic value of intellectual capital" or the IC-dVAL® approach (Bounfour, 2000, 2002, 2003). In my point of view, establishing such a link is necessary than ever.

From the point of view of the management of organizations, building competitive advantage on the basis of intangibles is mainly ensured via the deployment a "combinatory function" of these resources in a distinctive and necessary specific way. In other words, the problem is that of the definition of a dynamic approach to corporate competitiveness, starting in particular from the implementation of organizational processes that might be referred to as its routines or patterns of current practices and learning (Teece, Pisano, Shuen, 1997).

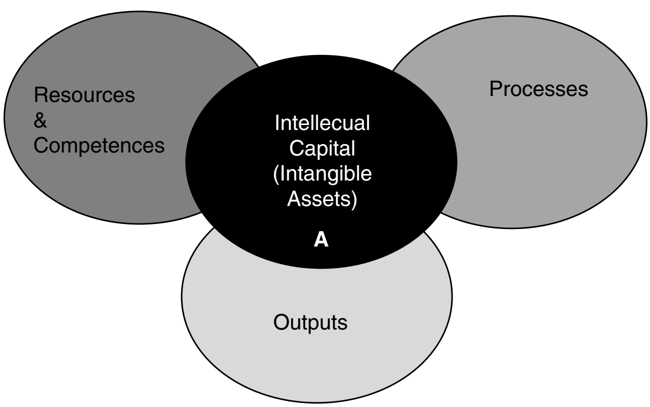
Four Dimensions

In analytical terms, four important dimensions of competitiveness must be integrated (Figure 1). Resources as inputs the mode of exploitation of these resources can be improved by the adoption of specific processes: processes, intangible assets, and outputs.

By integrating these four dimensions (and not only the last one), the problem of corporate competitiveness, in the context of the knowledge economy (KE), appears to be very complex. It should no longer be considered from only (often static) the perspective of market share or industry structure.

Figure 1

Building competitive advantage from intangibles: the IC-dVAL® four dimensions framework



Developing and Implementing a Set of Metrics

The deployment of the IC-dVAL® approach (Bounfour, 2000, 2002b) is done through an overall architecture of indicators related to items, blocks of items (resources, processes, and outputs), as well as to a global vision of corporate performance, through a synthetic indicator (Figure 2).

Also, the overall architecture includes two types of indicators, closely connected—***indicators of partial performance:***

- Performance indicators for resources (PiR)
- Performance indicators for processes (PiP)
- Performance indicators for outputs (PiO).

A set of approximately 25 indicators are included in this framework. Organizational performance is measured here by using benchmarking techniques.

> ***A synthetic index*** is *the overall index of performance* (OiP) for the whole company. It is calculated on the basis of previous indexes. It is often used for the calculation of the dynamic value of the IC.

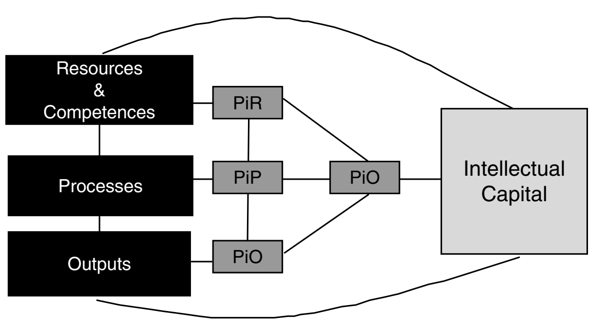
The whole approach has been implemented for dozen of companies and organizations at the European level: large companies, specific lines of activities within companies, as well as public organizations such as town councils.

From Micro- to Meso-/Macroperspectives: Collecting and Diffusion of Information on Intangibles

Over the last five years, several interesting initiatives have been implemented at the national level (Sweden, Denmark, The Nordic Project, Israel), as well as a regional level (the Ligue Arab region, with the support of the United Nations [Bontis, 2002], or the Pacific Islands, with the support of the World Bank [1997] and more broadly at the level of OECD zone [OECD, 1997]). Most of these initiatives consisted of using existing data, basically at the input and output level. Bontis (2002), for instance, referred to Edvinsson's approach, with some adaptation to a national context. How-

Figure 2

Metric Model for measuring corporate performance for IC



ever, further analysis is needed, especially focusing on the organizational and dynamic dimension of socio-economic performance. Other frameworks have been recently used (for instance, Croatia [see Chapter 12 by Ante Pulic]).

Building on the IC-dVAL approach results at the microeconomic level, a set of indicators are recommended for establishment at the meso-macroeconomic level, especially for statistical consolidation and benchmarking. Indeed, statistical data are now needed for clusters, communities of practice and sectors of activities, especially at the European level. Table 1 details the content of each dataset.

This framework can be—and is effectively—used for different public policy dimensions. It has already been used in the assessment of the impact of European Research and Technological Development (RTD) programs. It is also being tested for reporting on intangibles in the context of the KE.

Table 1: The "intangible resources four datasets" for mesoeconomic (clusters) reporting

Dimension for Performance for Intangibles The Four Datasets' Details
Dataset I: Resources (Inputs) Metrics
These are indicators related to measuring companies and economies resources such as: R&D, patents technology, infrastructure, human resources, information and knowledge, software, advertising, market research, vocational training, as ***inputs*** (investments) to an operator's activities. Data for two types of metrics are expected to be collected here: – **data related to the level of investment in a specific resource**—Hence, the *investment in resources indicators,* such as human resources technology resources or information resources (e.g., an expenditure on a market resource study); – **data related to the cluster members performance** (i.e., how do they perform compared to those 'best in class'; answering this question necessitates the undertaking of a benchmark exercise). Hence, the *performance indexes*. Physical resources as well as financial resources are considered as contextual elements.
Dataset II: Processes Metrics
These are indicators related to measuring defined processes for value creation in the new economy: networking, combining knowledge, virtual organizing, alliances, agile organization, developing routines, developing communities, developing standards, developing new business paradigms, developing communities of practice, developing networks and clustering processes, mobilizing human resources, developing financial markets trust, developing public RTD fundraising, and so on. Two types of data are expected to be collected here: – **data related to the level of investment in specific processes**, such as a networking process or an internal communication process. Hence, the *investment in processes indicators*; – **data related to the cluster members performance** (i.e., how do they perform compared to those 'best in class'; answering this question necessitates the undertaking of a benchmark exercise). Hence, the *processes indexes*.

Table 1: The "intangible resources four datasets" for mesoeconomic (clusters) reporting (*Continued*)

Dataset III: Outputs Metrics
Indicators related to measuring defined outputs and performance in the new economy, such as patents, trademarks, reputation, an increase in turnover, market niches, contractual contacts, communities of use, barriers to entry in specific businesses, increasing net value, and so on. Two types of data are expected to be collected here: – **data related to the value for specific output**, such as an additional turnover, an increase in market share, and a creation of niche due to a first mover advantage. Hence, the *outputs indicators*. – **data related to the cluster members' performance** (i.e., how do they perform compared to those 'best in class'; answering this question necessitates the undertaking of a benchmark exercise). Hence, the *output indexes*.
Dataset IV: Assets Metrics
Indicators related to measuring defined assets, mainly of intangible nature, in the knowledge economy: human capital (collective routines, knowledge), innovation capital, structural capital (including technology, patents, trademarks, standard software, and tools), and market capital (reputation, attractiveness, market niches, standards, and so on). **All four types of assets are to be estimated into €, $, or any other currency.** Evaluations are carried out at different levels: business unit level, corporate level, or group level.

A different set of indexes are recommended along the IC-dVAL framework: resources and competences indexes, process indexes, and output indexes.

Different types of IC are also recommended for identification and measurement: human capital, innovation capital, social capital, structural capital, and market capital. Each of these components is the subject of ongoing research for identification and measurement from the societal point of view.

Benchmarking European National Innovation Systems Performance: A First Analysis

If we can consider that the previous framework integrates a set of metrics that might be used for reporting and managing IC at a regional or national level, the problem we face is that of data availability. The following developments are preliminary results for ongoing research on metrics modeling for IC reporting and management in the European KE.

For this exercise, we used proxy values. Indeed, a set of metrics have been defined and used along with the four predefined framework items (Table 2).

Objectives of the Research and Modalities of Conduct

As it has been stressed earlier, the objective here is to proceed to benchmarking of national innovation systems in Europe, in order to determine critical factors of intersystems learning. Benchmarking is defined here according to what Lundvall and Tomlinson (2001) named intelligent benchmarking; its opposite is the often-used "naïve benchmark-

Table 2: Metrics used as proxy values for benchmarking EU IC performance

Resources Indexes	
Indicators	Year/period
• Public expenditures R&D/GDP	1999
• BERD/GDP	1999
• Percentage of venture capital/GDP	2000
• Percentage of new capital/GDP	
Processes Indexes	
Indicators	Year/period
• Percentage of SMEs innovating in-house	1996
• Percentage of SMEs innovating in cooperation	1996
• Percentage of home Internet access	2000
• Percentage of ICT markets/GDP	2000
• Percentage of high-tech value added	1997
• Labour productivity growth–Long-term	1991–1999
Output Indexes	
Indicators	Year/period
• Percentage of innovating exports/total sales	1996
• Unemployment rate	1999
• Percentage of new-to-market products	1996
• GDP per capita (PPS)	1999
• Real GDP growth	1995–1999
Asset Indexes	
Indicators	Year/period
A. Structural Capital Indexes	
Number of scientific publications per million	1998
EPO high-tech patents/population	1999
USPTO high-tech patents/population	1998
B. Human Capital Indexes	
Percentage of S&E graduates/20 to 29 years of age population	1999
Percentage of population with 3rd education	2000
Life-long learning	2000

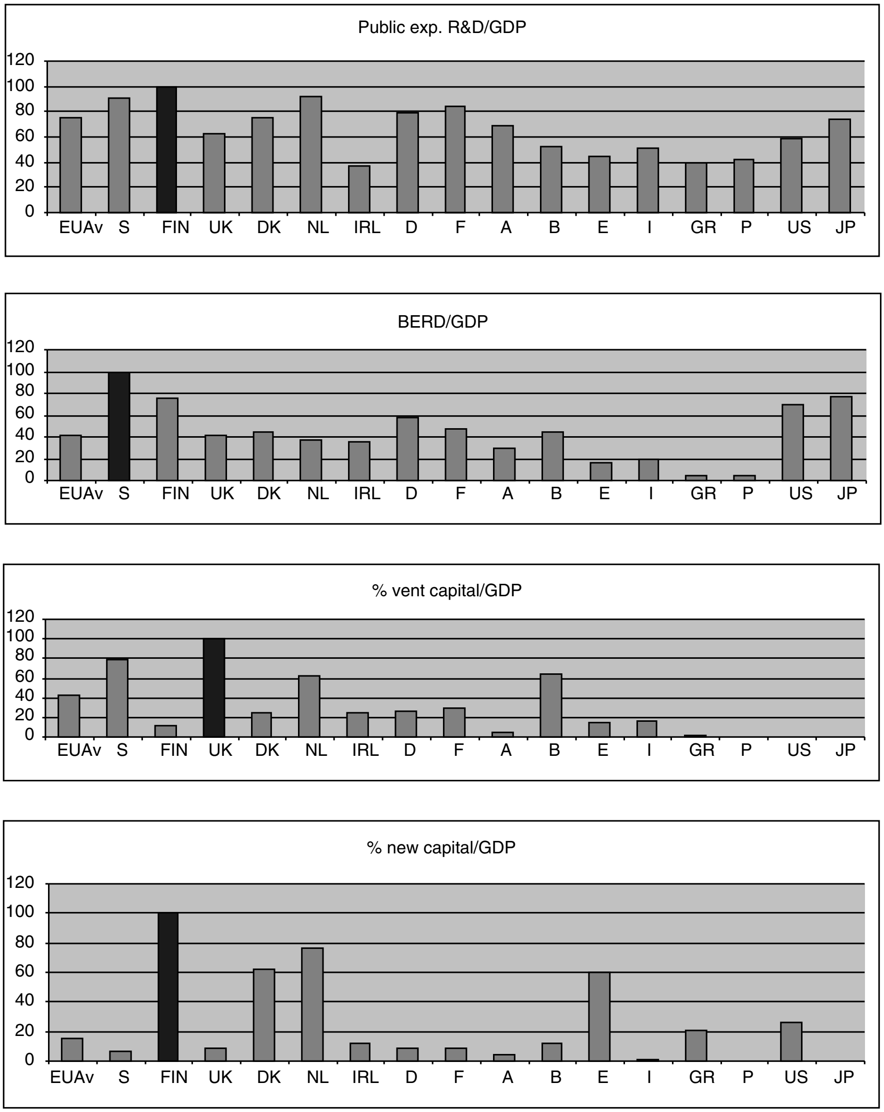
ing," i.e., a process of "inter-organizational learning by comparing." Therefore, resorting to metrics aims at bringing to the fore the level of performance of innovation systems and identifying their main possible explaining factors. Most of the data used are extracted from an important benchmarking exercise in the EU: The innovation trend chart. These data have to be interpreted in the framework of a large EU reflection on innovation policies (European Commission, 2000b, 2000c, 2001a, 2001b, 2002).

Preliminary Results

The performance of the European countries have been assessed along the indexes for the four dimensions of performance: (1) resources, (2) processes, (3) outputs, and (4) assets. Figures 3 to 8 detail the achieved results.

Figure 3

Resource performance indexes for European countries, according to the IC-dVAL approach



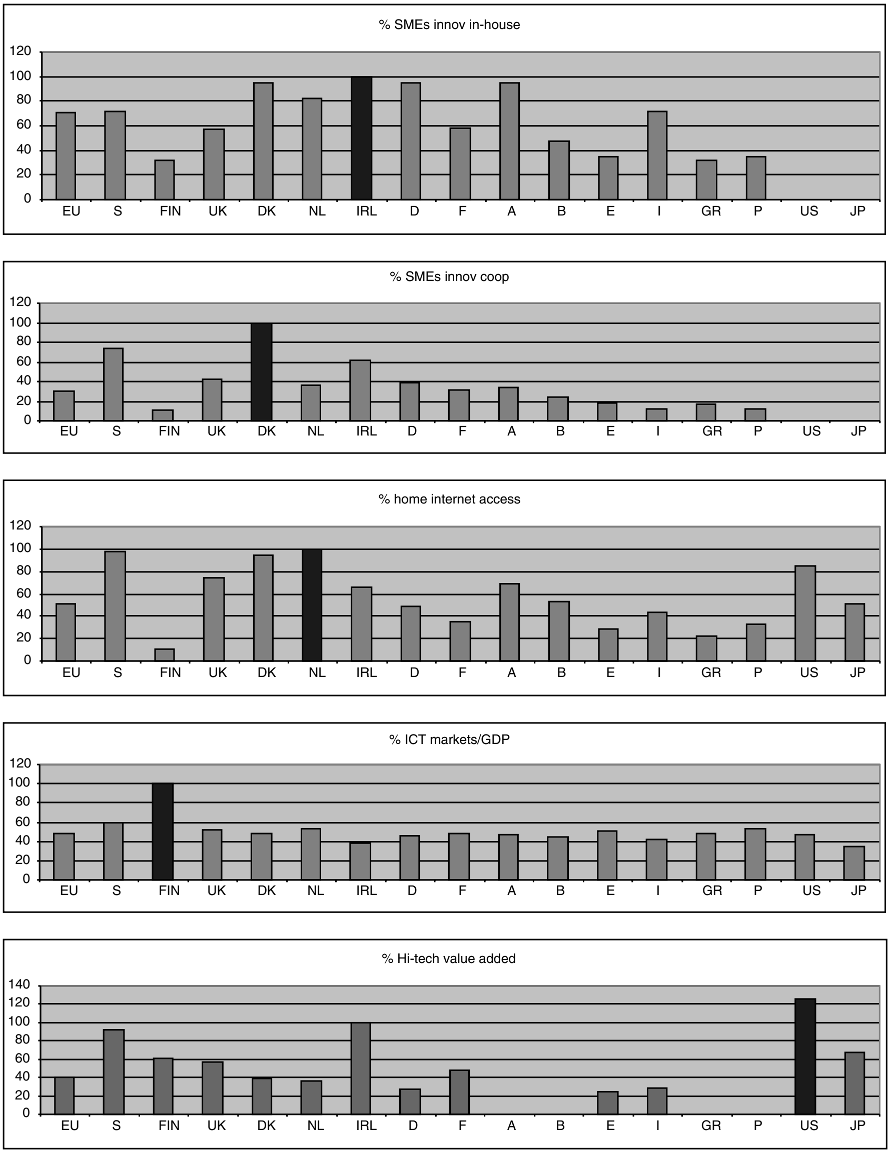
Resources Indexes

The consideration of the resources indexes, on the average, tend to indicate the following:

- For public R& /GDP , Japan is doing better than the U.S. But the U.S. is doing better than the EU. However, within the EU, Finland is the "best in class," followed by Sweden and the Netherlands.

Figure 4

Processes performance indexes for European countries, according to the IC-dVAL approach



- For business expenditure on research and experimental development (BERD)/ GDP, Japan and the U.S. are again better positioned than the EU (average). Sweden and Finland are again better players in Europe.
- For venture capital/GDP, we do not have comparable data for the U.S. and Japan. For this metric, the UK is the best player in Europe;

Figure 5

Outputs performance indexes for European countries, according to the IC-dVAL approach

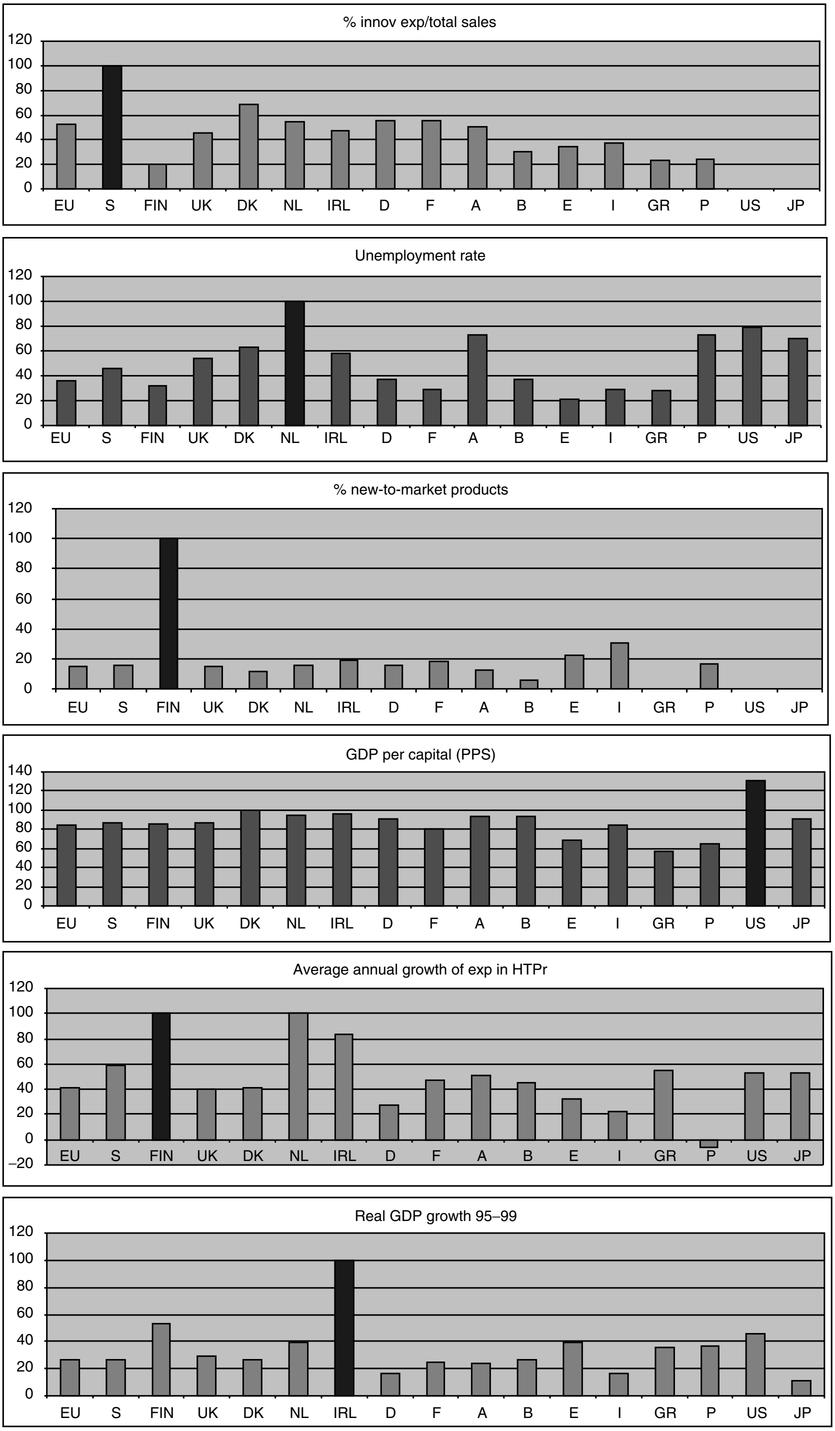


Figure 6

Assets performance indexes for European countries, according to the IC-dVAL approach

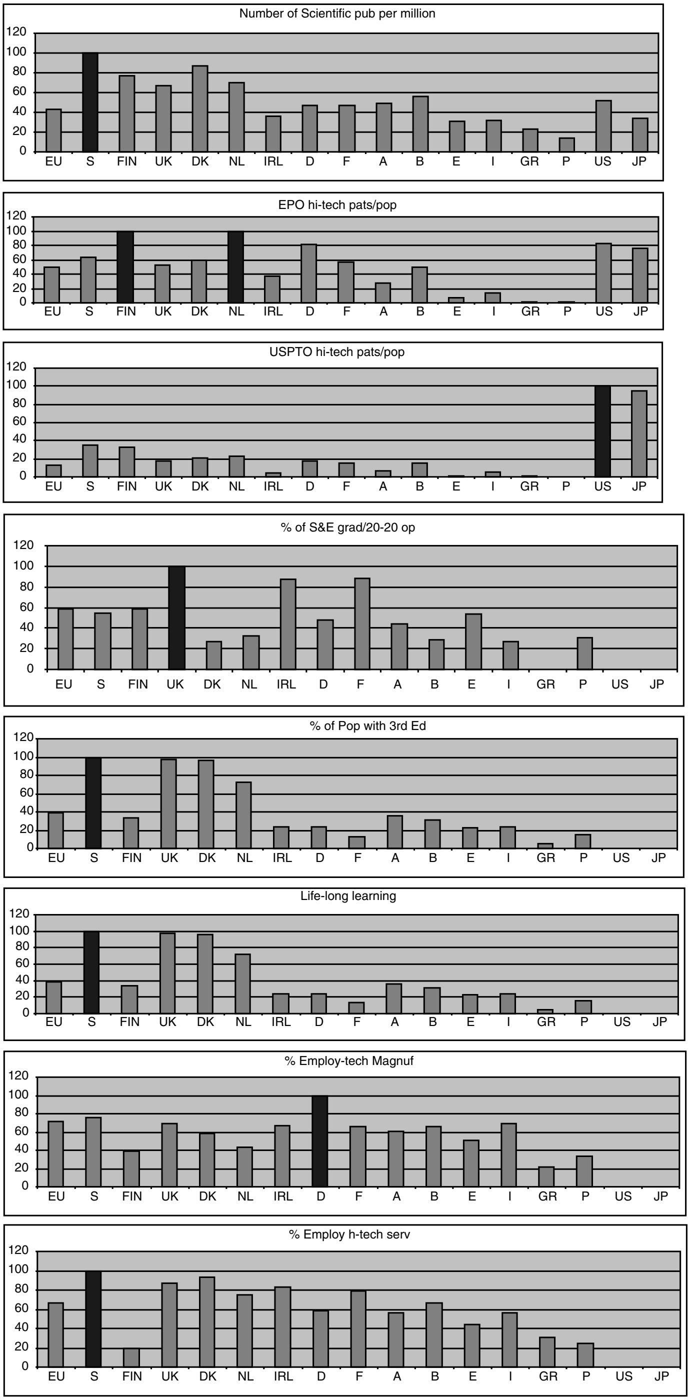
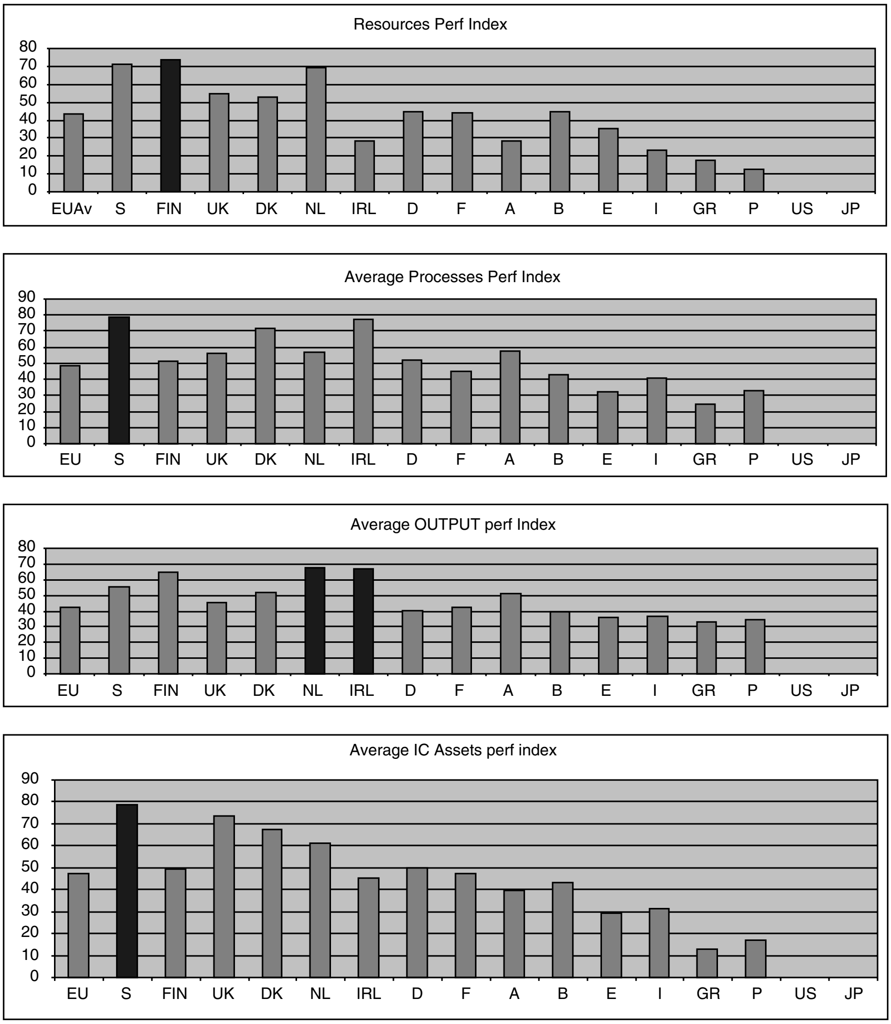


Figure 7

Average performance indexes for European countries, for the four dimensions of the IC-dVAL approach



- For new capital/GDP, the U.S. is doing better than the EU. Within the EU, Finland is the best player.

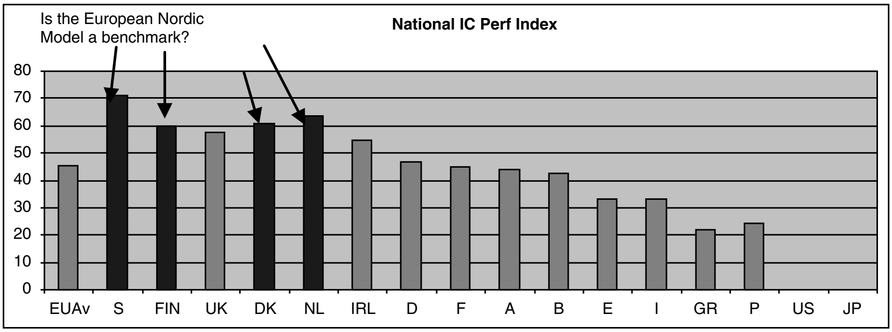
Processes Indexes

Metrics used here are proxies for a nation's organizational capital. From the data available from Figure 4, we can observe that:

- Ireland is the best player in Europe for percentage of small and medium-sized enterprises (SMEs) innovating in-house.

Figure 8

Final performance indexes for IC of European countries, according to the IC-dVAL approach



- Denmark is a leading player for percentage of SMEs innovating in cooperation. Therefore, social capital can be considered here as a strong value within this country.
- The U.S. is doing better than the EU and Japan for percentage of Internet home access. However, within EU, Nordic countries are outstanding players (The Netherlands, Denmark, Sweden).
- For ICT markets/GDP, the U.S. is doing better than the EU and Japan. Within the EU, Finland is the leading player.
- For hi-tech value added, the U.S. is the leading player worldwide, followed by Japan and the EU. Within the EU, Ireland and Sweden are the best players.

Output Indexes

The metrics used for the output dimension are heterogeneous. Three of them are of high socioeconomic importance and must be considered in a long-term perspective: (1) the unemployment rate, (2) the GDP per capita, and (3) the real GDP growth. By considering the available data, we can observe that European Nordic countries are excellent players worldwide. Indeed, available data bring to the fore the fact that:

- Sweden is the best player for the ratio: percentage of innovating exports on total sales.
- The Netherlands are the best in class for the unemployment rate. On average, the U.S. are doing better than the EU and Japan.
- Finland is a good player in new-to-market products, much in part to the success of Nokia.
- The U.S. is the best player for the GDP per capita, followed by European Nordic countries (Denmark, the Netherlands, among others).
- The U.S. is doing better than Japan and the EU for average annual growth of exports in high-tech products. But within the EU, Finland, the Netherlands and Denmark are excellent players.
- For real GDP growth, the U.S. is doing better than the EU. Ireland is an excellent player, due to mainly export-oriented economic policy.
- On average, the EU is lagging behind the U.S., for most of these indicators.

Assets Indexes

Proxy assets indexes are distinguished between structural capital (mainly patents) indexes, and human capital indexes.

For structural capital, the processed indexes indicate clearly that:

- here again, the EU is lagging behind the U.S. for a major ratio: the number of scientific publications per million;
- within the the EU, Nordic countries are the best players for this ratio;
- the same remarks can be applied for two major indicators for patenting: European Patent Office (EPO) and the U.S. Patent and Trademark Office (PTO) indexes.

For human capital, data attest also to the better performance of Nordic countries, except for one metric: the percentage of science and engineering (S&E) graduates among the 20 to 27 years of age population (UK is the leading country here).

Average Performance Indexes: National Intellectual Capital Indexes

On average, we can see that for each of the four dimensions used here—resources, processes, outputs, and assets—Nordic countries are the best players in the EU (Figures 7 and 8). At this stage, a hypothesis can be formulated: these countries might have the cultural characteristics needed to adapt to the KE. If we use the four dimension criteria suggested by Hofstede (1984), these countries might globally be considered as refusing power distance, more collectivist than individualists, more feminine than masculine, and so on.

These reasons might explain why these countries are the most important investors worldwide, in IC, as a field of research and action. The question then is: to what extent can the Nordic countries be referred to as benchmark in the European arena, or more specifically, to what extent can a process of 'learning-by-comparing' be implemented within Europe as well as outside?

Conclusions

The four dimensions of the IC-dVAL approach can be used at the microeconomic level as well as at the macroeconomic level, especially in the perspective of benchmarking IC performance. In Europe, the opportunity to specifically test, develop, and implement new organizational models that might be most suitable to achieving its strategic objectives. This can be done by dialogue between different models: the Nordic model, the South-Latin model, the East-Continental model, and the British financial services model. New metrics are now needed not just to give a more accurate picture as well as to build a new implicit order within and around organizations. Indeed, the organizational design is a major issue for corporate and innovation systems performance in Europe. In this context, using the trend chart data as a proxy value for intangibles, tend to suggest that in Europe—and probably worldwide—the Nordic Countries can be considered, possibly simplistically, as good players. But what does this tell us? At this stage several hypotheses can be formulated: first, we have to go further in analysis (it might be possible that the nation level of analysis is not good enough for larger countries); second, we have to develop and test new adapted metrics; third, these countries are generally characterized by good practices for the organizational dimension (the social capital) and by a real attention paid to the human capital;

and finally, cross-sectional analysis has to be completed in order to better establish this chapter's findings.

Considering benchmarking from this perspective lead us to recommend public authorities: (1) to encourage experimentation and learning by comparing processes, including within public organizations, and (2) to develop and implement new metrics at very intermediate levels (clusters, regions, voluntary clubs of companies, and public organizations) for supporting such processes and reducing the asymmetry of information for active agents.

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Chapter 8

National Intellectual Capital Index: The Benchmarking of Arab Countries

Nick Bontis, *DeGroote Business School, McMaster University, Hamilton, Ontario, Canada*

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Abstract

The intellectual capital (IC) of a nation (or a region of nations as is the case for this paper) requires the articulation of a system of variables that helps to uncover and manage the invisible wealth of a country. Most importantly, an emphasis on human capital allows for a better understanding of the hidden values, individuals, enterprises, institutions, and communities that are both current and potential future sources of intellectual wealth. This chapter attempts to address the following five research questions: (1) What is the current state of research for the IC development of a nation? (2) What are the subcomponents of IC development in the Arab region including human capital and structural capital (i.e., market capital, process capital, and renewal capital)? (3) What are the

dominant metrics and measures that identify and explain national IC development? (4) What are the antecedents and outcomes that explain the patterns of IC development? (5) What are the implications for future development of IC in the region?

The main outcomes of this chapter are the development of a national IC measurement methodology and index. The National Intellectual Capital Index is also used within a structural equation model to test several hypotheses related to national IC development.

> Knowledge is like light. Weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere. Yet billions of people still live in the darkness of poverty—unnecessarily. (KFD, 1998, p. 1)

Introduction

Nsour (2001) reports that rapid technological advances in computational power and communication technologies are transforming the nature of knowledge, skills, talents, and the know-how of individuals in the workplace. Today's global information marketplace requires a different kind of worker, one with competencies, attitudes, and intellectual agility conducive to systemic and critical thinking within a technologically oriented environment. For public and private institutions in the Arab states region to succeed in the new economy, this translates into restructuring industrial age organizational structures, processes, and mindsets to utilize the wealth-creating potential of people (Nsour, 2001).

The intellectual capital (IC) of a nation (or a region of nations as is the case for this chapter) requires the articulation of a system of variables that helps to uncover and manage the invisible wealth of a country. Although the importance of knowledge as a strategic asset can be traced back several thousands of years, it was the ancient Egyptian and Greek civilizations that represented the first evidence of the codification of knowledge for the purposes of leveraging regional power with their implementations of national libraries and universities. More recently, Machlup (1962) was the first to coin the term "intellectual capital" and used it to emphasize the importance of general knowledge as essential to growth and development. Alfred Marshall says "knowledge is our most powerful engine of production; it enables us to subdue nature and . . . satisfy our wants" (World Bank, 1999, p. 20). However, "knowledge is often costly to create, and that is why much of it is created in industrial countries" (KFD, 1998, p. 1).

The concept of IC was further expounded upon by management guru Peter Drucker (1993) in his description of post-capitalist society. Drucker (1993) highlights the importance and arrival of a society that is dominated by knowledge resources and a competitive landscape of IC allocation. By the end of the 1990s, references to IC in contemporary business publications were commonplace (Bontis, 1996; 1998; 1999). IC management became the domain of the so-called CKO or Chief Knowledge Officer (Bontis, 2001a; 2001b; 2002b; Mitchell and Bontis, 2000). In his groundbreaking cover story in *Fortune Magazine*, Tom Stewart (1991) provided the main impetus for a new world of intellectual capitalists.

Literature Review

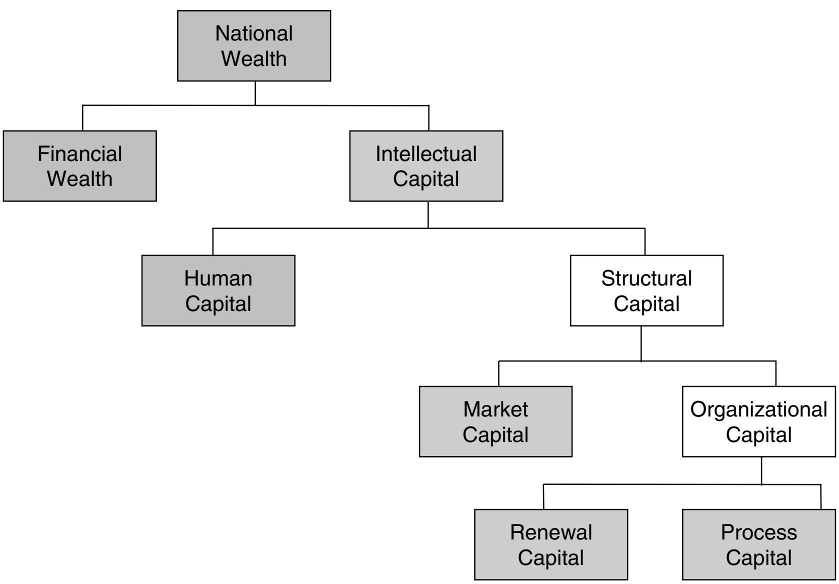
Much of the current academic literature on IC theory and its accompanying frameworks, constructs, and measures stems from an accounting and financial perspective, focusing on the firm level of analysis (Bontis et al., 1999; 2000; 2002). Theorists soon extrapolated the initial conceptual level to also include nations. Malhotra (2001) argues that leaders of national economies are trying to find reliable ways for measuring knowledge assets to understand how they relate to future performance. The expectation from finding a reliable measure of knowledge assets is that such measures can help governments better manage the intangible resources that increasingly determine the success of their economies. The key to determining these success factors is an understanding of relationships and synergistic modulations that can augment the value of each subcomponent of IC (Choo and Bontis, 2002). Approaching economic development from a knowledge perspective—that is, adopting policies to increase a nation's intellectual wealth—can improve people's lives in a myriad of ways besides higher incomes (KFD, 1998).

The IC of a nation includes the hidden values of individuals, enterprises, institutions, communities and regions that are the current and potential sources for wealth creation. These hidden values are the roots for nourishment and the cultivation of future well-being. For this purpose, it is essential to have a mapping system to describe the IC of nations and to systematically account and follow the evolution of such IC development. The system used to capture the statistics and describe the constructs of national IC can be presented in the shape of a modified IC navigator for nations. This framework consists of five value-creating fields, each focusing on an individual sphere of interest. Figure 1 is a modified version of the IC tree described by Edvinsson and Malone (1997). The following constructs have been transformed from a firm level to a national level perspective: market value is now national wealth, financial capital is now financial wealth, customer capital is now market capital, and innovation capital is now renewal capital. The remaining constructs are labeled the same (Figure 1).

Although much of the history of IC literature spans only a decade, the national view of this phenomenon is in its infancy. There have been only two countries that have

Figure 1

IC of nations. Source: Modification of Edvinsson and Malone (1997)



examined their IC development: Sweden (Rembe, 1999) and Israel (Pasher, 1999) prior to the Arab initiative established by the United Nations. This chapter signifies the first attempt to measure and benchmark IC development across several nations.

Sweden and Israel plan to revisit their numerical assessments every couple of years which is important due to the benefits of longitudinal trending. Furthermore, the IC development reports of both countries have provided a sound springboard for the advancement of other national programs such as foreign investment (Sweden) and government funding allocations (Israel).

The Arab Region

There has never been a specific IC development report published for the Arab region nor for any of the Arab countries individually. This chapter aims to fill that void and begin a process whereby the longitudinal IC evaluation for the Arab Region becomes an essential policy intervention. Although the Arab states have never been examined through the IC framework lens, there have been independent evaluations of several of the subcomponents of IC from various organizations including the United Nations and the World Bank. Specifically, the United Nations continues to support an initiative in which country-level and regional human development reports are published. The complete Arab Human Development Report (AHDR, 2002) can be downloaded from the United Nations Development Program website at http://www.undp.org/rbas/ahdr/.

The State Information Service (SIS) (2000) reports that the modernization program of the Arab states should aim at adopting the following three principles: 1) human investment through education and training, 2) viewing workers as intellectual assets, and 3) implanting and nurturing innovative, developmental, and cost saving behaviors in firms and government. It should be able to enhance teamwork spirit among workers and citizens as a basis for effective collective performance. Moreover, modernization is no longer a luxury, but rather an inevitable necessity for those countries that work hard to achieve prosperity and progress for their people.

A significant challenge that resonates in the Arab states in particular is the presence of oil as a natural resource, which contributes significantly to the financial wealth of certain Arab countries. Zineldin (1998) reports that within the oil-rich countries there is rapid growth in non-oil sectors caused by extensive government investment, continued growth in import demand, and rapid increases in the education levels of consumers, with consequent demands for sophisticated and high-quality products. Some economists distinguish between the oil-rich, such as Saudi Arabia, Kuwait, Iraq, and Libya, and the oil-poor such as Egypt, Syria, and Jordan. The ability of the oil-rich to use oil proceeds for domestic developments depends on their ability to translate these resources into useful imports. Owing to limitations on that capacity, they have been susceptible to shortages of domestic resources, resulting in internal inflation. In the oil-poor countries, the export sector cannot be distinguished from the non-export sector. Although export demand depends on the world economy, the supply of exports generally relates on the development of the whole economy. The oil-poor nations can become labor supply countries, where capital and import constraints usurp their economic growth. A number of oil-rich Arab countries (notably Saudi Arabia and the rest of the Gulf states) drive approximately 90% of government revenues from oil and have high per capita incomes, but a limited industrial base. Other states with oil resources have encouraged industrial diversification, usually within a framework of rigid state control (e.g., Iraq and Libya fall within this group). The major Arab countries without extensive oil reserves (i.e., Egypt, Jordan, Syria, Morocco, Sudan, and Tunisia) depend on industry and agriculture.

In summary, the lack of diversification in the economies of the Arab region are explored to set up the need for an overarching meta-policy to develop flexible and renewal IC in the region. The following arguments are introduced in support of an IC development report in the Arab region: 1) a lack of a diversified industrial base in virtually all countries; 2) a need for a solid educational system; 3) education output does not equal market demand; and 4) no infrastructure to stimulate spill-over effects from sectoral growth.

Conceptual Framework

Prior to reviewing the four key constructs that encompass the IC of a nation—human capital, process capital, market capital, and renewal capital (refer back to Figure 1)—this section will focus on the traditional economic assessment of financial capital. Malhotra (2001) reports that traditional assessment of national economic performance has relied upon understanding the growth of gross domestic product (GDP) in terms of traditional factors of production–land, labor, and capital. Given the changing dynamics underlying national performance, it is not surprising that some less developed economies with significant assets in information technology (IT) and Internet-related expertise are hoping to leapfrog more developed economies. For example, the El Ghazala region of Tunisia is recognized among the world's top technological hubs (Hillner, 2000).

The United National Development Program (UNDP) (1998) reports that in recent years, private financial flows into the Arab region have been below 2% of its gross national product (GNP). From this point of view, the strongest link of the region with the global market is the estimated $800 billion of Gulf Cooperation Council (GCC) money that is invested outside the region. Another link is created by remittances of Arab migrant workers, mainly from Europe. Apart from oil and related products, the Arab states virtually do not sell on the global market (UNDP, 1998). To put things in perspective, around 260 million Arabs export the same quantity of product as 6 million Finns. Arab producers hide behind relatively high custom tariffs. In the case of Egypt, Jordan, Syria, and Libya, an average custom tariff is as high as 30%. However, there has been a noteworthy move to join the global market via accession agreements. As of July 2001, Bahrain, Djibouti, Egypt, Jordan, Kuwait, Mauritania, Morocco, Oman, Qatar, Tunisia, and United Arab Emirates (UAE) have become members of the World Trade Organization (WTO). Algeria, Lebanon, Saudi Arabia, Sudan, and Yemen are observers (WTO, 2001). The associative agreements with the European Union (EU) to eliminate trade barriers in 12 years were signed by Tunisia, Morocco, and Jordan, while Algeria, Egypt, Lebanon, and Syria are at the negotiation stage. Last but not least, the Arab Free Trade Area was created to eliminate trade barriers between the members of the League of Arab States by the year 2008. In this way a hub-and-spoke structure is emerging in relations between the region and the outside world. Unfortunately, the Arab region's present competitiveness positions itself more as a spoke than a hub (UNDP, 1998).

Financial Capital

To evaluate the financial capital of Arab countries versus the Organization for Economic Cooperation and Development (OECD) member countries we can compare

GDP per capita values. The average GDP for Arab countries in 1999 was $7,238 per capita (see Figure 2 for each country value). The average GDP for OECD member countries in 1999 was $22,020 per capita.

Assessing a nation's IC is a daunting task. Moreover, the availability of data for the Arab states is generally sparse. Notwithstanding the limited secondary sources for Arab state metrics, the data collection process was conducted as thoroughly as possible. The data reported in Figure 2 represents the latest available information as reported by the various sources for the following countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, UAE, and Yemen (Figure 2).

The scope of this chapter focuses primarily on IC metrics. Clearly, there are many factors that relate to a nation's intellectual wealth such as health, poverty, and gender empowerment. However, it was decided that these related factors would be best acknowledged as beyond the scope of this particular study. This is not because these issues are not important. Rather, the complexities surrounding general human development (i.e., health, poverty, and gender empowerment) would be best addressed by subsequent research.

The Arab countries represented in this report have a combined population of 280 million inhabitants (DES01). This number is expected to grow to 380 million by the year 2015 (DES05). The six most populous countries are Egypt, Sudan, Algeria, Morocco, Iraq, and Saudi Arabia, which represent 72% of the overall population of the region. On average, 36% (DES04) of the population is between the ages of 0 and 15 years, which represents the future human capital of the Arab region.

As previously mentioned, the most common metric denoting the financial wealth of a nation is its GDP per capita. It is important to also normalize this figure for the difference in purchasing power across nations. Metric FC01 represents the GDP per capita with purchase power parity. Based on this figure, UAE, Qatar, and Kuwait have the highest financial wealth averaging around $18,000 per capita whereas Sudan and Yemen have <$1,000 GDP per capita. This compares with an average of $26,050 among high-income OECD countries, and an average of $7,238 among Arab states.

In addition to GDP measures, trade policy is an important factor in determining financial capital. Barriers to trade influence overall economic well being. Indicator FC04 is published by the Heritage Foundation and represents a nation's barriers to trade on a scale from 1 (low) to 5 (high barriers to trade). The Arab region on average has a relatively high score of 3.75 with the lowest scores coming from UAE, Oman and Kuwait. Another chief indicator of financial capital is the market capitalization of a nation's stock markets (FC05). The Arab region has $165 billion in market capitalization in its stock markets with Saudi Arabia ($67 billion), Egypt ($29 billion), and UAE ($28 billion) representing 75% of that total.

Human Capital

Human capital is defined as the knowledge, education, and competencies of individuals in realizing national tasks and goals. The human capital of a nation begins with the intellectual wealth of its citizens.

This wealth is multifaceted and includes knowledge about facts, laws, and principles, as well as the less definable knowledge of specialized, teamwork, and communication skills (OECD, 2001). When Doraid (2000) states that the real wealth of Arab states is the people that reside within them, it is this wealth to which Doraid refers.

Figure 2

Descriptive statistics on Arab countries

	Population					World Bank Indices			
	Total (millions) 2000	**Total** (millions) 1950	**Total Growth** (%) 1950–2000	**Age 0-14** (%) 2002	**Projected Population** (millions) 2015	**Gender GEM** (index) 2001	**Health HDI** (index) 2001	**Poverty HPI-1** (index) 2001	**Gender GDI** (index) 2001
	DES01	DES02	DES03	DES04	DES05	DES06	DES07	DES08	DES09
Algeria	30.31	8.75	246.4	34.8	37.85		0.693	23.5	0.673
Bahrain	0.64	0.11	481.8	28.2	0.78		0.824		0.814
Comoros	0.71	0.17	310.4	43.0	0.98		0.510	29.9	0.503
Djibouti	0.63	0.06	916.1	43.2	0.85		0.447	34.7	
Egypt	67.89	21.83	210.9	35.4	84.51	0.258	0.635	31.7	0.620
Iraq	22.95	5.16	344.9	41.6	32.53				
Jordan	4.91	0.47	940.3	40.0	6.97		0.714	8.5	0.698
Kuwait	1.91	0.15	1,156.6	31.3	2.36		0.818		0.815
Lebanon	3.50	1.44	142.6	31.1	4.31		0.758	10.2	0.741
Libya	5.29	1.03	414.1	33.9	6.84		0.770	16.7	0.748
Mauritania	2.66	0.83	222.4	44.1	3.84		0.437	47.2	0.428
Morocco	29.88	8.95	233.7	34.7	37.90		0.596	36.4	0.579
Oman	2.54	0.46	457.0	44.1	3.92		0.747	32.2	0.715
Palestine									
Saudi Arabia	20.35	3.20	535.7	42.9	31.06		0.754	17	0.719
Somalia	8.78	2.26	287.8	48.0	13.66				
Sudan	31.10	9.19	238.4	40.1	41.36		0.439	34.8	0.413
Syria	16.19	3.50	363.2	40.8	21.95		0.700	19.8	0.677
Tunisia	9.46	3.53	168.0	29.7	11.52		0.714		0.700
UAE	2.61	0.07	3,628.6	26.0	3.09		0.809		0.798
Yemen	18.35	4.32	325.2	50.1	33.16		0.470	42.5	
Arab states	**280.66**	**75.48**	**271.8**	**34.7**	**379.44**	**0.258**	**0.658**	**27.5**	**0.665**
SOURCE	UN, 2001	UN, 2001	Calculated	UNESCO	UN, 2001	HDR, 2001	HDR, 2001	HDR, 2001	HDR, 2001

Thomas Schultz (UNESCO, 1991) states that one-fourth of our income is explained by our physical capital while the rest is generated by human beings, highlighting the importance of human capital.

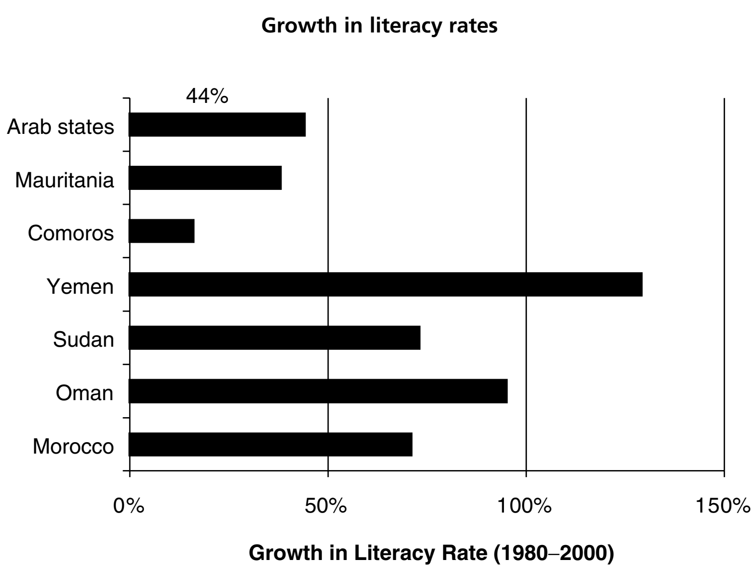
The measurement of this human capital, however, is quite difficult. Care must be exercised to ensure that metrics include the quality and quantity of individual stores of knowledge as well as that of the collective knowledge stores found within organizations (OECD, 2001). When analyzing the human capital of a nation, it is important first to fully examine the educational systems, which are the prime developers of human capital. In addition to education, the quantity and quality of a nation's educated population is key, including the degree to which people are developed after formal education is completed.

Education is the basic building block of human capital (Human Development Network, 1999). It is through education that knowledge and skills are developed, enhancing more than simply the ability of labor to perform. Weiss states that "[s]tudents are not taught civics, or art, or music solely in order to improve their labor productivity, but rather to enrich their lives and make them better citizens," suggesting that educated people provide additional value to a nation (OECD, 2001, p. 18).

Literacy figures (HC01 in 1980 and HC02 in 2000) for the Arab states are widely disparate, ranging from Mauritania's 39.9% to Jordan's 89.8% in 2000. However, growth over the past 20 years among several Arab countries has been fairly positive (Figure 3).

In fact, Yemen exhibited a literacy rate of 20.2% in 1980, and has since incurred 129% growth, earning a 46.9% rating in year 2000. While several countries have experienced exceptional growth over the past 20 years, Comoros and Mauritania have encountered slower growth amidst existing low literacy rates. The average literacy rate among Arab states is still <70%, which is inhibiting the widespread sharing of know-

Figure 3



ledge and information between people both within and outside of these countries. This is directly impeding human capital development within the region. Although education enrollment numbers are increasing, particularly at the primary levels, quality of education is still a contentious issue in the Arab states.

Formal education is not sufficient for the continued development of human capital. Companies and post-education training facilities must provide ongoing training to a nation's work force to enable it to cope with a rapidly changing world. The human capital of a nation is the intellectual wealth of its citizens and is developed through education and lifelong learning.

Process Capital

Process capital is defined as the non-human storehouses of knowledge in a nation which are embedded in its information and communications technology (ICT) systems as represented by its hardware, software, databases, laboratories, and organizational structures which sustain and externalize the output of human capital.

In today's global information society, one cannot overstate the implications of the knowledge revolution. We have only begun to comprehend the effects of this revolution on the economic, social, and political structures of societies around the world. It has been compared in magnitude to the industrial revolution that transformed the agrarian societies of the 18th century (UNDP, 1998).

The development of the information society is spearheaded by rapid innovations in science, communication, and computing technologies. Today, technological progress in ICT enables us to process, store, retrieve, and communicate information in whatever form it may take, unconstrained by distance, time, volume, and, increasingly, by cost (UNDP, 1998). This new concept adds new capacity to human intelligence and constitutes a resource that transforms the way we interact and the way we do business. In fact, the UNDP (1998) reports that the combination of human intelligence and IT has replaced the accumulation of physical capital as the leading factor of production.

The role of knowledge and IT in nurturing sustained development is increasing by leaps and bounds. The continuous developments in ICT are opening a world of new opportunities for harnessing knowledge for development. This trend brings about urgent threats, especially for developing countries. Taking advantage of ICT would undoubtedly help advance the knowledge and information systems of societies, allowing the creation, accessibility, and dissemination of current data, information and knowledge. Countries with inadequate computers, Internet access, and telecommunications are at risk of falling even greater behind their competitors in the world market.

The Internet has not considerably penetrated the Arab region. For example, Syria and Saudi Arabia do not even officially support such connectivity. However, the UAE has begun to develop an infrastructure, controlling 92.13 hosts per 10,000 people (PC09). Another yardstick to measure Internet access is the number of top-level domain names.

Current estimates indicate that individuals and companies in Arab countries own a significantly smaller proportion of top-level domain than much of the worldwide population (UNDP, 2000). Therefore, one can conclude that the connectivity of the region stands at a moderate to low state (UNDP, 1998).

Increasing Internet connectivity is an important step that many of the Arab regions must undergo to access to the myriad of knowledge stores available through this technology. Furthermore, collaboration both within the country and across borders can be facilitated through shareware technologies that leverage the Internet. These tools enable the sharing and accessing of explicit knowledge from around the world, and will increase the renewal capital of the country. Furthermore, by posting and collaborating through the Internet, market capital will increase as the knowledge of these countries can be publicized to other nations. Utilizing process technologies is a necessary action to participating in the global economy of the 21st century.

Weak telecommunications and Internet infrastructure in the region coupled with the high cost of connecting to the Internet are major impediments responsible for the slow penetration of process capital development in the Arab region. The region lacks a comprehensive and strategic approach to the multifaceted challenges and opportunities of the global information and knowledge society, where competitiveness reigns supreme (D'Orville, 1999). Although the development of ICT in the Arab region faces many challenges, it has huge potential for Arab trade and industry if government and private sectors unite to support it.

There is significant potential for the application of high technology infrastructure to aid in the dissemination and retrieval of information from around the world. However, government and private sector leaders must redirect investments into fast growing, high productivity areas. In the coming decades, these opportunities will be in businesses that can compete in the global market and utilize current IT (UNDP, 1998). Developing countries have an opportunity to leapfrog into new technologies without entering intermediary stages incurred over the past 50 years by economically developed countries.

Market Capital

Market capital is defined as the IC embedded in national intra-relationships. Market capital represents a country's capabilities and successes in providing an attractive, competitive solution to the needs of its international clients, as compared with other countries. A country's investment and achievements in foreign relations, coupled with its exports of quality products and services, constitute a significant component in its development of market capital, which is rich in intangible assets.

Market capital is social intelligence created by elements, such as laws, market institutions, and social networks. It is similar to social capital, but contains much more because it includes systemic qualities with embedded discovery attributes that enhance social capital creation. Of course, proxies for these elements may be hard to find in the Arab region.

One major factor that ascertains market capital is international trade. Doraid (2000) states that from 1981 the growth of merchandise trade in the Arab states has been the lower than in any other part of the world. International trade with the Arab states dropped below 3% in 1997 to 1998. As previously mentioned, approximately 260 million Arabs export the same quantity of product as 6 million Finns. Apparently, these nations have not been able to use capital from within the region and invest it domestically to attract foreign trade.

Trade in exports from the three existing trading blocks has not kept pace with trade in the rest of the world over the last 20 years (WDI, 2001). The Arab Maghreb Union (UMA–Algeria, Libya, Mauritania, Morocco, and Tunisia), the GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE), and the Arab Common Market (ACM–Egypt, Iraq, Jordan, Libya, Mauritania, Syria, and Yemen) are three trade blocks that exist within the Arab region. While their membership does not account for all countries within the region, these three blocks experienced declined overall trade decline for the period 1970 to 1990 (WDI, 2001).

Relationships within and across countries enhance the ability to create knowledge and also provide a greater ability to extract value from the knowledge of a nation (Sullivan, 2000). International trade brings innovative and more efficient methods of producing new and improved goods and services. The World Bank (1999) reports that foreign direct investment provides benefits to countries through spill-over of work force, influence on local suppliers, and technology sales. Foreign technology and knowledge transfer can be facilitated by initiating open trading regimes, encouraging foreign direct investment, and licensing foreign technology.

The brain drain suffered by some countries is a large problem resulting in some of the brightest graduates leaving for better job opportunities elsewhere (World Bank, 1999). In the past, qualified professionals would opt to not return to their homeland after obtaining a higher, more prestigious degree in a foreign country.

An example of the brain drain problem arises in Lebanon, due to the lack of business opportunities in the country. However, educated people in Qatar generally prefer to stay and work there because of their strong economy and all the financial advantages granted by the government of Qatar to its citizens (Interview, 2001).

The market capital of a nation manifests its IC. Although a lack of information persists throughout the variables used to measure market capital, the underlying structure of imbalance provided from an economic, social, and intellectual standpoint is evident in the Arab region. Among the Arab countries, Egypt is one of the most prominent in market capital. It has hosted the most international meetings of any Arab country, and it ranks among the highest revenue generators from book and journal exports. From the sections previously outlined, Egypt can be used as an example for other Arab countries to follow.

Renewal Capital

Renewal capital is defined as a nation's future intellectual wealth. This includes its capabilities and actual investments in renewal and development for sustaining competitive advantage. Examination of the forces shaping renewal capital demonstrates the link between continued investment in renewal capital and sustained economic growth. Further analysis of such components will yield a better understanding of existing challenges facing Arab states, and the future steps needed to remedy the situation.

Research and development (R&D) is a key parameter in renewal capital. This significance comes from the direct relationship between the success of a country's financial systems and the effectiveness of its R&D sector. The results of investment in R&D are not only limited to financial strength on the national balance sheet, but also to an increase in the efficiency of its population as a whole. Ducharme (1998) reports that in the context of intangible investment, the empirical literature on the private and social rates of return of R&D vary between 25% and 50%, providing further evidence of the impact of research on innovation and productivity.

Further components of renewal capital include patents and scientific publications. A country that performs well in these areas exhibits a high level of educated people who share and codify their knowledge and ideas. This typifies a country with potential to perform well in an IC audit. Total R&D expenditures in 1996 in Egypt ($227 million) and Saudi Arabia ($196 million) lead the region. All other remaining countries in the Arab region were far behind, each spending <$75 million (RC10). The number of researchers per million people of the population stood at 594 in Qatar, 459 in Egypt, and 362 in Libya (RC15).

Although Egypt and Saudi Arabia have distinctly outperformed their neighbors, the average performance will not ensure long-term information development at a global pace. The R&D expenditures develop the IC of a nation and, thus, should be a focal point for government expenditure.

Foreign patent applications represent the renewing of ideas and innovation within industries throughout a country. This figure represents renewal capital since this patent would likely not have been filed on behalf of the Arab country if the foreign worker had not been a resident within that country. This indicates that IC from abroad is being leveraged within the Arab country. While the total number of foreign patent applications for the Arab states was 70,793, over 95% of the foreign patent applications came from Sudan. All other countries who did report were clearly behind in this statistic, whereas 14 of the countries included in this study did not report this statistic.

The persistent dilemma in renewal capital is exacerbated by the lack of infrastructure, deficient funding, and insufficient modernization of skills. A recognition that government funding will not be adequate calls for the involvement of private industry in the form of R&D funding. Such investment will refresh a nation's store of renewal capital providing rejuvenation of national wealth.

Research Methodology

The purpose of the NICI (National Intellectual Capital Index is a trademark of the Institute for Intellectual Capital Research Inc.) is to assess the IC of a nation. The index is based on a conceptual framework in which the IC of a nation is comprised of four subcomponents which include human capital, process capital, renewal capital, and market capital. The following sections explain which items were used and the calculation of each respective subindex.

It is important to qualify this section by stating that it is not an exhaustive use of all available measures. This is merely a bold but necessary exploratory exercise. A more comprehensive set of countries with accompanying data would be necessary for such an index to be formally validated.

All of the items measured in this report were initially eligible for inclusion in each corresponding subindex. However, a quick scan of the tables clearly indicated the extent to which measures for some Arab states were still not published (and perhaps not tracked). It was methodologically necessary to include metrics that would maximize the number of countries in the proposed sample of study. There are a total of 22 countries that encompass the population of Arab states. After selecting the metrics that were reported by most countries, a sample list of 10 countries remained. This sample represents 77% (216.70/281.22) of the overall population of the Arab states.

National Human Capital Index (NHCI)

A total of 7 metrics were available to calculate an NHCI. There was data available from each of the 10 representative countries. Figure 4 outlines a summary of these metrics. As with any composite index, the selected weightings of metrics is open to academic debate. However, the research team of analysts debated and agreed on the weightings listed. Literacy rate (H1) was selected to have the largest weighting (30%) due to its significance as an important antecedent for knowledge absorption (Figure 4).

Figure 4

NHCI calculation

Index	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	
Metric	**HC02**	**HC05**	**HC11**	**HC16**	**HC23**	**HC25**	**HC26**	**NHCI**
Algeria	0.633	0.124	0.930	0.498	0.368	0.82	0.79	**0.586**
Egypt	0.553	0.077	0.998	0.544	0.793	0.88	0.85	**0.647**
Jordan	0.898	1.000	0.467	1.000	1.000	0.63	0.63	**0.842**
Kuwait	0.823	0.151	1.000	0.672	0.923	0.63	0.62	**0.726**
Morocco	0.489	0.135	0.910	0.453	0.374	0.55	0.51	**0.481**
Oman	0.719	0.114	0.990	0.274	0.135	0.75	0.75	**0.537**
Saudi Arabia	0.770	0.114	1.000	0.585	0.308	0.87	0.75	**0.638**
Sudan	0.571	0.241	0.611	0.084	0.173	0.46	0.41	**0.382**
Tunisia	0.708	0.183	0.933	0.560	0.430	0.87	0.85	**0.644**
Yemen	0.462	0.236	0.743	0.156	0.110	0.83	0.51	**0.410**
Weighting	30%	10%	10%	15%	15%	10%	10%	

H1 HC02 literacy rate
H2 HC05 number of tertiary schools per capita relative to highest value
H3 HC11 percentage of primary teachers with required qualifications
H4 HC16 number of tertiary students per capita relative to highest value
H5 HC23 cumulative tertiary graduates per capita relative to highest value
H6 HC25 percentage of male grade 1 net intake
H7 HC26 percentage of female grade 1 net intake

National Process Capital Index (NPCI)

A total of 8 metrics were available to calculate an NPCI. There was data available from each of the 10 representative countries. Figure 5 outlines a summary of these metrics. Telephone mainlines (P1) was selected to have the largest weighting (20%) since it is a fundamental requirement in leveraging the benefits of any Internet service (Figure 5).

National Market Capital Index (NMCI)

A total of 3 metrics were available to calculate an NMCI. There was data available from each of the 10 representative countries. Figure 6 outlines a summary of these metrics. The number of meetings (e.g., conferences and conventions) hosted (M3) was selected to have the largest weighting (40%) since it is one of the best opportunities to market a nation's IC (Figure 6).

National Renewal Capital Index (NRCI)

A total of 7 metrics were available to calculate an NRCI. There was data available from each of the 10 representative countries. Figure 7 outlines a summary of these metrics. The total expenditures in R&D (R3) was selected to have the largest weighting (30%) since it provides the funding for most national R&D activities and represents future investment (Figure 7).

NICI Rankings by Country

Once the four subindices of national IC were calculated, they were combined to form the overall composite NICI. Based on the NICI, Kuwait and Jordan have the highest level of national IC. This is intriguing given that it was Kuwait and Oman that scored the highest in financial capital. More importantly, it is interesting to identify the countries that have high NICI scores relative to their financial capital (Figure 8).

Both Jordan and Egypt have developed their national IC to a greater extent given their financial resources compared to any other Arab state. The following section aims to model the relationship that appears to exist between national IC and financial capital.

Hypotheses

The aim of this section is to investigate the interrelationships among the independent variables: national human capital, national process capital, national market capital, national renewal capital, and the dependent variable, national financial capital.

As a conceptual extension of the hypotheses tested by Bontis (1998) and his colleagues (Bontis, Chua, and Richardson, 2000; Bontis, Crossan, and Hulland, 2002), the proposed model examines the following relationships for the sample of 10 Arab countries represented above. The following six hypotheses are tested:

- H1 National human capital is positively associated with national process capital
- H2 National process capital is positively associated with national renewal capital
- H3 National renewal capital is positively associated with national human capital
- H4 National process capital is positively associated with national market capital
- H5 National human capital is positively associated with national financial capital
- H6 National market capital is positively associated with national financial capital

Figure 5

NPCI calculation

Index **Metric**	**P1** **PC01**	**P2** **PC08**	**P3** **PC09**	**P4** **PC10**	**P5** **PC12**	**P6** **PC13**	**P7** **PC14**	**P8** **PC17**	**NPCI**
Algeria	0.217	0.048	0.000	0.013	0.013	0.357	0.151	0.101	0.117
Egypt	0.313	0.099	0.037	0.056	0.051	0.468	0.171	0.101	0.168
Jordan	0.363	0.115	0.063	0.047	0.114	0.400	0.118	0.111	0.178
Kuwait	1.000	1.000	1.000	1.000	1.000	1.000	0.728	1.000	0.973
Morocco	0.221	0.089	0.014	0.032	0.082	0.364	0.166	0.072	0.130
Oman	0.375	0.218	0.130	0.376	0.310	0.895	1.000	0.074	0.385
Saudi Arabia	0.538	0.473	0.066	0.282	0.253	0.473	0.378	0.156	0.327
Sudan	0.038	0.024	0.000	0.003	0.000	0.401	0.124	0.072	0.073
Tunisia	0.375	0.126	0.004	0.061	0.038	0.330	0.144	0.082	0.158
Yemen	0.071	0.882	0.003	0.010	0.013	0.094	0.042	0.040	0.125
Weighting	20%	10%	15%	10%	10%	10%	10%	15%	

P1 PC01 telephone main lines per capita relative to highest value
P2 PC08 personal computers per capita relative to highest value
P3 PC09 Internet hosts per capita relative to highest value
P4 PC10 Internet users per capita relative to highest value
P5 PC12 mobile phones per capita relative to highest value
P6 PC13 radio receivers per capita relative to highest value
P7 PC14 television sets per capita relative to highest value
P8 PC17 newspaper circulation per capitarelative to highest value

Figure 6

NMCI calculation

Index Metric	M1 MC01	M2 MC08	M3 MC11	NMCI
Algeria	0.042	0.000	0.122	0.062
Egypt	0.004	0.027	0.433	0.183
Jordan	0.236	1.000	0.712	0.655
Kuwait	0.150	0.013	0.646	0.307
Morocco	0.036	0.013	0.509	0.219
Oman	1.000	0.016	0.324	0.434
Saudi Arabia	0.016	0.004	0.040	0.022
Sudan	0.000	0.000	0.053	0.021
Tunisia	0.757	0.035	1.000	0.637
Yemen	0.000	0.002	0.034	0.014
Weighting	30%	30%	40%	

M1 MC01 high technology exports as a percentage of GDP relative to highest value
M2 MC08 number of patents granted by USPTO per capita relative to highest value
M3 MC11 number of meetings hosted per capita relative to highest value

Analysis

A "Cronbach's alpha" test was used to evaluate the reliability of the measures as suggested by Nunnally (1978). Churchill (1979) suggests that this calculation be the first measure used to assess the quality of the metrics. Since a rigorous psychometric evaluation of the NICI and its subcomponents has never been conducted in previous studies, this test was used as an exploratory tool to aid in the removal of poor metrics.

Cronbach's alpha is considered an adequate index of the interitem consistency reliability of independent and dependent variables. Nunnally (1978) suggests that constructs have reliability values of 0.7 or greater. The following three metrics were removed to increase the overall reliability measures of each construct:

H3 HC11 percentage of primary teachers with required qualifications
M2 MC08 number of patents granted by U.S. Patent and Trademark Office (PTO) per capita relative to highest value
R7 RC21 tertiary expenditure as a percentage of public education funding

Removing the above items resulted in the following Cronbach alpha scores for each construct: national human capital (0.752), national process capital (0.957), national market capital (0.639), and national renewal capital (0.525). The latter two constructs fall below the 0.7 threshold but were retained for overall model development given the exploratory nature of this research study and the small sample of countries available for study.

Figure 7

NRCI calculation

Index	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	
Metric	**RC08**	**RC09**	**RC10**	**RC12**	**RC16**	**RC17**	**RC21**	**NRCI**
Algeria	0.243	0.031	0.275	0.580	0.066	0.199	0.734	0.254
Egypt	0.180	0.095	0.999	0.150	1.000	1.000	0.141	0.699
Jordan	1.000	0.099	1.000	0.280	0.027	0.059	0.530	0.480
Kuwait	0.355	0.511	0.889	0.290	0.041	0.035	0.305	0.411
Morocco	0.738	1.000	0.838	0.410	0.102	0.315	0.403	0.564
Oman	0.297	0.410	0.281	0.130	0.007	0.011	0.316	0.187
Saudi Arabia	0.528	0.014	0.551	0.170	0.038	0.226	0.438	0.309
Sudan	0.053	0.188	0.405	0.160	0.062	0.060	0.433	0.204
Tunisia	0.838	0.710	0.540	0.330	0.033	0.091	0.434	0.395
Yemen	0.145	0.210	0.591	0.050	0.025	0.028	0.800	0.267
Weighting	10%	10%	30%	10%	15%	20%	5%	

R1 RC08 book imports as a percentage of the GDP relative to highest value
R2 RC09 periodical imports as a percentage of the GDP relative to highest value
R3 RC10 total R&D expenditures as a percentage of the GDP relative to highest value
R5 RC16 number of ministry employees in R&D per capita relative to highest value
R6 RC17 number of university employees in R&D per capita relative to highest value
R7 RC21 tertiary expenditure as a percentage of public education funding

Figure 8

NICI rankings by country

	NHCI	NMCI	NPCI	NRCI	NICI	FC
Kuwait	0.726	0.307	0.973	0.411	0.604	1.000
Jordan	0.842	0.655	0.178	0.480	0.539	0.229
Tunisia	0.644	0.637	0.158	0.395	0.459	0.345
Egypt	0.647	0.183	0.168	0.699	0.424	0.198
Oman	0.537	0.434	0.385	0.187	0.386	0.773
Morocco	0.481	0.219	0.130	0.564	0.349	0.198
Saudi Arabia	0.638	0.022	0.327	0.309	0.324	0.626
Algeria	0.586	0.062	0.117	0.254	0.255	0.293
Yemen	0.410	0.014	0.125	0.267	0.204	0.047
Sudan	0.382	0.021	0.073	0.204	0.170	0.038

FC   FC01 national financial capital, GDP per capita relative to highest value

Partial Least Squares (PLS) Modeling

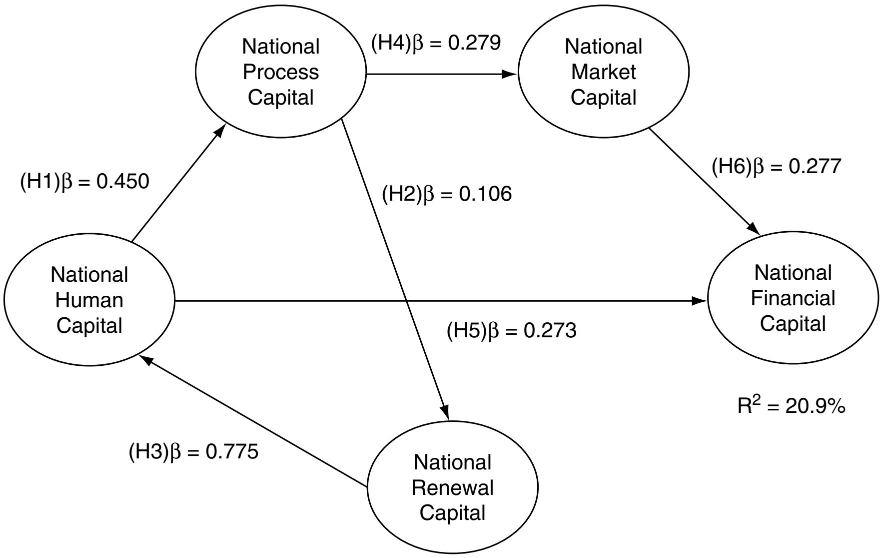
Once the final items for each construct were retained, they were modeled using PLS. As discussed in detail by Bontis (1998) and his colleagues (Bontis, Richardson, and Chua, 2000; Bontis, Crossan, and Holland, 2002), PLS (partial least squares) is a structural equation modeling technique typically chosen for handling relatively small data samples. PLS has been used as a research tool in a variety of settings such as business disciplines, cooperative ventures, global strategy, risk-return outcomes, geographic scope, and in IC research. Hulland (1999) reports that PLS maximizes the explanatory power of a conceptual model by examining the R-squared values for the dependent (endogenous) constants. PLS is used to test the model within its nomological network.

The four constructs in this study derive their meaning from both their underlying measures as well as their antecedent and consequent relations giving a researcher the benefit of examining the constructs in an overall theoretical context. In this study, the sample size of 10 countries is clearly a limitation. Statistical results cannot be construed as significant with such a small sample. However, if paths are deemed to be substantive and in their appropriate direction, a commitment for further data collection can and should be supported.

Figure 9 outlines the final conceptual model into a structural equation map. Each of the beta-coefficients is substantive and in the appropriate direction with H1 and H3 clearly significant. It is important to reiterate that no claims of overall statistical significance can be made given the small sample of countries. At minimum, with 4 exogenous constructs in this model, PLS would require a sample of 40 countries to realize tests for statistical validity (Bontis, 1998). It is also important to note that the overall conceptual model yields an R-squared value of 20.9% which is relatively strong for such macroeconomic measures. In other words, national IC accounts for nearly one-fifth of the explanatory power of the financial wealth of an Arab country.

Figure 9

NICI conceptual map



Model Interpretation

Given the model, it is worthwhile to convert the hypotheses into prose. By following the hypotheses in consecutive order with the previous model, the following commentary can be made:

> Human capital is the pre-eminent antecedent for the intellectual wealth of a nation. As a nation's citizens codify their knowledge into the systems and processes of a country (H1), those structural capital assets can then be renewed for the future (H2) by investing in R&D. A feedback loop further develops a nation's human capital (H3). Eventually, the codified knowledge base of a nation can be marketed (H4) within the global and domestic economies. As the human capital continually develops (H5), a nation's ability to market its intellectual wealth will result in a higher financial well-being (H6).

It is interesting to note that there is a strong relationship among groups of Arab countries. Figure 10 graphically illustrates this relationship. When the relative financial capital index is plotted against the NICI, two clusters of countries form (Figure 10).

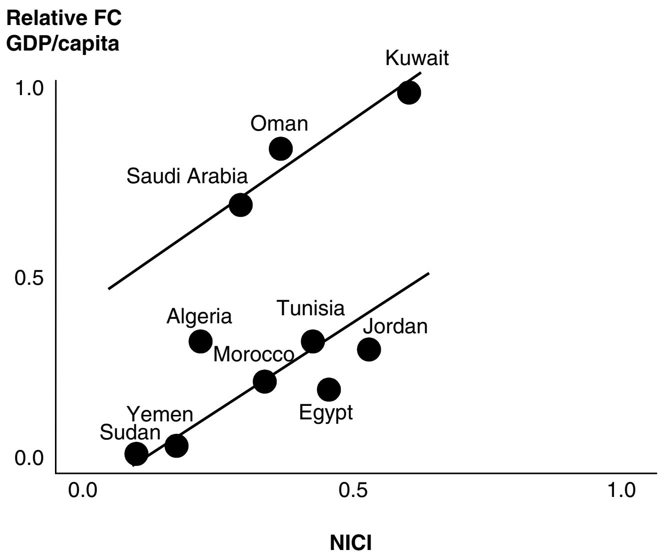
Clearly, the relatively higher cluster contains the oil-rich countries Saudi Arabia, Oman, and Kuwait. In this case, it seems that vast amounts of oil reserves may explain a significant portion of the remaining explanatory power of the national IC development conceptual map.

Measurement Challenges

There are many limitations to the measures used in this study due to the incomplete data available from many nations. The following human capital metrics would be useful for future collection:

Figure 10

Country clustering



- figures on the cumulative organizational level of training and development per capita and training and development participation rates
- the percentage of GDP spent on education by level of education over the size of the population at various age groups
- measures with respect to quality of education and the further development of standardized testing results
- instruction time and length of school year
- penetration of education such as a measure to determine the urbanization versus ruralization of educational participation, quality, and results
- the total number students at each level of completion as a ratio of the total population
- numeracy rates in addition to reading, writing, and basic science

The following process capital metrics would be useful for future collection:

- computer literacy rates
- digital storage per capita
- volumes of books in libraries per capita
- transportation statistics such as paved roads per capita and road safety
- availability and extent of software usage
- entrepreneurship and number of venture start-up
- venture capital funding

The following market capital metrics would be useful for future collection:

- openness to different cultures
- number of foreign spoken languages

- inflow and outflow of tourism
- subjective measures of honesty and trust in business dealings
- time required to launch services and products internationally
- international awards won by country or individuals from country
- immigration and emigration data including source of inflow and outflows as well as area of expertise
- magazine exports (to go along with books and periodicals)
- host of world expos and world conventions
- professional athletes a country produces, and what sport
- appearances at Olympics, number of athletes on team
- number of graduate students studying abroad on scholarship

The following renewal capital metrics would be useful for future collection:

- number of graduate students studying abroad who return to their homeland
- ratio of patent applications to granted patents by domestic individuals and corporations versus individuals who are abroad
- number of applications for registered trade marks
- various measures regarding intellectual aptitude of the younger population

Implications

The development of a nation's IC requires the application of a concerted effort in the development of human, process, market, and renewal capital. Each component of IC has distinct characteristics and thus recommendations are specific to each component.

Particular attention must be given to the measurement and monitoring of key capital metrics. Through effective monitoring of key capital metrics, a nation's progress can be measured and strategies adjusted. For this monitoring to occur, the metric data must be complete, accurate, and current. Without this monitoring, the outcomes of policies and programs will remain unknown.

In addition, when developing policies and strategies for each component, a global wealth of knowledge can be tapped. The best practices in each component can be studied from countries as far away as Canada and Japan. Each Arab country has different strengths that can be studied, enhanced, and implemented. Currently, Arab countries tend to apply a vertical approach to problem solving focusing on the successes and failures of the past as opposed to a horizontal examination of others around the world (UNDP, 1999). Establishing strong networks with decision-makers in other countries can prove to be an excellent long-term investment.

The emergence of the global information economy is driven by rapid technological innovations and offers tremendous opportunity. Coupled with this opportunity is a danger of being left even further behind if developing countries do not become more competitive, diversify their economies, and integrate more effectively with the global information economy. An opportunity also exists to leapfrog over old technologies and bypass the growing pains that developed countries have endured. The application of ICT to government, education, business, health care, and natural resource management provide significant boosts to a country's interconnectivity and process capital (Dahlman and Adhar, 1999).

The major challenges in the area of human capital are increasing enrollment numbers, leveling discrepancies between rural and urban education access, enhancing opportunities for lifelong learning, raising literacy rates, and improving education quality. The tracking of information pertaining to the aforementioned challenges must be both quantitative and qualitative. Data that tracks education enrollment, literacy rates, and the number of graduates are important; however, details on how teachers use textbooks and design curriculum are valuable as well. The importance of measuring both quantitative and qualitative measurements cannot be overstated.

Literacy is a strong measurement of the intellectual capabilities of a nation's labor force. Today, however, basic literate proficiency in reading and writing is not sufficient. Skills in teamwork, problem solving, ICT, and math are requirements (OECD, 2001). Literacy measurements should be expanded to include these metrics and then literacy should be aggressively monitored and developed.

The existence of education in itself is not sufficient for proper human capital development. More crucial is the quality of the education being delivered. Compounding this problem is the lack of information regarding the quality of education in many Arab states. Very few Arab countries (e.g., Jordan, Oman, and Egypt) have attempted to assess the performance of their students and the results from these studies suggest many areas for improvement (Berryman, 1997).

Arab countries may also benefit from the IC development initiatives of other countries like Israel. Israel used its own IC examination to evaluate curriculum redesigns which opened up competition to new ideas and targeted the further development and reallocation of resources for science and technology degrees.

Two reports published by Executive Service Corps of Washington (ESCWA) (2000a, 2000b) favor using the education system to increase the acceptance of computers and IT. By offering incentives to students and faculty and initiating the introduction of computers in education curricula at early ages, adoption can be significantly increased. As a complement to formal education, leveraging IT in offering distance education will further speed the adoption and development of ICT skills (D'Orville, 1999).

Nations should concentrate on formulating national and regional ICT strategies and maintaining modern international and domestic communication systems. This must be complemented with massive efforts to provide relevant content in Arabic (D'Orville, 1999). Private enterprise has a role in supporting a national technological infrastructure as well. They must promote partnerships between industry, universities, and research institutions and invest heavily in designing and converting software to facilitate knowledge creation and management in Arabic.

The promotion of IC assets is the most effective way to benefit financially from them. It is the flows of people, technology, and ideas between and within countries that is key to overall market capital success. The essence of market capital is a nation's ability to share their knowledge with the rest of world. Nations that have never hosted an international meeting, conference, or event should prioritize and put forth an effort to help market the strengths of their country and plan meetings. Additionally, professional and trade organizations should be encouraged to participate so that experiences can be shared. However, market capital is about knowledge coordination and contextualization as well. Tourism is an excellent way to develop the market capital of a nation. As tourists begin to appreciate a country, their desire to establish financial and IC flows increase.

Improvements to tertiary education will stem the flow of highly desirable Arabs immigrating to foreign countries. These improvements would also increase the ability of a nation to attract new academics as well as promote additional ties with other countries through academic research cooperation. Finally, the shift from closed and protected systems to more open environments that encourage investment and increased trade should be encouraged. Investing today for the benefit of tomorrow is often difficult. The pressures of existing problems require direct and immediate attention, however, investing in future potential must not be ignored. The first priority in enhancing renewal capital is to forge stronger links between university research and the industries they serve. This link will serve the vital purpose of aligning the needs of industry with current research as well as challenging industry with new technologies and ideas.

Arab countries should immediately develop long-term policies on scientific research, based on intimate cooperation between R&D institutes, universities and industry. Central to such policies is the realization that various components feeding into R&D must be developed simultaneously. These include: educational systems and standards; research institutions dealing with basic and applied research; information acquisition systems; funding institutions; professional societies; consulting services; technical support systems; procurement services; and science education for the public at large.

The renewal capital of a country may also be further developed beyond R&D initiatives. For example, further investment in libraries, and book imports as well as teaching faculty per pupil provide the intellectual infrastructure for a country to replenish its overall IC in the future.

Conclusions

The Arab region has long been known for its rich natural resources. The oil industry is recognized as the key component of national income for this region. However, the IC of this region is the renewable asset of this developing territory and must become a top priority for each constituent in order to sustain an increased financial well-being.

Technological developments coupled with fast paced markets and continuous information regeneration requires knowledge-based skills to be consistently measured, utilized, and improved. Furthermore, as economies continue to become more knowledge-intensive, IC will become the competitive edge of people, corporations, and nations. Historically, higher levels of IC have been associated with higher standards of living, improved health, and continued increases in international political involvement. However, the power of knowledge and ideas are not often associated with the long-term prosperity of a nation. This disparity highlights the need to value the IC of a nation, as it is a key antecedent for involvement in the global economy of this century.

The model created in this report interrelates market capital, renewal capital, process capital, and human capital as a means of articulating the intellectual wealth of a nation. Renewal capital represents a nation's future intellectual wealth, valuing infrastructure and investments that aim to create a long-term competitive advantage. While traditional economic measurement tools consider average life expectancy as an indicator of human potential in an economy, they do not recognize the intrinsic value of the human storehouses of knowledge as depicted in the comprehensive human capital indicators. Furthermore, consideration must also be given to non-human stocks of knowledge, such as digital storage which accounts for the process capital of a nation. Finally, market capital depicts a nation's ability to market its own intellectual resources. This motivates cooperation and the sharing of new ideas, information, and tools for development across international borders.

The following two key propositions resulted from the NICI model development:

1) national IC accounts for nearly one-fifth of the explanatory power of the financial wealth of the Arab region
2) human capital is the pre-eminent antecedent for the intellectual wealth of a nation. As a nation's citizens codify their knowledge into the systems and

> processes of a country, those structural capital assets can then be renewed for the future by investing in R&D. A feedback loop further develops a nation's human capital. Eventually, the codified knowledge base of a nation can be marketed within the global and domestic economies. As the human capital continually develops, a nation's ability to market its intellectual wealth will result in a higher financial well-being.

Although the metrics designed in this study have shown a link between national IC and financial capital, continued research must be done to ensure consistent and complete data is analyzed to effectively represent the entire region. Furthermore, additional measures must be developed to create a solid index of measures for use in both the Arab region and abroad. The NICI should be reviewed and updated regularly, ensuring that governments can begin to actively leverage the intellectual wealth of their nations.

Arab professionals would benefit from collaboration across nations. Two associations in particular that would be of benefit for Arab states commencing knowledge management initiatives include: the Arab Knowledge Management Society (www.akms.org) and the Arab Club for Information (www.arabcin.org). Although the problems and bottlenecks in enhancing the economic growth and human development are well recognized by Arab officials and experts (UNDP 1999), Arab government officials cannot play these roles effectively without input from business. There is need for leadership in both the public and private sectors. This is a cliché, but as a result of the tremendous inertia built into Arab economies and their institutions, it becomes an absolute imperative for the overall IC development of the region. This is further emphasized by the AHDR:

> The dignity and the freedom of the Arab people demand that countries join together to provide human services: health, education, and training, particularly for girls and women and people living in rural areas, along with strong efforts to abolish illiteracy, especially in the less developed Arab countries. Cooperation in financing and implementing such programs (whether at the regional or the individual country level) is in essence the true basis of all other forms of cooperation. It deserves to be given priority in joint Arab action because such initiatives are at the heart of human development—and human development is at the heart of securing a freer, more secure and more fulfilled future for every citizen of all the Arab states (AHDR, 2002, p. 131).

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Chapter 9

The Intellectual Capital of the State of Israel

Edna Pasher and Sigal Shachar, *Edna Pasher PhD and Associates, Israel*

Abstract

This chapter focuses on the process and outcome of the intellectual capital (IC) study of Israel, which was published in September 1998. The IC picture of Israel presents the hidden values and the key driving success factors of Israel. The findings show Israel's achievements along the first 50 years of its existence in different areas, including education, science, international relations, communication, and computer infrastructure.

As Israel entered its 51st year, it was one of the developed countries in the world. Since 1950, Israel's economy had grown 21-fold. Other countries have grown, but Israel was the only country in which the population had increased by 330% while having to fight periodic wars. This growth had dramatically narrowed the gap between Israel and the developed Western nations and, at the same time, widened the gap between Israel and the very large group of developing countries.

This chapter will introduce the assets of the state of Israel with comparative advantage and high growth rates during its first 50 years of existence.

How we got involved

Edna Pasher PhD and Associates, a management consultancy and research firm from Israel, conducted a study on measuring the IC of Israel, which was published in September 1998. We started the study in January 1997. The study was led by four young people: two from Israel and two from Sweden—those who had done the study of the IC of Sweden with Leif Edvinsson.

In 1995, we first collaborated with Leif Edvinsson (at that time the VP for IC at Skandia, and the first person in the world to hold such a position) to create the *"Knowledge in Action"* Israeli annual conferences, which have since then been introducing the latest ideas of knowledge management into Israel.

It was Leif's idea that following the study of the IC report of Sweden, which he led, we should embark on such a study in Israel. We enthusiastically agreed.

Figure 1

The intellectual capital of the state of Israel (1998)

The IC report was based on data and information collected from written material such as professional literature, newspaper and magazine articles, as well as discussions, brain-storming sessions, and interviews with key figures from diverse fields. The project included an extensive representation of the younger generation's perspective since they are Israel's source for future affluence and growth.

Who Did the Study?

The project was led by Galit Maoz-Caspi and Fanny Rousso-Rechter from Edna Pasher PhD and Associates assisted by Caroline Stenfelt and Madeleine Jarechov, who had done the Swedish study with Leif Edvinsson.

The IC of Israel report was a product of extensive collaboration with leading figures from the academic field, such as Professor Baruch Lev of the NYU Stern Business School, and from the relevant Israeli government ministries (Appendix).

They willingly shared their human capital and provided us with their wealth of knowledge and experience! This was of great help in compiling a unique document which was extraordinary, both for Israel and the rest of the world. Dozens of people took a part in this research (Pasher, 1998, IC report of Israel).

The Process

We decided to base the Israel IC Report upon a comparison of Israel with other developed countries, and not with developing countries, since developed countries are the ones which must serve Israel as role models and who Israel competes with in the international markets.

The project had four phases:

Phase 1: Creating a vision of Israel to serve as the benchmark for the study
Phase 2: Identifying the core competencies needed to realize this vision
Phase 3: Identifying the key success factors for each competency
Phase 4: Identifying the indicators for each key success

Phase 1: Creating a Vision for Israel

The vision of Israel which was used in this report, was crystallized through brainstorming sessions and interviews with leading figures in various fields: life sciences, social sciences, urban planning, accounting, business management, and many more disciplines and perspectives. We involved young people as well and asked them questions about how they hope to see the future of the country. The definition of the vision incorporated elements of the Israel 2020 Program, which was formulated by a team led by Professor Adam Mazor. This 2020 program included four alternative planning directions for Israel's future:

1) *Business as usual* is based on the continuation of present trends without initiated changes of direction or alternative, i.e., the population will continue to crowd into the central region of the country, rather than to the periphery.
2) *The economic alternative* is bases on optimal economic growth will be effectuated through an emphasis on business services or high-tech industry, a trend that will bring about maximal growth and a higher standard of living.
3) *The social alternative* is based on the state being able to provide an equitable quality of life for all of its inhabitants. Every residential area would offer similar possibilities.
4) *The physical environmental alternative* seeks to promote a better quality of life for the population on the basis of sustainable development. It includes: urban renewal, prevention of new settlements and increased density of existing ones, improved public transportation, and emphasis on green buffers and open spaces.

In addition to the four alternatives, a *"peace scenario"* was prepared which assumed a lasting peace between Israel and its neighbors. As a result of the peace process the team envisioned accelerated economic growth.

The vision of Israel, which emerged in our study of its IC, was the substantiation of Israel's position as a developed, modern, democratic and pluralistic nation—attractive for the world's Jewry, investors, tourists, and, of course, its own citizens.

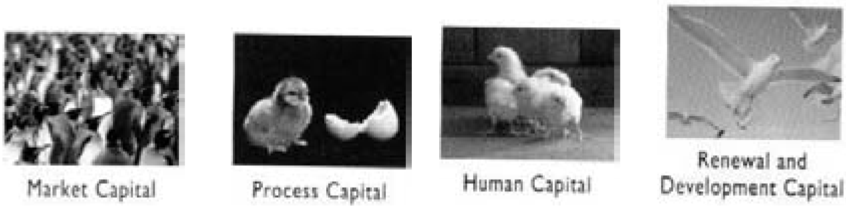
First, Israel should strive to enhance the quality of life for all of its residents. This must include an effort to increase equality among the various sectors in the society and decrease socioeconomic disparity. Similarly, the country must eliminate verbal and physical violence and increasing crime. It must do this while building a culture based on tolerance and mutual respect.

Second, the country must make itself attractive for future generations by continuing to develop its knowledge-based industries, scientific research, and technological development. These are, in fact, the country's front line of its future progress.

To achieve these goals, Israel must nurture peaceful relations with its neighbors in the Middle East. Relations based on peace will create an environment which will encourage the investment of resources in renewal and growth (www.mfa.gov.il, 1995).

Figure 2

Model of the focus areas of Skandia



Phase 2: Identifying the Core Competencies of Israel

In this stage, we attempted to identify the core competencies, which would make Israel competitive in the future global markets. These competencies emerged from written material, discussions, and conversations with key figures in the fields. In order to produce the balance sheet, the various competencies were clustered according to the four areas of focus described in the Skandia model of IC (renewal and development, human capital, market capital, process capital) (Edvinsson and Malone, 1997).

Phase 3: Defining the Key Success Factors

In order to measure Israel's accomplishments and assess its status in comparison with other countries, we defined Israel's key success factors for each of its core competencies:

1) Renewal and development capital: in order to examine Israel's potential, we have analyzed the key success factors that focus on Israel's investments and yields in technological development and next-generation products.
2) Human capital: the key success factors we chose for assessing the position of Israel in this IC category were: education, equal opportunities, culture, and health.
3) Market capital: we chose outgoing tourism, openness to foreign cultures, international events, and foreign languages skills to reflect Israel's core capabilities in market capital.
4) Process capital: the key success factors for creation of know-how in Israel have been taken from a variety of fields such as communications, education, agriculture, management, entrepreneurship, risk-taking, employment, immigration, and absorption.

Phase 4: Success Factor Indicators

At this stage, the indicators for measuring the key success factors were crystallized in the discussions we conducted with a large group of experts (Appendix). We collected up-to-date material in order to measure Israel's Intellectual Capital assets and compare them with those of other countries. In order to achieve the project's goals and produce the IC report of the state of Israel in 1998, we were forced to make due with comparative data which was available at that point.

Israel was found as one of the leading countries in the world in the percentage of degree holders (all degree levels) who majored in mathematics and computer sciences, life sciences, and engineering—out of all holders of academic degrees.

The aforementioned fields of specialization have a crucial impact on the country's future growth. In these fields, Israel is ahead of many other developed countries, including the U.S., Denmark, Japan, and Italy (Figure 3).

Another example is the extent of commercial services based on the sales of intangible assets as an indicator for assessing Israel's IC. The service sector, based on knowledge and human capital, are the key success factors for the country in the future. One of the indicators for assessing the development of Israel's service sector reveals an average annual growth of about 6% between the years 1983 to 1993. This gives Israel a high ranking among the countries of the world—ahead of Japan, the U.S., and Canada (Figure 4).

The Israel IC Report provides the reader with an integrative and balanced picture of our future as we grasp it today. The report is used as a tool to navigate and control the country's realization of its vision. To that end, it should be updated periodically, in accordance with changes and developments that occur in both the internal and external environments. Since 1998 we have conducted IC studies both in the private and the public sectors in Israel. Unfortunately, we have not yet succeeded in creating a sustainable government commitment to a periodic IC Israel report on a national level (Shachar, 2002).

Figure 3

The percentage of degree holders in mathematics, life sciences, and engineering, out of all holders of academic degrees. Source: The Institute of Higher Education in Israel—trends and developments, 1997.

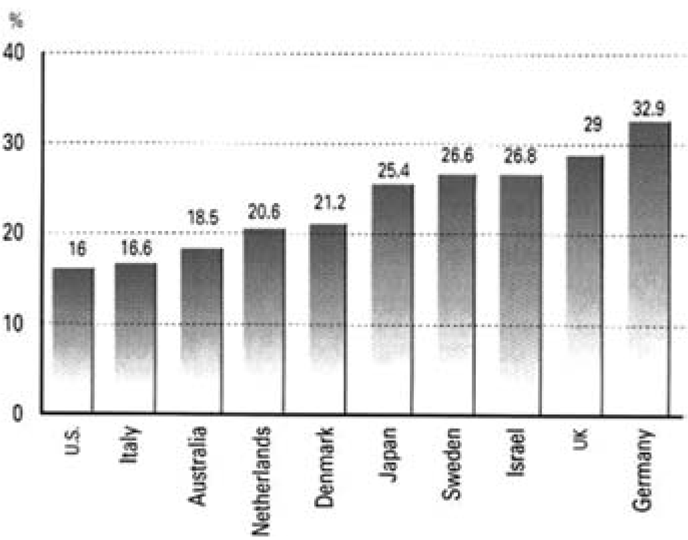
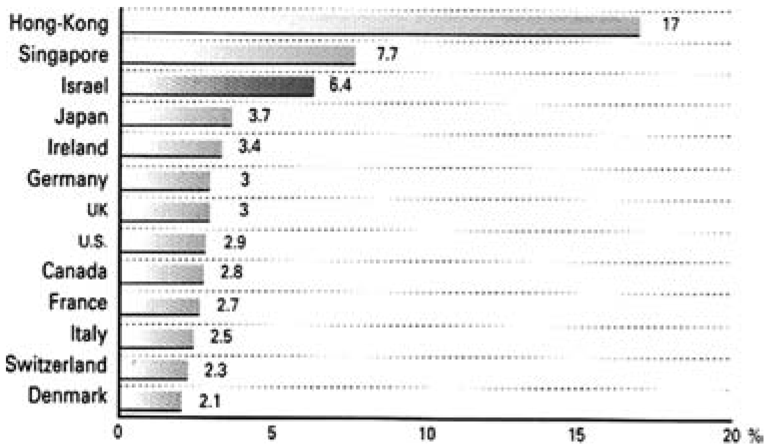


Figure 4

The average annual growth rate of the service sector during 1983 to 1993. Source: The World Competitiveness Yearbook, 1996.



Some Main Findings

Renewal Development and Innovation

Based on Porter and Stern's (1999) innovative personnel, the number of international patents filled, basis using research, development spending, education, and other factors, protection capacity is calculated per capita. Throughout the years of its existence, the state of Israel has contributed significantly to scientific research and international co-operation. Despite its small size, Israel can claim impressive achievements in this field.

Scientific research is one of the main strengths of Israel's growth. Israel is one of the "laboratories" for brilliant ideas. This was expressed in 1996 by the presence of 18 Israeli companies on the American Stock Exchange (more than any other foreign country).

In 1996, there were more than 2,000 hi-tech companies operating in Israel, all with quite a promising future. The translation of scientific successes into unique products for which there is also a demand has led to an increase in Israel's gross national product (GNP) to annual levels of about 5% to 6%.

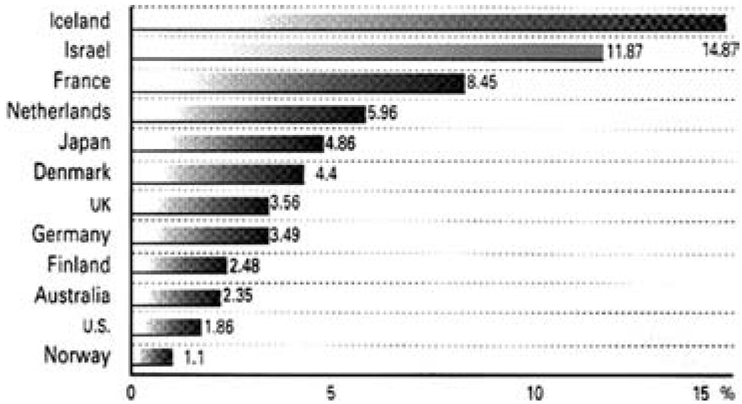
According to research conducted by economists at Harvard University and the Massachusetts Institute of Technology (MIT), Israel ranked seventh in terms of registered international patents in relation to the number of residents. Between 1975 and 1996, Israel registered 80 international patents per one million residents. These dramatic results position Israel ahead of such strong countries as Germany, Holland, France, Britain, South Korea, and Italy and behind Japan (first place), the U.S., Switzerland, Taiwan, Sweden, and Finland (Figure 5).

Human Capital

Human Capital constitutes the population's total assets and capabilities reflected in learning, knowledge, health, experience, motivation, intuition, entrepreneurship, expertise, and many other assets which have a competitive edge in the past and present, as well as potential for good income and profits for the future (Brooking, 1996).

Figure 5

The annual growth rate receiving patent rights, 1998 to 1994. Source: The World Competitiveness Yearbook, 1996.



Knowledge is the core value in the Jewish culture and has a deep meaning in Hebrew. Pasher, Wohlgelernter, and Zucker describe in their study *Knowledge in the Bible* (1996) that in Hebrew the word *Da'at* (knowledge), which first appeared in the Bible, has many meanings: wisdom, truth, understanding, love, intuition, consciousness, experience, recognition, information, and ethics. Da'at (Knowledge) is seen differently in the Bible than its 'synonyms': Chochma, Bina, Machshava, and Sechel—wisdom, understanding, thought, and intelligence respectively. The Bible chooses its words carefully and there are no simple synonyms. Each word or translation for Knowledge carries with it a connotation going beyond its superficial meaning. Some modern derivatives of the root of Da'at (Knowledge) Y.D.A are Meida-data, Mada-science, and Yeda-Knowledge in its broadest sense. A very interesting use of this root Y.D.A in the Bible is what in modern Israel we refer to as "to know someone in the 'Biblical sense,'" which is sexual intercourse! (This insight of the connection in Hebrew between knowledge and love was our original inspiration to conduct the *Knowledge in the Bible* study.) The root Y.D.A. has over 900 entries in a concordance of the Bible and encompasses a wide range of meanings. This shows the significance of knowledge in the Hebrew culture from the very beginning, and during the whole history of the Jewish people (Wohlgelernter, Pasher, and Zucker, 1996).

The key success factor for knowledge creation and sharing is education, it also has a very significant place in the Jewish culture and is one of Israel's cornerstones, as shown in the following example. One of the indicators for assessing the quality of Israel's human capital in the Israel IC report is the number of Israel's graduate students working towards advanced degrees (masters and doctorates) relative to the total number of students at institutions of higher learning. In 1992, the percentage of students working towards advanced degrees in Israel was about 27% of the total number of students at institutions of higher learning. This proportion is much higher than in other developed countries. The growth of the percentage of students working towards advanced degrees (8% per year since 1990) points to the Israeli awareness of the importance of learning and the constant thirst for knowledge.

Market Capital

Market capital reflects the IC embedded in Israel's relations with other countries. Israel's investments and achievements in foreign relations, coupled with its export of quality products and services, all within a relatively short time, constitute a significant component in its development of market capital which is rich in intangible assets.

Some of the Israeli people's most notable characteristics include their desire to meet others, learn, see, widen their horizons, and develop and renew themselves. The great openness of Israeli citizens toward different cultures constitutes an important channel of communications in learning about trends and needs in the "global village."

The indicator that examined this openness was their rate of participation at international conferences in various places around the world.

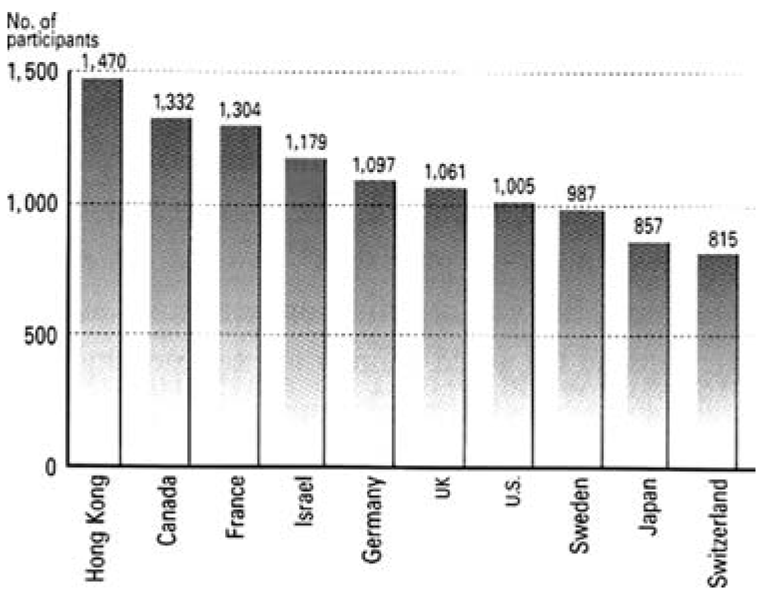
According to the International Council of Chemical Associations (ICCA) report, Israel is in the fourth place among the countries it examined, averaging about 1,200 participants at an international conference (Figure 6).

Another surprising indicator reflected the increasing interest by international entities in Israel is the number of events which were held in the country.

The ICCA report, which examined 20 top countries in hosting international events, showed that Israel is among the leaders in the field. Despite the security incidents in Israel, it is ahead of countries such as Canada, Sweden, Hong Kong, Norway, and others.

Figure 6

The countries which lead the world in their rate of participation at international conferences, 1995. Source: ICCA data, 1997.



Another point that reflects the international openness shown by Israelis as well as their motivation to maintain this asset is the educational system's committed effort to teach foreign languages. The Institute of Management Development (IMD) study found that Israeli schools teach foreign languages in a more professional manner as compared with other countries. Knowing a foreign language alleviates problems of communications in both the local culture and in the global market.

Process Capital

This category reflects Israel's intellectual assets which support its present activities. These assets facilitate sharing, exchange, flow, growth, and transformation of human capital to structural capital. These assets include information systems, laboratories, technology, management attention, and procedures.

Israel has become a hothouse for some of the brightest and most profitable technological ideas. The country is an important research and development (R&D) center for international hi-tech companies and has more start-up companies than any other country with the exception of the U.S.'s Silicon Valley. Since 1982, the number of hi-tech start-up companies in Israel has grown from approximately 50 to more than 2,000.

The venture capital funds are an important instrument in supporting entrepreneurship and enabling the success of start-up companies. Israel has succeeded in germinating and cultivating a large number of hi-tech companies because of the infrastructure and venture capital funds that invest in start-up companies. In 1997, about 80 venture capital funds operated in Israel and in the years 1992 to 1997, investment in new technologies stood at around $2 billion.

This research shows that, since its establishment, Israel has succeeded in accomplishing a great deal while overcoming difficult challenges and investing in the future. In many fields, Israel is at parity with other developed countries. In a number of fields, such as scientific activity and the quality of its work force, Israel even surpasses the leading developed nations (Edvinsson and Stenfelt, 1999).

The International Response

Since its publication, the IC report of Israel has created great interest all over the world, both in the academic world and the public sector. Dr. Pasher has often been invited to present the story of the IC of Israel at international conferences. During the years of high growth in high-tech and start-ups, Israel was second only to Silicon Valley in the U.S. Small nations are especially interested in learning the secrets of this success. In Israel, we are not surprised at all, since, during 2,000 years of exile, the Jewish people were not allowed access to the old tangible origins of wealth—land or heavy industry—the Jews have become experts in "brain work." In addition, since they were exposed to frequent attacks in many hostile environments they have developed a high sensitivity to threats and opportunities which is one of the core characteristics of entrepreneurs. Last, but not least, the Jewish people consider themselves "the people of the book"—learning and education are top priority. Thus, when we returned together to our old homeland, it was only natural that knowledge work would become our forte. This study visualized this unique story, from oppression to success through IC.

Final Remarks: Israel and Its Neighbors

We live in a networked world. Our study shows that Israel is well integrated in the world knowledge economy. Both private and government-owned Israeli companies create business collaborations worldwide. Unfortunately, this is not yet the case with our neighbors.

The 1979 peace treaty signed between Israel and Egypt was a first attempt at reaching a normalized relationship between Israel and one of its Arab neighbors. Unfortunately, it was not followed immediately with the other neighboring countries. In the 1990s, the Oslo Agreement between Israel and the Palestinian Authority followed by a peace treaty between Israel and Jordan created new hopes in our region. During those days we dreamt of "a new Middle East" in which we and our neighbors would flourish together, with collaborations and investments from all over the world.

Unfortunately, this dream did not come true. The Israeli-Palestinian conflict has escalated, and we are left with the memories of the dream.

However, our vision has not changed. We still hope that somehow "a New Middle East" will become a reality and Israel and the Arab world can co-evolve in harmony with a triple bottom line success in economy, society, and ecology. We were raised on an ethos: "where there is a will there is a way." This is what keeps us optimistic about the future of the Middle East.

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Appendix

The list of those who helped in the process of the Israel IC report:

Dr. Shmuel Adler—Ministry of Absorption
Miriam Asif—Foreign Ministry
Koby Bibi—Ministry of Absorption
Nava Brenner—Central Bureau of Statistics
Zvika Dash—Office of Chief Scientist

Benny Dreyfuss—Ministry of Labor and Welfare
Moshe Even Zahav—Ministry of Tourism
Dr. Boaz Evron—Weizmann Institute
Alex Fredber—National Institution of Transportation
Ora Haviv—Ministry of Science
Erez Henig—IDC institute
Shlomo Hershkovitz—Counsel of Higher Education
Tommy Horkani—Information Center, Office of Prime Minister
Hanna Ifergan—Ministry of Tourism
Prof. Joseph Katan—Tel-Aviv University
Prof. Ruth Klinov—Hebrew University
Lilly Klinov—Ministry of Transportation
Prof. Baruch Lev—NYU, Stem School of Business
Danit Levinzon—Ministry of Treasury
Dalila Magnat—Gitam BBDO
Prof. Adam Mazor—First Architects
Yehuda Mechber—Foreign Ministry
Pablo Mendler—Central Bureau of Statistics
Dalila Nachshon—Center for the Research of Social Policy in Israel
Sarit Nakash—Bank of Israel
Chaim Orpaz—Ministry of Education and Culture
Uzi Pompian—Bank of Israel
Dr. Yossi Segal—National Academy of Sciences
Prof. Michael Sela—Weizmann Institute
Dr. Emanuel Sharon—Bank Hapoalim
Dr. Shimshon Shoshani—The Jewish Agency
Danny Singerman—Industrialists Association
Ilan Sosnotzky—Ministry of Treasury
Esther Sultan—Ministry of Tourism
Rodi Weiner—Volcani Institute
Yafa Weingarten—Brookdale Institute
Michael Wolf—Ministry of Science
Zvi Yanai—(Formerly) Ministry of Science

Chapter 10

Rethinking Leadership in the Knowledge Society

Learning From Others: How to Integrate Intellectual and Social Capital and Establish a New Balance of Value and Values

Bernhard Von Mutius, *Strategic Advisor, Frankfurt am Main, Germany*

Reframing the Issue

Between Past and Future: Germany's Role as a Learning Nation

The discussion about *intangible assets* and specifically about the role of intellectual capital (IC) is of vital importance to every nation. This particularly applies to Germany, a country with great intellectual potential and rich in cultural tradition. Germany possesses a broad range of institutions of higher education and excellent research organizations—from the Max Planck Institutes to the Fraunhofer Institutes—as well as innovative companies and, last but not least, undiminished inventive genius. With regards to the number of filed patents, Germany was, after all, one of the global leaders in 2003, alongside the U.S. and Japan.

Nonetheless, the debate about IC and its economic and social significance had a late start in Germany compared to other countries, for example, in the Scandinavian region. During the last three years it acquired momentum in some companies and—mainly private—universities and business and governance schools. Here, it receives increasing attention, for example in the context of interdisciplinary projects and knowledge management courses. In the political sphere, however, the debate has barely started.[1]

[1] As we go to press, a prototyping project on "Wissensbilanz," under supervision by the "Wirtschaftsministerium" (Ministry of Commerce) has just commenced.

German politics has recently been preoccupied with other reform themes. Financial measures aimed at cutting the state deficit took precedence over intellectual programs striving to stimulate innovation. This is now beginning to change. Spending on education, knowledge and new technologies is increasingly regarded as an investment in the future. Regions and cities and their scientific communities have begun to compete intensely for recognition as leading German knowledge locations. A country-wide innovation offensive aimed at the business and science community was launched this year to generate new impulses in this direction. Still, the country's IC has not yet become an explicit subject of public debate. In practice, there have so far been very few experiments with IC balance sheets, IC reporting models, or rating instruments at the regional or local level.

Interesting and practice-oriented examples that might act as models for others consequently remain thin on the ground. This may be unfortunate, but it is a fact that also has positive implications. In Germany, we are now compelled to (and will hopefully also be able to) *learn from others*: comparing, assessing carefully, and reflecting with an eye to the future. And this may prove to be an advantage; we have the chance to draw a wider radius of awareness in doing so.

First of all, this means learning from successful examples, from the experience gained by the best in different countries, and studying these examples attentively from different angles. But it also means learning from the many examples of failure, from the abortive concepts and models, often put forward with very ambitious claims, which were en vogue especially in management during the past decade and whose claims could not be realized because these models lacked breadth of vision.

The aim of such learning would be to avoid one-sidedness of every kind as far as possible and eventually arrive at an *integrated, comprehensive, and balanced concept* in dealing with intangibles that is *suited* to the *complex* challenges of the knowledge society. This concept could be of equal relevance to future-oriented management and farsighted governance in business, society, and politics.

Rethinking Leadership: An Integrated Concept, A Border-Crossing Approach

So, what can be learned? What is this chapter about? And why discuss integration?

Integration means bringing together in a well-considered way what has so far been separate. This is a difficult task undertaken only if we are convinced that what has so far been separate is not feasible or capable of functioning on its own in the long-term.

The proposal presented in this chapter is to place the idea of IC in a *broader context*. Not to dilute it, but to enhance its impact. This context is broadened in three respects.

First, it appears to be of vital importance not to discuss the theme of IC in isolation from *social capital*, but to make the inseparable *interconnection* of these two forms of capital a focus of exploration from the start. Both intellectual and social capital are *intangibles, human and immaterial values*. And, in practice, they can be generated and increased only in rather similar ways: by sharing knowledge in cross-border relationships.

Secondly, I would like to recommend that we consciously establish a conceptual *relationship* between the apparently *soft* topic of intangible assets or values and the *hard* strategic topic of tangible assets or material (physical and financial) value. This argument proposes that immaterial and material assets should be regarded in the future as being of equal weight and needing to be balanced in new ways in all areas of leadership and management activity.

Finally, this requires addressing the theme on a *different level*. It is to be viewed, not as a subordinate or partial function of management or administration, but as a *comprehensive and interdisciplinary leadership task*.

This integrated approach, which aims at a new balance of value and values, can be described as an extension of the concept of *integrated management* developed by Knut Bleicher at the University of St. Gallen and others. The governing idea of this approach is that, in the future, all organizations in business, society, and politics will need to devote at least the same degree of attention to managing intellectual resources as to the management of material resources.

This approach originates in *economics*. Therefore, it can best be studied by examining business communities. Here, at least, the discussion has advanced furthest in the German-speaking countries. And consequently, this is also the starting point and focus of this chapter.

The concepts developed in this context, however, may also be *relevant to other organizations and institutions*, to communities, cities, and regions in an increasingly interconnected knowledge-based economy. After all, what we are ultimately concerned with is a different, system-transcending concept of leadership, based on a *different way of thinking*. It is a mode of thought that consciously crosses conventional conceptual borders between leadership, management, and governance, borders whose strict delineation is longer salient. Therefore, one could also argue that the overriding task is: *rethinking leadership in the knowledge society.*

This will be outlined in seven steps in the following two sections. Next, we begin with a brief review of the last decade of bustle and confusion in management and explore the *lessons learned*. Then, we will attempt to explain by a three-pronged argument why a new integrated approach under inclusion of intangibles is becoming indispensable to securing our economic and social future.

In the final section, we shall show in detail how this new approach is becoming feasible and explore three elements that require special attention: management models, leadership conduct, and competencies.

Value and Values

Looking Back or Learning to See With Both Eyes

During the last 10 to 15 years, we have seen many management fashions, e.g., lean management or re-engineering, come and go. Their focus was always on the hard, cost-cutting factors, and they always professed to serve not only the immediate purpose of earnings growth, but also to enhance long-term competitiveness.

Yet, the outcome has been to confine strategic attention to an ever-narrowing radius. In the end, the *shareholder value* model was presented and expected to bring stable, enduring, long-term capital appreciation. The stock markets welcomed this model with open arms and then interpreted it in a short-term mode in line with their priorities, thus restricting it even further. The result: “corporate purpose became more and more limited, from the stakeholder to the shareholder, to the expectations of young analysts” (von Oetinger, 2002). Investors were promised huge value enhancements on the stock markets. It seemed that everything could be planned, and that everything was possible. The outcome of these simplifications became palpable in recent years: we experienced one of the most crushing value losses in memory. Many business players, therefore, are beginning to ask themselves, as Mick Jagger did: "I wonder, where did we go wrong?"

In embarking on the overdue correction of this development, however, one kind of one-sidedness should not be replaced by another. Here, we advocate an integrated approach that consciously brings together the tangible, physical, and financial "value orientation" with an intangible "values orientation" in defining strategic orientation, in designing management systems and in leadership conduct.

How can value and values, the quantity and the quality of relations, economic efficiency and sustainability, and the capacity for innovation and social responsibility be balanced better and developed as an integrated whole?

What we are concerned with is a broadened concept of strategy and leadership, moving beyond the rigid, outdated separation of corporate accounting and business development. What is at issue is a new guiding code of balanced, knowledge-based corporate leadership, which I call *balanced values management*.

This does not mean devising an entirely new model. The task, rather, is to start from existing insights and experiences and combine them in a new way on the strategic level.

The Transformation of Economic Value Determinants

The new strategic importance of immaterial values rests primarily on deeper processes linked to the shift to a knowledge-based society. As information and knowledge increasingly become our most important economic resources, humans themselves, with their knowledge and abilities, increasingly take center stage in the value creation process. In Meinhard Miegel's words, people are becoming "to some extent a coal deposit or oil well. They themselves are the processed raw material to which value is added" (Miegel, 2001).

That is why we are now seeing a gradual shift in economic valuation—from tangible assets to intangibles, from real capital invested in material property, buildings, or machinery to IC located above all in the minds of employees, partners, suppliers, and customers, hidden away in their technology and learning environments, their team structures, and relationship networks. In contrast to physical or financial capital, this capital usually grows in strange ways, by sharing information, knowledge, and ideas. And, whereas the successes of the past are deposited in real capital, the potential for an organization's future competitive edge resides in IC. This is the foundation of the capacity for innovation. It is the source of tomorrow's competitive advantage. Or, as Lester C. Thurow wrote: "Today knowledge and skills stand alone as the only source of comparative advantage."

Creativity, willingness to learn, and the ability to share knowledge are becoming assets that will define our future. And the dynamic interactions and relations involved in sharing knowledge are tending to grow in importance relative to the production of fixed, material, and indivisible products. In future, *relations* that cross borders both within the company and to outside companies, partners, and customers are likely to become the most important source of value.

We are moving increasingly from an "economy of scale" towards an "*economy of relations.*" Put simply: relations value beats product value, or, value creation is based on an appreciation of values.

Some years ago in her acclaimed book *World Class*, Rosabeth Moss-Kanter described the process by proposing that all managers who want to succeed on the global market should reconsider their self-image: "They should change the job titles on their visiting cards to reflect their most important tasks: destroyer of walls, builder of bridges."

Networks, Relations and Values: The Organizational Dimension

Current discussions about the developing *networked and apparently borderless* organizations of the future also show that we are moving in the direction of an *economy of relations*, in which immaterial values are acquiring a new and harder meaning.

What do we actually mean when we discuss networked organizations? How can the new functional patterns of an organization, which are linked, but cannot be reduced to the networks of information technology (IT), best be described? And, is there any model that shows how a network could operate optimally?

Well, there really is such a model, but not in the existing environment of our social institutions, and there are, indeed, no benchmark studies about it. This model comes from the world of living nature. It is embedded in every one of us. It is the human brain.

The human brain is incredibly high-performing and operates with exceptional efficiency, but also remarkable elegance. Exceptions confirm the rule.

And, according to everything we know from brain research to date, this high performance is based, above all, on the following functional principle: *interconnections or relations* are more important than the individual parts. The brain functions because something happens *between* the neurons, by electrical, chemical, and possibly rhythmical connections, networks, and relationships.

There is no central unit that directs everything from above. Rather, the brain masters its complex tasks by largely decentralized and circular processes, in a symphonic interplay between the self-regulating elements of our nervous system.

To put it differently: the *intelligence* of this organization is based on the *self-organization* of its networked components.

Self-organization and decentralization are naturally only one side of the new pattern. And before idealizing it, we should also look at the other side: more freedom, more decentralization? Yes, but how do we ensure that the shared goals of the company are achieved? How do we secure the quality of work and the loyalty of employees? Fading boundaries? Up to a point, yes. But what can then actually hold an organization together?

Is it just the money or the stock options? Are businesses increasingly becoming "mercenary operations" (Sattelberger, 1999)? Or are they turning into communities or relationship networks held together by values? In the difficult process of strategic, organizational and communicative innovation, such networks are reorienting themselves more consciously than ever towards values such as transparency, integrity, excellent quality, customer focus, team spirit, and respect for others that act as credible *binding forces* both internally and externally.

They can give stability and direction to knowledge flows. They can facilitate the integration of decentralized business activities. And they can give, above all, sense and meaning to knowledge workers. Sense and meaning, by the way—I do venture to make this prediction—will become ever more vital resources for organizations and their staff.

In the future, therefore, management evidently not only faces the task of granting more space for new, virtually unlimited freedom, but also has to consciously assign it a distinctive and defining form through values. This seems paradoxical. But that is what organizations often are. And—as Jansen/Littmann write in their book *Oszillodox*: "Managers are artists of paradox. Those who still do not see this as their job, should think again! It will be their job. Or the job of someone else."

Sustainability and Social Responsibility as Competitive Factors

Until now, some managers believed that, having realigned their organization to meet profit requirements and tossed overboard everything that appeared unnecessary to this aim, they were now well equipped to brace the storm of global competition. But a fresh wind has blown in recent years in Germany as elsewhere, one that comes from an entirely different direction, bringing with it supposedly alien influences that were never seriously considered in the past. They go by the names "corporate citizenship," "sustainability," "civil responsibility," and "social cooperation."

Businesses increasingly find themselves being assigned new roles and an expanded range of responsibilities. They face the challenge of *committing themselves to the community* outside the corporation. And this pressure from outside is bound to increase in the years to come. This is partly the outcome of social problems and conflicts which are likely to intensify and already confront companies in the majority of industrialized countries. One need only consider the problem posed by the relocation of employment to countries with lower wage and tax levels, or the global ageing of our societies with its grave consequences, for example, for our social security and pension systems.

But many social organizations, fast growing national and supra-national networks and grass-roots initiatives are also pushing the process ahead. They include the United Nations' "Global Compact," the World Economic Forum's "Global Agenda," the European corporate network "Corporate Social Responsibility" (CSR), and the German "Econsense-Forum for Sustainable Development." Together with leading international corporations, the latter has explicitly adopted the "balance of economic, ecological, and social goals" as a guiding principle in its corporate policy statement.

How do we explain this development? Above, I mentioned influences "supposedly" alien to the system. They seem alien only to those who view them with the eyes of the industrial past, when clear borders were still drawn between the economic system and other social systems. Today these *lines are becoming even more blurred*. In a networked, knowledge-based economy, *businesses increasingly depend on the world outside their doors,* especially on functioning infrastructures, quality research, educational facilities, and intact natural environments. In global competition, which is also competition for the best minds, these factors can be decisive advantages.

Therefore, businesses have a strategic interest in designing innovative and cooperative relationships with their environments. Such relationships increase their *social capital*. This is a capital which, much like IC, forms in relationships where added value is generated by mutual respect.

Companies that build bridges to their social environment not only act in a socially responsible way, they also do the smart thing from an economic point of view. Their public standing will grow, and their credibility increase. And ultimately, the stock markets will reward that fact.

This is why new forms of business valuation are being developed, which assign a key role to the so-called "ethical" values of social and ecological responsibility. Appropriate benchmarks, evaluation methods and standards, as well as norms and instruments for this kind of non-financial reporting are being designed. They range from the "Global Reporting Initiative" (GRI) through consulting and auditing, to funds that only accept companies committed to the "triple bottom line" (economy, society, environment). In other words, in the future, social and ecological dimensions of values will form part of every business success story. This is why it is high time to make these dimensions an integral part of *overall corporate strategy* and integrate them into management, measurement, and reporting systems. This is also what we mean by balanced values management.

Achieving a New Balance by Integration

Integrating Management and Reporting Models: An Urgent Leadership Task

A range of models and instruments are available today that provide companies and non-profit organizations with a broader information base, comprising more than just financial data and thereby helping them achieve a more balanced orientation.

The first such instrument, now widely in use, is the *Balanced Scorecard*.

Another is the *Business Excellence Model* of the European Foundation for Quality Management (equivalent to the *Performance Excellence Model* of the Baldridge National Quality Program), which originated in quality management. Then, of course, there are the different intellectual capital models like the *Intellectual Capital Navigator, IC Rating,* the *Value Chain Scoreboard,* or the *IC Statements*.

In addition, there are different standardized systems for *environmental and social reporting*, as well as, in the German-speaking countries, the so-called *Values Management Systems*, which introduce standards of moral integrity behavior into the management structure specific to a given company (Wieland, 1999).

What all these models have in common is that they consciously establish a broader orientation and management horizon and, explicitly or implicitly, make balancing a management task. "Finding the new balance," says Leif Edvinsson, "how well balanced values are being practiced" is the key question of Jac Fitz-enz. And "if a company wants to sustain high profitability," says Eric Israel of KPMG, "it must balance and integrate its financial, environmental, and social performance. Large, multinational companies are starting to understand that concept." So much for the good news.

The bad news has two names. They are: *lack of integration* and *subordinated function*. So far, the best elements of these models, which often overlap in terms of content, but are used in very different and usually subordinate functional areas, have been integrated only in rare instances. To do so would require cooperation of the leadership team across borders, disciplines, and divisions. This is why sustained implantation of the themes IC, or social capital at the highest leadership level, where the big strategic signposts are set, has so far rarely been achieved.

Therefore, it comes as no surprise that the hard, but more easily quantifiable, result-oriented goals such as cost-cutting or return on capital, turnover or cash flow always predominate, while the soft, less easily quantifiable goals and values become marginal. In plain language: those who pay attention to soft, intangible values still seem "divorced from mainstream business concerns" (Pierce, 2001). Their projects, programs, and systems seem like a "separate parallel structure" (Baker et al., 2002), a merely decorative extension added to the hermetically sealed structure of traditional management and evaluation systems. They are regarded as additional work that apparently has little bearing on the normal strategic and operative business. This situation is not only tiring for all concerned, but above all ineffective. And it raises the question whether things could not be done differently, and more easily: Why not seek the *connection* between value and values straight away? Why not erect the building in a balanced way *right from the start*?

The first question could be: how can the development of a *vision* or *strategic mission* be *combined* with designing fundamental *values*, corporate principles, or guidelines? How do the two co-exist? The second step is to summarize the organization's fundamental goals and values in an *integrated, operation-oriented model*, which is *connected with* strategic and operative management and geared towards day-to-day business requirements.

A further step involves fitting together the different management system and reporting models in detail, making them consistent with each other and designing their fields as contiguously as possible. Where possible, the result should be *one* integrated, clear management model that is easy to handle and comprises intermeshing modules covering all aspects of the firm: from the corporate guidelines through the annual targets and resulting project and process plans to auditing and reporting. On successively deeper levels, the goal structure of the higher levels appears in a more enriched or detailed form. The concept is comparable to the well-known explosion drawings of technical systems, which present more detailed or additional views from one level to the next.

In this way, a perspective will emerge step-by-step, which is transparent to all and will enable a high degree of self-management and self-evaluation in the organization. Moreover, the basic structure of a virtual company memory is created, which can be used for knowledge and innovation management as well as for managing human resources and change.

That such integration is not only possible but also achieves results that are excellent in every respect—strategically, structurally, culturally, and financially—has been proven by notable examples, especially in mid-sized companies in Germany. It is probably no coincidence that they include winners of the German Quality Prize (such as the company Aubi) and companies that earned distinctions in the *Knowledge Manager of the Year* competition (such as the company Brühne).

The task of integration, which has been sketched here with a view to the micro level of individual organizations, is naturally an even greater challenge at the macro level. As long as the different models, instruments, and standards for measuring and reporting intangibles continue to be developed separately, and as long as their creators and communities only compete, instead of cooperating across borders, disciplines, and countries, the dominance of the old thinking that is one-sidedly focused on the increase of material wealth is unlikely to be overcome, especially in our financial communities.

Fortunately, a number of initiatives aiming to progress *towards a unified model* (Mackay, 2003) are underway at international level, including under the auspices of the European Commission. It is to be hoped that they succeed, to ensure that the efforts being made inside companies to achieve more balanced management are also supported in the external practice of company valuation and, hence, receive stronger resonance on the financial markets and in the media that report on them.

The decisive question is: will an enlarged, *integrated performance concept* be developed here, as well? Will it be one that includes factors like intellectual and innovation assets, comprehensive quality management, and social and environmental responsibility? Much remains to be done until that can become a reality. But we can begin to win greater resonance for this approach now through our own conduct as managers.

A Different Mode of Thought: Leadership as a Border Crossing and a Balancing Act

Of course, a roadmap is not the terrain. Orientation models and management instruments are only aids. They can be helpful, but they can also hinder work when they are focused on too rigidly. Tools are not a replacement for strategy, or for managers' own ideas and judgment in decision-making and/or defining objectives. As Fredmund Malik writes, experience shows: "The more important a goal is for a company, the less quantifiable it is in the strict sense of the term." And: "The more important goals are, the more contradictory they also (unfortunately) are. This is a fact of life. This is why setting good goals always calls for *the art of weighing and balancing*" (Malik, 2000). As Peter Drucker first stated almost three decades ago: "There are only a few things which distinguish as clearly between capable and incapable management as the ability to weigh up objectives against each other. There is no recipe for that; all that can be said is that this weighing up cannot be done mechanically or mathematically" (Drucker, 1994). These ideas strike me as more relevant than ever.

In an increasingly complex, contradictory, and insecure world, the old mechanical and arithmetical methods of decision-making are less and less feasible.

What is needed is a different form of thought capable of recognizing both quantitative *and* qualitative factors and hence able to deal with ambivalence and instability. It is a mode of thought that can transcend one's own discipline and system borders, carefully explore what is new or alien, what lies *beyond* those borders, so as to include in one's own awareness what has so far been excluded.

This is what I call *re-including thinking*. It gives rethinking leadership new meaning. Conventional discussions about leadership—especially, but not only in the political field—are often still shaped by old contents (visions, concepts, competence descriptions) and often even by superficial slogans. What is missing is the connection to the new requirements of the knowledge society. A level of reflection is lacking that incorporates new conceptual approaches to *complex innovation and change processes* in the discussion consistently and in a practice-oriented manner. In the future, it will not be sufficient to define strong leadership, for example, in terms of being a strong decider, setting clear goals, or being assertive and determined. Leadership, understood as "adaptive work" (Heifek, 2003), will be defined increasingly by the intellectual capacity to step outside the box and register new, sometimes paradox developments and, above all, their possible consequences. That means: do we pay more attention than previously to intellectual and emotional processes and relations inside and outside the organization? Do we take information on people's worries and fears as seriously as our quarterly reports? In planning our operations, do we have a grasp of the "intellectual forces and effects," called for by Carl v. Clausewitz in his *On War*? Or do we still orient "our principles and systems only toward material things and one-sided activities," as Clausewitz already observed critically in the 19th century?

Thinking of both material and intellectual forces and bringing value and values together is becoming increasingly important. For this reason, leadership is related to balance in every sense today, not only in corporate orientation, but also in managerial conduct. People want to be led, and they are looking for leadership. But they do not want interchangeable faces whose sole distinguishing features are those known from job ads. They want personalities who stand out for their farsightedness and integrity, as well as for a high level of economic, social, and ecological responsibility. In their leadership, they should combine readiness for change with sensitivity, innovative ambition with social competence, and efficiency with sustainability. Men, and increasingly women, are needed who regard their entrepreneurial activities not as a narrow administrative or economic function, but on a much broader level as "a creative, comprehensive, and meaning-giving social role" (von Koerber, 2002). Managers today are increasingly asked by their employees, partners, customers, stockholders, and the public: do you *yourself* possess the ability to act responsibly and cross borders? And, especially after the multiple scandals of recent years, from Enron through Lipobay to Parmalat, they will increasingly confront the question: have you *yourself* developed convincing and transparent values for your behavior?

We should think over our answer carefully and in good time. For the values we personally embody in the end also decide on the future valuation of the company.

Thinking About Expanded Leadership Competencies

If what I have outlined so far is only halfway convincing, do we then not need to take a fresh look at the qualification profiles or competence requirements of our managerial staff?

I want to refer here to only *three competencies* I believe are intimately bound up with the necessary integrated development of IC and social capital in the knowledge economy (KE).

In conjunction with the *other mode of thought* open to the future that I previously outlined, a mode of thought that can cope with contradictory and unstable developments, I regard these as key competencies for managers in the 21st century.

The first key competency is *social competence*. Although the concept sounds familiar, in practice this remains a scarce resource in many organizations, although they have sent their executives on many communication and team training workshops and even—this applies in particular to a number of big corporations—had their top managers climb mountains repeatedly with Reinhold Messner.

This is apparently not sufficient to meet the new requirements of the KE. It is, after all, not about getting on with colleagues or forging likeminded teams, but the far more difficult building of *relationships across borders*.

This is why I would suggest developing a new and broadened conception of learning (and, above all, practicing) social competence as learning in and about *social cooperation* across borders. Sharing knowledge—with people who are *not* like-minded and come from a different field, discipline, or culture—is what represents the essence of social competence today's world.

Cooperation projects such as the corporate citizenship projects of some companies in Germany in their social and cultural environments are so fruitful for developing social competence. They are of exceptionally high *learning utility* for companies and their staff. If they did not already exist, some of these projects would need to be invented by human resources departments.

They are called "Seitenwechsel" (Changing Sides) or "Perspektivenwechsel" (Perspective Change) and range from learning in social environments to crossover involvement of workforces in building nurseries or schools. Participants everywhere agree that mutual learning of social competence is the most important and meaningful outcome of these initiatives. And people commented that such projects are far superior to previous outdoor training.

The *second* key competence is closely related to the first, but leads in a different direction: *border-crossing competence*. It can also be described as the ability to promote innovation. Everybody knows the phenomenon concerned here. It is called "looking beyond the end of your nose."

People who possess this border-crossing competence can *combine* different perspectives, their own experiences, and those outside, creatively, to develop useful innovations. Because, as demonstrated in many sociological studies, new ideas emerge above all on the *borderlines* between companies and their environments, by bringing different perspectives in contact with each other. The sociologist Mark Granovetter at Stanford University has spoken of "*weak ties*" in this context: connections that tend to be weaker, such as those typical of cooperations or networks, have proven more conducive to the development of creativity and creation of innovations. This is why "crossing borders" is virtually a precondition of innovation and growth. It is the key to increasing IC.

Consistent exercise of this creativity-generating faculty also has a pleasant side effect. It helps counteract the always imminent CA or "Corporate Alzheimer" which sets in almost inevitably wherever people are solely preoccupied with themselves.

We need social competence alias capacity for cooperation, so as to share knowledge, and border-crossing competence alias capacity for innovation, to combine knowledge from different areas, so as to create something new. So far, so good.

But the question is what happens with the new ideas and concepts that have emerged in the heads of individuals or smaller teams. *How do the new ideas and concepts reach* the entire organization and its environment outside without being rejected again by the immune system of the respective communities? How can it develop stable or even *sustained influence*, usually through many process steps? Have we recently not experienced repeatedly that elaborately planned technological and, above all, social innovations fail because things simply do not fit together as they should? Conventional management categories and concepts like planning, implementation, or execution evidently often fail in the context of *complex, border-crossing projects*.

We should consider a *combining* competence that requires being newly learned and defined and will, in my opinion, become increasingly important for leaders in business, society, and politics. It reaches beyond technical skills and project management know-how. It has a great deal to do with both creativity and properly conceived dialog-oriented communication. This competence consists in the ability to *design complex intellectual and social architectures* and give comprehensible and adaptable *form* to the processes involved in cooperation with others. The aim is to achieve an integrated form in which very different elements merge to become a *coherent whole*, as in any successful physical architecture, excellent theater performance or the skilful jamming of a jazz ensemble.

In Germany, we use a concept to describe the form of a coherent whole. It originated in the study of nature and art and was then adapted by psychology. While being related in content to the English concept of design, it is hard to accurately translate, which is why it was not adopted in the English language. It is the word *Gestalt* and the derived *Gestaltung*.

I propose that we call the *third key competence* to be developed *Gestalt competence*. But, regardless of the term, working on this competence, especially in the management and governance context, means learning from *cultural environments* and, in particular, from the *arts*. The question we need to ask is: how can we comprehensibly *form* the in*form*ation we pass to others? Which form do our re*form* or trans*form*ation projects have? How can we "gestalt" relationships and correspondences that permit linkage between differences, in our communication processes as well as our knowledge, innovation, and change architectures?

To put it differently: will we be able to develop a competence in the future that is in equal measure—functional, social, energetic, and aesthetic. It is one that we evidently lack in the present: the capacity to go beyond individual intellectual achievements and *design shared achievements* without losing individuality, plurality, and diversity.

This is where the circle of my argument draws to a close. Of course, these have only been suggestions and conceptual proposals. And, as plausible as they might be, what counts in the end, as we all know, is the *personal* quality of managerial staff. To put it even more bluntly: What counts is the *character and integrity* of the individual.

This is why we will probably need to talk far more about character and character formation in the future, if we want leaders in business and politics, nationally and internationally, to win greater trust again. *Trust capital is ultimately the most vital capital in the KE.* This, too, forms part of the vision of a new balance of value and values. It also is what is meant by *rethinking leadership in the knowledge society.*

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Chapter 11

Japan and Other East Asian Economies Under the Knowledge-Based Economy

Seiichi Masuyama, *Professor, Research Institute for Industry and Economics, Chuba University, Japan*

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Introduction

Advances in information and communication technology (ICT) have had profound economic effects and facilitated the move towards a knowledge-based economy (KBE) by improving the efficiency of production, distribution, and innovation processes. East Asia is no exception. The region is moving toward a KBE with three distinct characteristics. The first is the diverse development stages of East Asian economies, spanning Japan, a high-income economy, newly industrialized economies (NIEs), and low-income economies. The second is the region's remarkably orderly pattern of development in the post-war years. In this so-called flying geese pattern, Japan, the leading economy, shifted old industries to the NIEs, which in turn shifted their old industries to other developing economies in Association of Southeast Asian Nations (ASEAN). Foreign direct investment (FDI) played a major role in this sequential transfer of manufacturing capacity. In recent years, however, the emergence of the Chinese economy and the prolonged recession of Japan have disrupted the orderly flying geese pattern. The third characteristic of East Asia is its heavy manufacturing orientation. Japan, Korea, and Taiwan concentrated on manufacturing as a result of their export-led industrialization, and then FDI from Japan and the NIEs in ASEAN economies and China developed manufacturing capabilities throughout East Asia. Major issues for the ongoing development of the East Asian economies include how these characteristics will affect their process of adaptation to a KBE and how the region's characteristics themselves will be affected as a result.

The first section of this chapter discusses the five key elements necessary for the running of a KBE; these provide yardsticks for judging the adaptation of East Asian economies to KBE, which is evaluated in the second section. A third section sets forth an agenda for the region's economies to continue their move toward a KBE. A final section discusses what Japan needs to do to in order to adapt to the KBE.

Formation of a KBE

The ICT Revolution Spawns the KBE

The ICT revolution reaches into all aspects of the economy and facilitates its transformation into a KBE in which knowledge-related activities are the main source of competitiveness and added value. In that process ICT increases productivity in production and innovation processes. The Internet reduces transaction costs in such areas as medical and financial services, improves management efficiency through supply chain management (SCM) and other schemes, and facilitates innovation by increasing the efficiency of knowledge dissemination and international collaboration.

A KBE is an economy in which knowledge is created, captured, delivered, and utilized efficiently by firms, organizations, individuals, and communities and where outdated knowledge is continually replaced. Hence, a KBE requires that the economic and social system provide incentives to end obsolete activities and replace them with more efficient activities to permit ongoing industrial restructuring (Dahlman and Andersson, 2000).

Moreover, network externalities[1] work in many sectors of a KBE because of the pervasive use of ICT. Products and services that meet widely accepted standards tend to dominate the markets as consumers benefit from those standards, and the production of many ICT-related products and services is subject to increasing returns to scale. Hence, those producers who can influence or monopolize standards, such as Microsoft and Intel in personal computers, dominate markets at the expense of those who fail to possess or influence the standards. Since most ICT-related standards have so far emanated from advanced countries, particularly the U.S., East Asian corporations have been in a disadvantageous position.

Another characteristic of a KBE is the increasing share of services in the economy. As the ICT revolution proceeds, the demand for services increases more than the demand for hardware. Processing information by ICT increases the demand for "codified knowledge," that is information in the form of data, images, and symbols. Computer software, research and development (R&D), know-how, content, and financial products become more important, in part because they can be processed and distributed in a codified format and also because they represent the kind of innovation activities that are in high demand in a KBE. The demand for music and visual content is increasing as the diffusion of broadband telecommunication services leads to a multiplicity of delivery channels, and the demand for financial services has increased with the fusion of financial innovations such as options and futures and ICT.

The growth of services is being pushed by the separation of software from hardware, the separation of the production process from the innovation process, the

[1] Network externality means that the value to each member from participating in a network increases as the number of participants increases.

increasing demand for content, and the growth of financial services, among other things. With the progress of the ICT revolution, it becomes possible to separate, code, process, and transport the "knowledge" that was once inextricably embedded in physical goods, and the distinction between the manufacturing and service industries, and between hardware and software, blurs. Moreover, computer simulation and ICT remove the necessity for product R&D activities to be performed in close proximity to production activities and, thus, the innovation process becomes physically separated from the production process. As these functions are out-sourced to different firms, the weight of service inputs in manufacturing increases. The results of innovation activities often take the form of services, such as provision of software, intellectual property, R&D, and know-how.

In fact, as the global economy shifts toward a KBE, service-oriented economies have performed better than manufacturing-oriented economies, at least among advanced economies, and the legacy of a heavy manufacturing orientation may work as a disadvantage in the future transformation of the East Asian economies to KBEs.

The Basic Elements of a KBE

Crucial to a KBE are efficient ICT industries and infrastructure, efficient—often international—production networks, powerful innovation systems, human resources to support the preceding three factors, and industrial and organizational renewal. Positioning in the five elements of a KBE previously mentioned determines the outcome in their adaptation to a KBE. In the current transition from the industrial age to the age of the KBE, there are growing divides between those countries, societies, enterprises, and people that have smoothly adapted to the paradigm shift and those that lag in making the adjustment. Such divides have appeared within and among advanced economies, but the ones between advanced and less developed economies present the most peril.

The ICT Sector and Infrastructure are the Platform of the KBE

The ICT infrastructure, equipment, and services provide the means for creating, disseminating, and utilizing knowledge and constitute the platform of a KBE. Many economies are rushing to construct a so-called national information infrastructure to build a base for their transformation to a KBE. In the U.S., which leads in the transformation to a KBE, investment in ICT equipment and software increased from 29% of total investment in 1987 to 52% in 1999 (OECD, 2000). The information infrastructure, or 'info-structure' consists not only of telecommunications networks, but also of strategic information systems, supporting policy and legal systems, and human resources to develop and utilize the physical infrastructure (Dahlman and Andersson, 2000). Electronic commerce is expected to constitute a growing part of the info-structure. To facilitate info-structure development, deregulatory measures that enhance market competition are preferred over public spending, at least in advanced economies. It is argued that an economy's proximity to ICT hardware producers is not as important for it to benefit from KBE as its proximity to ICT software producers and service providers (OECD, 2002).

The Formation of International Production Networks

The formation of international production networks may be the greatest impact to the ICT revolution as they constitute an integral part of a KBE. Before the spread of ICT, international production networks were typically patchwork arrangements between core firms and local affiliates to provide the core firm access to cheaper labor or local markets. In contrast, with the pervasive application of ICT, international production networks have become integrated, coordinated systems of activity that take advantage of the specialized technology, skills, and know-how at each node (Borrus, Ernst, and Haggard, 2000). These production networks tend to organize firms, including small and medium-sized enterprises (SMEs), horizontally rather than hierarchically and to co-ordinate their activities through SCM with the extensive use of ICT.

The complementarity between this type of organization and the spread of ICT has accelerated the physical and organizational separation of the innovation function from the manufacturing function. This separation is seen in the emergence of the so-called fab-less manufacturers and those specialized in manufacturing such as the electronic manufacture services (EMS) providers and semiconductor foundries. In the semiconductor industry, the fab-less firms concentrate exclusively on chip design, maintaining no production facilities and outsourcing the manufacturing of chips to foundries, which specialize in original equipment manufacturers (OEM) production.

Geographically, production networks in a KBE tend to have manufacturing processes located separately from innovation centers, with production mainly in developing economies and innovation functions typically in advanced economies. Developing economies, which tend to have abundant labor, have emerged as manufacturing centers, particularly for ICT equipment. In these circumstances, with an almost unlimited supply of cheap, industrious, and fast-learning labor, China has emerged as the major global center for the manufacturing of ICT equipment.

At the same time, there is a tendency for producers from the same industry to concentrate in local networks or clusters. Thus, the competitiveness of a location depends not only on its supply of production factors such as low-cost labor but also on the depth of its industrial cluster. Noteworthy concentrations include the ICT cluster around Taiwan's Hsinchu Science Park, the electronics industry cluster straddling Singapore and Malaysia, and the ICT industry cluster in the Pearl River Delta of southern China. The force behind agglomeration in a KBE is the advantage of physical proximity for the sharing and diffusion of knowledge rather than the advantage of central location for minimizing transport costs. As industrial activities become more complex and involve many firms in complementary activities, however, access to supporting industries becomes more important to competitiveness.

The Importance of Innovation Systems

Investment in the creation of knowledge and technology is a primary source of economic growth in a KBE, and an economy's ability to provide a congenial environment for innovation activities determines its international competitiveness. Moreover, innovative capability becomes crucial to each firm because its competitiveness depends to a large degree on the ability to differentiate its products and services. Finally, innovation capacity is becoming particularly important for the success of advanced economies and the firms based there, as innovation activities separate from manufacturing and as manufacturing activities migrate to developing economies that have abundant unskilled labor. Advanced countries account for nearly 90% of R&D

expenditures around the world and for about the same proportion of patents granted and scientific papers produced (World Bank and OECD, 2001).

Innovation results from complex interactions among those who produce, disseminate, acquire, and apply various types of knowledge. These actors include workers in private firms, universities, and public research institutes who are involved in cooperative research, human exchanges, cross-licensing, and equipment purchases (Dahlman and Andersson, 2000). The likelihood of successful innovation depends on the performance of the entire complex of interactions, or what is called the innovation system. Similar to manufacturing systems, some functions of innovation systems tend to concentrate in close geographic proximity.

Innovation involves the creation and interaction of two types of knowledge: explicit knowledge and tacit knowledge (Nonaka, 1998). Explicit knowledge is logically derived and more codifiable while tacit knowledge tends to be experience-based and difficult to codify. The initial effect of the ICT revolution has been a dramatic increase in the demand for explicit knowledge. Thus, important components of an innovation system for a KBE are internationally competitive universities or creators and disseminators of explicit knowledge, which support the application of scientific knowledge and cooperation between academia and industry. Moreover, financial systems that support innovation-oriented start-up firms, such as venture capitals and emerging company markets, pave the way for replacing outdated knowledge with new knowledge. Advanced economies have developed specialized stock markets to meet this need, such as NASDAQ in the U.S. and EASDAQ in Europe. Finally, stronger protection of intellectual property rights and standardization of these protections across national borders assist innovation. Corporations around the world are relying more on patents, particularly U.S. patents, to help them capitalize on successful innovations.

Moreover, with economic globalization, local innovation systems need to be linked internationally to gain exposure to and to incorporate best knowledge and practices. Shared language and common culture enable national economies to link readily with innovation systems beyond their own borders. For example, the existence of an ethnic Chinese community spanning the Pacific Ocean has contributed greatly to the transfer of knowledge from the U.S., particularly Silicon Valley, California, to Chinese-speaking economies in East Asia, such as Taiwan and China. In addition, sending people abroad to study in advanced economies, especially in the U.S., and proficiency in the English language, the linguistic standard in the Internet age, facilitate the international linkage of innovation systems.

Embodied Knowledge: Human Resources Are Key

Human resources, which embody knowledge, are essential to a KBE. The needs of a KBE are not the same as those of the industrial age. Industrial economies relied on workers with an accumulation of skills working in a cooperative organization. A KBE requires both creative talents to sustain innovation systems and information technology (IT) workers to support the ICT sector and infrastructure. Moreover, the fast pace of innovation in a KBE means that knowledge becomes obsolete quickly and that people need to refresh their skills and keep up-to-date on the required knowledge. Thus, in order to supply a labor force that serves the needs of firms in a KBE, a society's education model must foster individual creativity and openness to lifelong learning. Societies and firms need to design their education and training programs to meet the needs of the KBE.

Moreover, the market for knowledge talents is becoming global, even encompassing developing economies, as advanced economies try to build competitive advantage in innovation to replace the out-migration of manufacturing capacity. The economy of Silicon Valley, which is supported by engineers from all over the world, particularly ethnic Indians and Chinese, is in the forefront of this phenomenon. Firms in advanced economies are also shifting innovation activities abroad, even to developing economies. Motorola and Microsoft, for example, each set up R&D centers in China. In other cases, firms in advanced economies compete to recruit talents from all over the world and outsource knowledge-intensive activities to foreign firms that control knowledge workers.

The Reorganization of Industry and Corporate Structures

The increase in knowledge inputs and the application of ICT are leading to the reorganization of industries, firms, and economic activities. First, the reorganization or restructuring, of industry is being accelerated by the confluence of three trends: 1) the rapid growth of ICT equipment and service industries, which itself fosters industrial restructuring; 2) the application of ICT to logistics as seen in SCM, which encourages reorganization of value chains and within the industrial sector; and 3) the ongoing separation between innovation and manufacturing, which is prompting the reorganization of industries internationally.

With the transition to a KBE, corporate organizations are moving away from centrally directed, vertically integrated structures toward new forms of business organization. Horizontal organizations with distributed authority are more responsive to changing conditions. In a KBE, successful enterprises tend to out-source non-core functions to relatively autonomous specialists and use ICT to coordinate among the network nodes, for example, to manage the flow of information and materials through the supply chain. Thus, there is a greater role for SMEs in a KBE. Already this phenomenon is taking shape. For example, emerging small firms are central players in Silicon Valley, and Taiwan's relatively small personal computer (PC) producers networked with small producers of parts are more competitive than, for example, Japan's large integrated corporations.

As a KBE requires such drastic changes in the organization of industries and firms, we can argue that an economy cannot fully realize the benefit of productivity growth due to ICT unless and until such reorganizations proceed. To facilitate this process and the transformation to a KBE, many economies will have to allow more liberalization and deregulation. Moreover, a healthy functioning capital market is essential to support such restructuring. In particular, venture capitals and equity markets are a crucial means of financing in a KBE because start-up businesses and SMEs, which are a core of the KBE, lack the physical assets to submit as collateral to obtain loans from banks. These markets are important also because the corporate governance they impose stimulates the constant reallocating of resources to their best use.

Impact of the KBE on East Asian Industry

Becoming the Manufacturing Base for International Production Networks

The ICT revolution has already greatly affected the East Asian economies, both their short-run performance and their industrial structure. So far, the impact of the ICT revolution on Asia has largely occurred through the region's function as the world's main manufacturer of ICT equipment (Table 1). Concerning short run performance,

Table 1: Asia's share of global export of PCs and ICT equipment, 1990 and 2000

Exporter	Value (US $ bil.) 2000	Global Share (%)			AGR (%) 2000/1990
		1980	1990	2000	
East Asia excluding Japan	291.3	11.9	20.8	32.9	
Korea	42.9	2.0	4.8	5.5	13
Taiwan	58.4	3.2	4.7	6.2	15
Singapore	74.1	3.2	6.4	7.9	14
Domestic Export	41.8	2.5	4.9	4.4	11
Re-export	32.3	0.7	1.5	3.4	22
Hong Kong	4.0	2.0	1.6	0.4	–2
Malaysia	44.3	44.3	1.4	2.7	21
Philippines	24.1	0.1	0.6	2.6	29
China	43.5	n.a.	n.a.	4.6	
U.S.	153.5	20.2	17.3	16.3	12
Japan	108.2	21.1	22.4	11.5	5
U.K.	49.6	6.4	6.5	5.3	10
Germany	45.1	9.9	7.5	4.8	7
Netherlands	36.1	4.0	3.4	3.8	14
France	32.4	4.7	4.1	3.4	10
Ireland	25.5	0.9	1.7	2.7	17
Mexico	33.0	0.1	1.5	3.5	22
Total	774.5	78.3	85.4	84.3	

The figures for East Asia excluding Japan are the totals of the economies listed in the table.
Source: Compiled by Nomura Research Institute based on WTO data.

the production and export of ICT equipment to meet strong global demand pulled the region out of the 1997 financial crisis, and then the meltdown of the ICT boom sent these economies plunging again. They have subsequently recovered. With the progress of the ICT revolution, manufacturing capacity in the region shifted from Japan and the NIEs to ASEAN and, especially, to China as these two areas became bases for the manufacturing of ICT equipment. At the same time, Singapore and Hong Kong have emerged as regional ICT hubs. On the other hand, the East Asian economies have not established a strong position in the soft side of the ICT industry, that is, software and IT-related service industries.

The Emergence of OEM Producers in the Asian NIEs

As the separation of innovation and manufacturing functions proceeds, networking between innovation activities in advanced countries and manufacturing activities in East Asia is on the rise, especially in the ICT sector. By compensating for the lack of domestic innovation capability networking with advanced economies increases the East Asian economies' capacity for growth. In this way, the region has become the world's center for the manufacturing of ICT equipment.

Since the 1990s, as ICT became a core technology, the U.S. has eclipsed Japan as the source of innovation for East Asia's manufacturing center. In the electronics sector, Japan produces only a small share of high-growth ICT equipment, while its relatively large share of the production of low-growth consumer electronics has been eroded with a shift of production to East Asia, particularly China. The prevailing system in the ICT equipment industries is one in which brand-possessing firms mainly in advanced economies implement R&D and firms in the Asian NIEs use OEM production in their own territories and increasingly in China. This division of labor initially took shape when U.S. electronic makers switched from Japanese to Taiwanese and Korean manufacturers to supply components such as integrated circuits. With this strategic decision, the U.S. manufacturers circumvented their previous dependence for key components on the vertically integrated Japanese manufacturers, which were also their competitors in final product markets (Borrus, Ernst, and Haggard, 2000). As a consequence, the influence of Japanese manufacturers in the East Asian ICT industry declined significantly, although they still supply a significant share of key components.

This division of labor between brand-name firms in advanced countries and OEM-producing firms in developing economies benefits the producing firms in several ways. It frees them from the need to devote resources to marketing and distribution and allows them to concentrate on producing as efficiently as possible. It allows them to accumulate experience and knowledge that can serve as the basis for developing their own technologies or products.

In this way, electronic firms in Taiwan and Singapore have begun to transform from OEM producers for global brand-holders in the U.S. and other advanced economies to producers with broader responsibilities. They have used the knowledge and feedback on product development they gained through these long-term contract production relationships to tackle higher functions such as original design manufacturing (ODM) and coordination of customers' supply chains. Specialized contract electronic manufacturers are now evolving EMS providers of overall service packages. Through these changes, ICT firms in the Asian NIEs have become more competitive, especially in terms of price, against Japanese firms producing PCs, semiconductors, and other electronic goods and components. In particular, EMS providers already threaten Japanese firms and have prompted their reorganization.

The emergence of OEM producers in Asian economies such as Taiwan is due also to organizational innovation. The ICT industry in Taiwan consists of many SMEs in contrast to Japan or Korea, where large firms dominate the industry. Taiwan is second behind the U.S. in the number of ICT design firms (127) and the domestic sales ratio for IC production in Taiwan (54.7%) is greater than in North America, Japan, or Europe (Chen and Liu, 2001). Moreover, many of Taiwan's SMEs are run by independently minded Chinese who share a respect for the importance of "relationship." These characteristics meshed with the horizontally organized local production networks required by the KBE and thus facilitated the formation of efficient industrial clusters in Taiwan's IT industry. In addition, the industry's diversified network structure smoothed the linkages between Taiwanese firms and similarly organized firms in Silicon Valley (Chen and Liu, 2001).

The Emergence of China as a Major Production Base

China has become a major node in the production networks linking the U.S. and East Asia. From the middle of the 1990s, ICT manufacturers based in the Asian NIEs, particularly in Taiwan, shifted their labor-intensive production processes to ASEAN and more recently to China to maintain competitiveness as wages rose at home.

Export-oriented foreign investment in contract manufacturing, mainly from Taiwanese firms, attracted by southern China's seemingly inexhaustible supply of unskilled labor, helped the Pearl River Delta area become a production base for ICT hardware exports. Indeed the inflow of FDI is giving rise to a virtuous circle in which the development of FDI-financed parts and components suppliers increases the area's ability to attract more FDI. Concentrated public investment in infrastructure by China's central government also helped to attract foreign investment. The area now accounts for more than one-half of the world's production of copiers, printers, and desktop PCs, and recently, it has become a major source of ICT parts as well. In addition to its comparative advantage in unskilled labor, the competitiveness of the Pearl River Delta is based on this agglomeration of parts manufactures and on financial and logistics support from nearby Hong Kong (Kuroda, 2001).

The Chang Jiang Delta around Shanghai has developed as a production centre of products, which need more skilled labor such as notebook PCs, mobile phones, and semiconductors with the help of domestic-market oriented foreign investment. The Shanghai area offers a significant pool of educated workers, and the existing local industries are concentrated in knowledge-and capital-intensive sectors (Kuroda, 2001). As they did in the Pearl River (Zhu Jiang) Delta, Taiwanese investments have been playing a crucial role in the industrial development of the Chang Jiang Delta.

Taiwanese firms, which have begun to possess their own innovation capabilities as a result of past transfers from firms in the U.S. and Japan, are now transferring these technologies to Chinese engineers and firms. This transfer is proceeding rapidly, helped by the common language and culture of Taiwan and Mainland China. Moreover, with the accession of Taiwan to the World Trade Organization (WTO) at the end of 2001 it will be difficult for the Taiwanese government to restrict Taiwanese firms from trading and investing in China (Kuroda, 2001). At the same time, China's accession to the WTO is attracting more foreign investment by western and Japanese firms to China, further accelerating technology transfer from them.

Moreover, China seems to have a greater abundance of the entrepreneurial spirit required in a KBE than the ASEAN economies have. Domestic firms captured 90% of China's television market, 80% of the PC market, and close to 10% of the mobile phone market in 2000. Unlike firms in ASEAN and Taiwan, China's domestic firms control one of the most profitable parts of a value chain. They have filled the missing links—the product development function and the supply of core components by outsourcing them as they are available in the market in the prevailing environment of a modular production architecture.

Gradual Build Up of Innovation Systems

Since most East Asian economies have developed through technology transfer from advanced economies, their innovation systems have lagged their production systems. Other than Japan, East Asian economies are weak in the innovation activities that are increasingly valuable in a KBE, even though the NIEs are catching up in this area.

Japan, the only advanced economy in the region, has traditionally been a major source of innovation, transferred their technologies through FDI and export of key components that embody the latest technologies. In the 1990s, however, Japanese innovation systems failed to keep up with the ICT revolution and fell behind American systems particularly in emerging ICT technologies. One factor that probably hindered Japan's ICT is its orientation to experiential or tacit knowledge. In order to be used by ICT equipment, knowledge must be codified, but this is more difficult to do with tacit knowledge than with explicit knowledge, the type of knowledge more abundant in the west. Innovation systems in Japan are centered in private corporations where lifetime employment, patient capital, and other systems are geared to the development of tacit knowledge by accumulating experience and close co-working within corporate groups. Universities in Japan have not been structured to co-work with corporations and even Japanese corporations prefer to co-work with foreign universities as an advent of KBE has increasingly compelled them to do joint R&D work with universities. In fiscal year 2000, Japanese corporations spent 157 billion yen (USD 1.46 billion) for R&D with foreign organizations while they spent only 79.3 billion yen (USD 0.74 billion) for R&D with Japanese universities.[2]

With Japan's increasing recognition of its failure in moving fast enough toward a KBE, there have been efforts to emulate international best practices. As of 2004, Japan's national universities will change their status to become independent administrative agencies; their management will become more flexible and competition among universities will intensify. Many universities have established technology-licensing organizations to increase the commercialization of the knowledge and products of their research institutes. However, institutional complementarity makes it difficult for Japan to change its national innovation system too drastically.

At the same time, there are now increasing signs that Japanese corporations have started to regain strength in the KBE environment owing partly to their unique innovation systems based on tacit knowledge. Against the background of the increasing spread of the KBE, Japanese corporations have widened their lead in the automobile industry, where a modular development and production system is less suitable and an integral development and production system is more effective. In a modular system, a number of independent suppliers autonomously develop and produce subsystems according to pre-set standards, and the final product is assembled based on these standards. In an integral development and production system, on the other hand, suppliers with established relationships with an assembler work closely to coordinate development and production (See Fujimoto [2003] for distinction between modular and integral production systems). The recent shift of demand in the electronics industry from ICT equipment for corporate use to digital consumer electronics such as digital cameras and flat-panel televisions has strengthened the competitive position of vertically integrated Japanese electronics companies. They claim that they can develop and produce products more quickly, particularly by developing and producing custom-designed key devices, which are the means to differentiate their products. It is increasingly clear that a KBE requires both types of development and production systems.

Korea's innovation system is also undergoing major reform in the wake of the 1997 financial crisis. The financial crisis revealed that the traditional system, characterized by heavy intervention from the central government and the dominance of *chaebols* or large conglomerates in capital-intensive projects, could no longer function. Government intervention was drastically curtailed and as Korean firms became more profit-conscious and less expansionist, *chaebols* streamlined their R&D operations and spun off unprofitable businesses, creating many technology-based SMEs. Moreover, SMEs have developed greater independence from the *chaebols* and they increasingly form strategic alliances (Suh, 2003). Thus, Korea seems to have started to create more functional innovation systems.

In contrast to Korean firms, Taiwanese firms have specialized in OEM production and have not developed product development capabilities sufficiently. The Hsinchu Science-based Industrial Park (HSIP), which was established by the central government in 1980, became a successful ICT cluster, consisting of the Industrial Technology

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[2] Table 4–3–8 in the *White Paper on International Trade*, Year 2002.

Research Institute (ITRI), the national R&D laboratory, and two national universities and ICT firms including many start-up firms. The ITRI spun off a number of successful ICT firms, including two semiconductor foundries, United Microelectronics Corporation (UMC) and Taiwan Semiconductor Manufacturing Corporation (TSMC). However, most R&D conducted in the HSIP is applied research on production processes and is not really high-tech, and the ICT firms established in HSIP are mostly OEM manufacturers, which do not possess product development capabilities (Wang, 2004).

Mainland China is also beginning to develop its own innovation systems. A large-scale competitive innovation center seems to be emerging in Beijing. The Zhongguanchun area in Beijing already has a concentration of software and R&D firms linked with the capital's high caliber universities and research institutions. Firms in this area could connect with the versatile industrial concentrations in southern China and near Shanghai to form innovation-oriented, domestic production networks. Universities have not played a major role in innovation systems in Japan, Korea, and Taiwan, other than to supply well-educated engineers to private firms. China's innovation systems have a superior quality in some respects even though they remain less developed than those in Japan and NIEs, chiefly because of the dearth of modern corporations. China's universities and research organizations have become extremely commercialized and the linkages between universities and the industrial sector are tight. In fact, many research institutes and universities have established their own technology firms such as Legend and Founder. Such linkages are well suited to innovation systems under a KBE. Chinese universities have played an active role in local industrial clusters not only in Beijing but also in other cities such as Shanghai and Tianjing, in contrast with Japanese universities, which do not compete with each other and have played only a limited role in industrial development.

Disruption of the Flying Geese Pattern in East Asia

The development pattern of East Asia has long been characterized by the image of an orderly flock of flying geese with Japan in the lead, followed by the Asian NIEs, and then the less developed economies in the region. Mature industries moved from Japan to the NIEs through investments and technology transfer, and from Japan and the NIEs to the other economies in the region, with a beneficial impact on economic growth. Overall, it is becoming apparent that in the transition to a KBE, the flying geese pattern is being disrupted and a new economic geography is emerging in East Asia. The alternative: each economy faces the risk of knowledge divides and the opportunity for leapfrogging depending on how well it positions itself in the five key elements of a KBE.

In East Asia, the NIEs have begun to outperform Japan in the PC industry, in parts of the semiconductor industry, and in some service industries such as finance and distribution. Their quicker adaptation to the organizational models suitable to the KBE played a major part in the order change. Also, China has been rapidly developing industrial clusters in the ICT equipment area and now poses a serious competitive threat not only to the ASEAN economies but also to the NIEs and even to Japan in the high-technology area. But there is also a risk that some economies may fall further behind. The later-developing countries in ASEAN including Malaysia, Thailand, the Philippines, and Indonesia, seem to be finding it difficult to adapt to a KBE. Thus, it seems quite possible that China will leapfrog ahead of the ASEAN economies.

In general, the level of industrial development is still much lower in China than in Japan, but several conditions in China are more favorable to future development than those in Japan. One factor is the potential of China's huge, dynamic market, which attracts domestic and foreign investment with the prospect of benefiting from economies of scale. FDI is likely to bring in modern technology because of fierce competition among domestic and foreign firms. Other factors are the regional diversity and the fierce inter-regional competition in China, which can create more liberal, efficient investment conditions and greater innovative efficiency than the centralized innovation and production systems in Japan. The combination of these factors should contribute to deeper industrial clusters, which will compete with each other.

On the other hand, a number of other conditions in China stand in the way of its future development, at least in the short run. The level of higher education and the number and quality of scientists and engineers in China are not sufficient to create a comparative advantage in high-tech areas for the foreseeable future. Moreover, if it is to support high-tech industrial development, China needs to improve its protection of intellectual property rights and its financial system. China's financial system, including its stock markets, are designed and operated to support the stagnant state-owned enterprises (SOE) sector, and provides very little support to the dynamic ICT sector that is led by private firms. In addition, the lack of an efficient nationwide transportation system may hinder the spread of production networks to inland areas. However, China's accession to the WTO is expected to bring significant improvement in these conditions in due time. Moreover, even if high-tech activities remain confined to a few locations, as we have mentioned, the sheer size of China's economy means that the further development of even these few concentrations will probably have significant repercussions for the rest of the world, and particularly for East Asia.

East Asia's Agenda for Transforming to a KBE

Agenda for the KBE

To transform and adapt to the emerging KBE, the East Asian economies must work on each of the five supporting components by:

- developing the ICT sector, including ICT-related service industries and ICT infrastructure, as a platform for the KBE
- adapting to international production networks
- strengthening innovation systems
- upgrading human resources
- restructuring industries and corporations

Although the list of agenda items is applicable to all East Asian economies, the priority that each economy places on individual items depends on its stage of development. For example, later-developing economies tend to emphasize measures to help their economies adapt to and connect with international production networks: improving the telecommunications infrastructure, and building an ICT-trained workforce, and developing industrial clusters. The top priority in the NIEs, on the other hand, is generally the same as in the advanced economies—enhancing innovation activities.

One unique and critical issue for the NIEs, however, is how to transform from catch-up systems that emphasize transfer of knowledge from advanced economies into systems that emphasize the indigenous creation of knowledge. If the NIEs are to take advantage of the paradigm-shifting ICT revolution to leapfrog the advanced economies by adapting more promptly to a KBE they will need more than simple ICT strategies. They should devise a comprehensive approach that emphasizes strengthening innovation systems by fostering more creative human resources. Moreover, the NIEs as well as Japan, need to transform their economies from manufacturing-oriented ones to more service-oriented ones.

Another important aspect of the strategy of East Asian economies in relation with the KBE is international linkages. It is extremely important for them to increase their linkages with the two giant economies in the Pacific—the U.S. and China. Linking with Japan is becoming less important, but it remains a factor. Revitalization of Japan will have a major impact on the future geography of East Asia under the KBE.

Developing ICT Infrastructure

There is wide disparity among East Asian economies in ICT infrastructure. The NIEs have reasonably well developed telecommunications systems and indeed, Korea, Hong Kong, and Singapore are well ahead of Japan in broadband telecommunications infrastructure, which is crucial for the development of e-commerce. In other East Asian economies, however, low penetration rates of fixed telephone lines and of mobile phones have retarded the diffusion of the Internet, and in ASEAN and China the state of the infrastructure is a serious problem (Table 2).

The inadequacy of basic telecommunication infrastructure in Indonesia, the Philippines, and Thailand has constrained their use of the Internet and development of Internet-related businesses. Providing adequate land-based telecommunications service is particularly difficult given the geography of Indonesia and the Philippines and alternative telecommunications systems and local models of Internet access have emerged in both economies. The government of Indonesia pioneered in using satellites to provide domestic telecommunications for the archipelago. Providing access to telephone and Internet service has become a rapidly growing business for small- and medium-sized Indonesian entrepreneurs, and the 2,000 to 2,500 Internet kiosks in

Table 2: ICT indicators

	Main Traffic Lines per 100 People		Cellular Mobile Phone Subscribers per 100 people	Internet Users per 100 People	PC Users per 100 People
	1997	2002	2002	2002	2002
Korea	45.3	48.9	68.0	55.2	55.6
Hong Kong	56.2	56.5	94.3	43.0	42.2
Taiwan	50.0	58.2	106.2	38.1	39.5
Singapore	44.4	46.3	79.6	50.4	62.2
Japan	52.1	55.8	63.7	44.9	38.2
Malaysia	19.5	19.0	37.7	32.0	14.7
China	5.6	16.7	16.1	4.6	2.8
Thailand	8.2	10.5	26.0	7.8	4.0
Philippines	2.9	4.2	19.1	4.4	2.8
Indonesia	2.5	3.7	5.5	3.8	1.2
U.S.	63.6	64.6	48.8	55.1	65.9
France	57.9	56.9	64.7	31.4	34.7
Germany	55.1	65.1	72.8	41.2	43.1
U.K.	54.0	59.1	84.1	42.3	40.6

Source: International Telecommunication Union.

Indonesia are the most of any economy in the Asia Pacific region (Hutabarat, 2001). Filipinos turned to Internet cafes and mobile telephones as a way around the deficiencies of the telecommunications infrastructure.

East Asia's divergence from the flying geese pattern is nowhere more evident than in the development of Internet infrastructure. On the one hand, the NIEs are pulling ahead of the long-standing leader, Japan, and on the other hand, the gap between the leaders and the other developing economies seems to be widening. South Korea is the global leader in broadband Internet connections. Japan was behind leading OECD countries until recently, when private competition in a deregulatory environment has pushed it ahead. According to the International Trade Union (ITU), Japan had the lowest overall broadband communication cost in the world in 2002, while with a broadband saturation rate of 7.1%, Japan was behind South Korea at 21.3%, Hong Kong at 14.9%, and Canada at 11.2%, but ahead of the U.S. at 6.9%.

The reversal in the order of development between Japan and the NIEs and the widening gap between the NIEs and the other developing economies in the region reflect differences among the economies in the extent of deregulation in the sector. Inadequate competition due to over-regulation of telecommunications has undermined the building of an infrastructure platform in some economies. In Thailand, the lack of competition among Internet connection firms has kept Internet access charges at high levels (Tangkitvanich, 2001).

Thus, facilitating competition in the telecommunications sector is a major agenda item for East Asian economies, and the governments have been increasing their efforts in this area. The ASEAN economies acknowledged with the e-ASEAN Framework Agreement the need to adopt regulatory and legislative frameworks for e-commerce (Hutabarat, 2001). Next, it is critical to foster an environment conducive to the development of e-commerce.

Adapting to International Production Networks

The major positive impact of a KBE on the heavily manufacturing-oriented East Asian economies thus far, has been to integrate them into international production networks, particularly for ICT equipment, and the region's economies have been striving to deepen their access to international production networks. They have developed physical infrastructure, such as roads, ports, and telecommunication facilities, and smoothed customs procedures to improve the cost and efficiency of transportation. Late-comer economies, such as Vietnam and Myanmar, however, still must undertake many improvements in infrastructure before they are positioned to serve and benefit from international linkages. Moreover, the development of logistics industry is recognized as a crucial factor for not only enhancing production networks but also for the development of domestic markets in countries such as China.

Along with the higher volume of international transactions in goods and services that results from the smoother networking has also come a higher volume of cross-border payments and settlements. The international payments infrastructure needs to be improved to cope with this new aspect of the global economy. The East Asia region would become even more attractive as an international network node if participants could be confident of smooth settlement of the financial aspect of transactions. In particular, East Asian economies have much to gain from finding ways to connect their real-time gross settlement systems of individual economies with regional networks (Chen and Ng, 2001).

The FDI-fed agglomerations of industry, such as the ones in Singapore-Malaysia, southern China, and Thailand, have been the foremost source of the region's high performance in international production networks so far. Fostering existing industry clusters and creating new ones, therefore, is an important way to strengthen East Asia's connections to international production networks. Recognizing the importance of industrial agglomeration, the Singapore government is seeking to develop a new cluster in the ICT equipment industry. In its Industry 21 Master Plan, the government selected the electronics industry as the key cluster to make Singapore a world premier electronics hub by attracting leading global firms with the most advanced product design, manufacturing, and application software capabilities (Chia and Lim, 2001).

Promoting ICT-Related Service Industries

While East Asia has become the world's top supplier of ICT equipment, it is relatively weak in the service side of the ICT industry. This prevents East Asian economies from fully capturing the benefits of a KBE. Another compelling reason for these economies to develop ICT-related service sectors is that it would make their macro-economies more stable by diversifying their industrial structures. The comparatively heavy dependence of the region's economies on external demand for ICT hardware has made them relatively volatile, as evidenced by their rapid recovery from the Asian economic crisis followed by their sharp plunge in the wake of the global ICT bust. Moreover, difficulties in competing with China in the manufacturing sector have compelled many East Asian economies to seek opportunities in the service sector.

The skewing of East Asia's industrial structure toward manufacturing to the neglect of services was, to some extent, a natural consequence of the prevailing Japanese model of industrial development in the region and the flow of FDI from Japan and the NIEs. Korea and Taiwan, which followed the Japanese model closely, are comparatively weak in the service sector including ICT-related services. Only 7% ($4.1 billion) of Korea's total ICT output in 1999 was software and other computer-related services, and 70% of that was produced by foreign firms (Kim, 2001). Similarly, in 1999, the $3 billion of software and other ICT services produced by Taiwan was less than one-tenth of its worldwide production of hardware ($39.9 billion). Korea and Taiwan are much weaker in the software and other ICT service industries than are advanced countries including Japan and then Singapore, which functions as an ICT hub.

As the ICT revolution generates a growing emphasis on service-type activities, the East Asian economies are being forced to readjust their underlying industrial strategy and orientation. From 1998 to 1999, software and IT service output in Taiwan grew at a rate of 35% per year, almost twice the 18% per year rate of growth of hardware output (Chen and Liu, 2001). The sector is already the fastest growing part of the ICT industry in Korea. Taiwan recognizes that the future growth fields include the OEM production of mobile phones, telecommunication and broadband networks, software, optical electronics, and services are increasingly important inputs in these fields. Korea also expects that the software and computer-related service sector, which has been growing at twice the rate of ICT equipment and services, will become an even more important part of the economy, especially as new technologies emerge in several fields (Kim, 2001).

Some East Asian economies strive to form ICT service-oriented industrial clusters as well as to develop their innovation systems by developing regulatory and physical infrastructure to attract domestic and foreign investment. In order to stimulate a strategic cluster of firms specialized in Internet and multimedia applications, the

Hong Kong government joined with a private firm to provide the needed infrastructure in the "Cyberport Project," which when completed in late 2004 will make available 100,000 square meters of intelligent office space and other facilities for high-tech and media companies (Chen and Ng, 2001). Malaysia's Multi-Media Super Corridor project is intended to attract leading ICT companies focused on multimedia and communications products, solutions, services, and R&D, and it now houses over 60 world-class international companies.

Some East Asian economies also try to attract the off-shoring of ICT services. The Philippines has high expectations for its software industry as well as for ICT-related administrative processing activities, based on Filipinos' fluency in English and on the country's long-standing commercial relationship with the U.S. With wages only 15% what they are in the U.S., the Philippines is hoping that U.S. firms will outsource to local firms customer support services and back office services in finance, accounting and health care. Such services are suited to Filipinos' relatively low-level IT skills and have a large effect on non-ICT white-collar employment. The Philippine Economic Zone Authority (PEZA) has accredited 200 hectares in nine information technology parks, which provide infrastructure, support facilities, and amenities to attract IT firms and promote the development and export of software products and services (Vera and Lee, 2001). The IT-enabled services in PEZA grew 91% per annum from 1995 to 2001 and employ 7,000 people and generated exports over $1 billion in 2001 (Antonio and Padojinog, 2003).

Two factors, in addition to the legacy of the past development model, contribute to the persisting weakness of some East Asian economies in ICT services. One is the happenstance of linguistic heritage. With approximately 80% of Internet transactions completed in English, non-English speaking Asian economies are at a disadvantage in selling content and application software for the Internet market. On the other hand, India and the Philippines, which have relatively strong English language ability, have been able to enjoy global economies of scale in software and Internet-related businesses. More than the limitations of language, however, the inadequacies of the region's innovation systems have contributed to the underdevelopment of East Asia's IT-related services sector.

Strengthening the Innovation System

The weakness of innovation systems in East Asia is not only a major reason for the underdevelopment of the service sector in the region but also constitutes a major constraint on the region's progress towards a KBE. Even the region's NIEs lag well behind the advanced economies in technological level. In 2001, experts judged that the ICT industry in Korea stood at 60% to 70% the level of its counterparts in advanced countries and two to three years behind them, except in the narrow areas of semiconductor memory, TFT-LCD, and CDMA mobile phone standards where Korea had the lead (Kim, 2001). Taiwan's technology trade balance still shows a large deficit. In recognition of these problems, East Asian NIEs share the view that their corporations need to expand innovation activities, establish their own brands, and increase the share of service business in order to increase value added. There are large gaps in R&D capabilities between advanced economies and the NIEs and between the NIEs and other developing economies (Table 3).

In part, the weak innovation systems reflect the predominant catch-up model by which East Asian economies concentrated on manufacturing products that were developed in advanced economies and relied on advanced economies to transfer

Table 3: Indicators of R&D capacity

	Enrollment Ratio in Tertiary Education %	R&D Expenditure as % of GDP	Number of Scientists and Engineers per Million Population
	1993	1998	1985–1995
China	4	0.7	350
India	6	0.7	149
Malaysia	25	0.4	500
Korea	48	2.7	2,636
Singapore	38	1.8	2,728
Japan	30	2.9	6,309
U.S.	81	2.5	3,732

Enrollment ratio is the number of students enrolled divided by the population in the 22 to 24 years age group. Source: *The World Competitiveness Yearbook*, 1997 and 1999 to 2000.

technology. Having specialized in OEM-production under contract to foreign companies, many firms in the NIEs, unlike ones in Japan, lack experience in product development. They are weak in basic research skills and experience, as they have mainly concentrated on applying technologies that were developed in advanced economies. However, Japan, Taiwan, and South Korea have gradually strengthened their innovation systems as previously mentioned.

Advanced economies now generally prefer a cluster approach to industrial policy over a sector approach in science, technology, and innovation policy in part after recognizing that geographically concentrating technologically related sectors tends to stimulate innovation (Dahlman and Andersson, 2000). East Asian economies appear to be moving in a similar policy direction for similar reasons. For East Asian economies—the NIEs, in particular—strengthening weak innovation systems is a major challenge in their transition from catch-up industrial economies to KBEs. Encouraging clustering is one of many policies that government may adopt to try to raise an economy's innovative capacity. Experience has shown that when government intervenes too much, it tends to stifle the creativity that grows out of voluntary collaboration among individuals and organizations. Thus, government support of national innovation systems should be indirect, such as by creating an overall environment that is conducive to innovation.

East Asian economies that have traditionally relied on a top-down, interventionist approach to encourage and direct innovation are being forced to shift to a more open, cooperative, bottom-up paradigm. For example, in a newly adopted policy framework, the Taiwan government has been promoting cooperation among industry, public research institutes, and universities. Furthermore, in its 2000 Long-term Vision for Science and Technology Development, the Korean government sought to change (Dahlman and Andersson, 2000):

- from a government-led, development-oriented, and domestically networked R&D system to a private-led, dissemination-oriented, and globally networked system;
- from a supply expansion policy to an efficient utilization policy; and

- from policies to cope with short-term demands to long-term policies that will lead to the creation of new markets.

Upgrading Human Resources

Demand for the human resources that are critical in the transformation to a KBE, workers that embody knowledge, is increasing rapidly in East Asia, as elsewhere in the world, but such workers are in relatively short supply in this region. East Asian economies are well endowed with high quality unskilled workers to support the manufacturing sector. Moreover, East Asia has a relatively large pool of educated workers, but they are concentrated in Japan and NIEs. East Asian economies and are not particularly rich in the kinds of human resources that support the ICT sector and infrastructure or the innovation activities that are crucial for KBEs.

Indeed, a shortage of ICT workers has become a bottleneck for the development of the ICT sector and infrastructure in East Asia. The problem is especially serious in late-comer developing economies such as Thailand and Indonesia, and it may possibly create digital divides or keep them from being able to support the ICT sector and infrastructure that they require in order to adapt to a KBE. In contrast, the Philippines has steadily increased the number of students in IT-related fields and annually results in 40,000 technology and engineering graduates, although their quality is not sufficiently high (Vera and Lee, 2001). The Philippines, along with India and Singapore, is in a more advantageous position than non–English-speaking countries such as Thailand because English language capability facilitates communication between local ICT workers and foreign clients or employers (Tangkitvanich, 2001).

Raising the quality and quantity of higher education is necessary not only to meet the shortage of ICT workers but also to provide the region's economies with a work-force that can create and apply new knowledge. East Asian economies successfully expanded primary and secondary education capacity to supply the workers demanded for their rapid industrialization, but higher education is insufficient in Southeast Asian countries. Northeast Asia has a relatively large pool of educated workers which is on a par with those in Europe and North America, but the pool of such workers in Southeast Asia is rather small (Table 4). University enrollment ratios in Japan and the NIEs are comparable to those of European and North American countries. China's university enrollment ratio is still low, but the absolute number of university graduates is large because of the size of its population. The number of university students is growing rapidly because of the quick rise in the enrollment ratio. Since the relatively large pool of highly educated workers to serve as a basis for a KBE in Northeast Asia has not been matched by the size of the economy, there is a scope for economic expansion.

However, because these education systems typically emphasize rote memorization, they have not encouraged creativity. Moreover, the comparative neglect of higher education has constrained the innovation capability of these economies. The quantity of R&D workers in Korea is sufficient, but their quality is still inadequate (Dahlman and Andersson, 2000). Korea's education and training programs are targeted at supplying production workers and not at the graduation of highly skilled software workers that are in high demand (Kim).

To ensure the availability of adequate human resources to realize the transition to a KBE, the region must adopt a new model of education and training that emphasizes quality, creativity, life-long learning, and total human resource development. In fact, East Asian economies have increased their efforts to upgrade the overall quality of their human resources.

Table 4: First university degrees and science and engineering degrees by region: 1999 or most recent year

Region/Location	All First University Degrees	% of 24-year-Old Population	Total Science & Engineering	% of 24-Year-Old Population 1975	% of 24-Year-Old Population 1999
Total, all regions(a)	6,781,885		2,649,460		
Northeast Asia	1,276,544		804,747		
Japan	532,436	30.1	350,535	4.7	7.7
China	440,935	2.2	322,769	0.4	1.3
Hong Kong	11,362	12.2	5,425	2.1	4.5
South Korea	204,390	24.7	91,296	2.1	9.0
Taiwan	87,421	22.7	34,722	2.6	7.7
Southeast Asia 4	279,712		138,622		
Indonesia	144,314	3.6	97,095	N.A.	0.8
Malaysia	10,511	3.2	4,760	N.A.	0.8
Singapore	5,599	11.5	5,599	N.A.	7.8
Thailand	119,288	9.8	31,168	N.A.	1.7
India	750,000	4.8	176,036	N.A.	1.1
Europe(a)	2,118,553	21.5	799,921		6.1
European Union	1,908,967	22.4	439,171	N.A.	6.5
North America	1,514,627	25.9	481,544		4.6
United States	1,199,579	35.3	384,674	4.0	6.0

N.A. = not available. For countries with both short and long degrees, the ratios are calculated with short and long degrees as the numerator. (a) Includes only those locations for which relatively recent data are available. Source: Science and Engineering Indicators 2002, National Science Foundations.

Securing an adequate supply of ICT workers is the top priority. The Singapore government has systematically directed its human resource development plan at recruiting ICT service specialists and electronically delivering education and training. As early as 1985 its "National IT Plan" called for the development of ICT specialists and the "IT 2000" plan of 1992 also called for the acceleration of the development of IT-related human resources. Moreover, the "Infocomm 21 Master Plan" of 2001 called for improving the environment for developing an Internet-adept labor force by providing world-class education, training, and recruiting (Chia and Lim, 2001).

Upgrading human resources is also the major prescription against the emergence of digital divides. Late-comer developing economies in East Asia have high expectations that official development assistance (ODA) can increase the availability of education and training in ICT, and they seek the cooperation of advanced economies to this end. One desirable characteristic for such training programs is that they have a built-in multiplier mechanism such that each wave of participants in turn trains a succeeding wave (Wan and Yusof, 2001).

Since it takes time to develop domestic manpower through training and education, some East Asian economies are resorting to importing knowledge workers as an immediate solution to the shortage. Singapore subsidizes housing costs and offers tax deductions to employers that recruit overseas talents. Similarly, Malaysia is flexible about granting work permits to help corporations related to the Multimedia Super Corridor recruit knowledge workers from overseas. Hong Kong has loosened restrictions on the immigration of scientists and engineers from the Mainland. To overcome an anticipated shortage of 26,000 skilled workers in software and e-commerce in May 2000, Korea liberalized its immigration policy by offering foreign ICT professionals a "gold card" visa that allows them to work in the country for up to 10 years (Korean Herald, 2000). Japan is also moving to relax visa requirements for ICT workers from developing economies in East and South Asia.

A more basic, long-term solution to upgrading human resources is to reform the education system. The agenda issues in this regard include expanding the supply of creative human resources that support a KBE and encouraging lifelong learning opportunities to ensure continuous renewal of knowledge. Singapore and Hong Kong are at the forefront of the region's economies for having revamped their education systems to emphasize the process of learning rather than simple memorization.

Facilitating Industrial and Corporate Restructuring

East Asian economies have focused their efforts to adapt their industrial structures to a KBE on building up the ICT-related service sector to balance the overdependence on hardware production. While private corporate efforts will mainly direct the shift toward the ICT and service sectors, government policies that strengthen innovation systems and improve efficiency in goods, labor, and capital markets are also essential.

As industrial restructuring proceeds and the KBE becomes more pervasive around the world, an economy's international competitiveness will determine whether it is organized to utilize ICT efficiently. In particular, competitiveness will depend on management's ability to use ICT effectively, and corporations will need to reorganize to accommodate ICT as an essential management tool. For East Asia, the main challenges with respect to corporate organization are to restructure existing corporate organizations, to promote SMEs benefiting from network externalities, and to create pathways for new business formation. In Taiwan, locally owned firms, mainly SMEs, are already organized in networks, and together with the accumulation of production and marketing capability in strategic industries are expected to propel future industrial development (Chen and Liu, 2001). On the other hand, Korea needs to reorganize the *chaebols* into non-vertical network organizations to overcome the problems caused by their oligopoly control and to reinvigorate the economy. In this respect, the financial crisis of 1997 had a profound impact on the *chaebols,* leading them to de-integrate their corporate organizations and to establish more equal and independent relationships with SMEs (Suh, 2003).

For East Asia, where local corporate organizations are, generally speaking, not highly developed, new business start-ups should be seen not only as adding to the population of corporations, but also as a means of introducing more efficient forms of corporate organization. Encouraging start-ups, particularly in the ICT sector, has become a major policy goal. Many East Asian economies have adopted measures to promote venture capital and emerging stock markets. Korea's KOSDAQ market, introduced in 1996, took off after the Asian financial crisis (Shin, 2002). In 1999, Hong Kong opened a special board, the growth enterprise market (GEM) with more liberal listing requirements. Recently, Singapore shifted emphasis from encouraging existing domestic corporations to enter and grow in the high-tech manufacturing sector to promoting start-up activities in such areas as software, the Internet, biotechnology, and mobile communication. As a result of funds offered through the "Technopreneurship 21" Program, Singapore experienced a record number of start-ups from 1998 to 2000 (Chia and Lim, 2001).

Need for a Comprehensive and Indirect Policy Framework

Governments should adopt comprehensive policies toward the KBE, not just narrowly defined ICT policies. They should address, for example, the supporting elements of a KBE. In fact, the East Asian NIEs clearly recognize the need for a comprehensive approach. For example, the Singapore government's Infocomm 21 is a blueprint for making Singapore a regional center of the digital economy by integrating the functions of an ICT hub with existing distribution and finance hub functions. The government is coordinating the implementation of its plan to develop Singapore into an ICT hub with other related policies regarding technology, inward FDI, manpower, and consumer education (Chia and Lim, 2001). Likewise, the Korean government is also treating ICT policy as part of a broad KBE policy. Its Comprehensive Plan for Korea's Transition to a KBE identified "thorough nationwide informatization" as one of five core program areas, which also included enhancing the innovation system, promoting knowledge industries, revamping human resource development, and developing a safety net (Woo, 2000).

In such a framework, the primary role for government is increasingly seen as an indirect one, that is, to establish a policy framework that favors strengthening the economy's competitive and comparative advantages. For example, Korea is realizing the undesirability of its earlier direct interventionist policies. Indeed, government fiscal incentives to nurture start-up firms exacerbated the consequences of the meltdown of the ICT stock boom (Kim, 2001).

The governments of the later-developing economies of Southeast Asia have not yet adopted broad programs to guide them into the era of the KBE. So far, they have tended to focus policies on providing ICT infrastructure, such as the Nusantara-21 Project in Indonesia, the MMSC in Malaysia, and the Three Golden Projects in China.

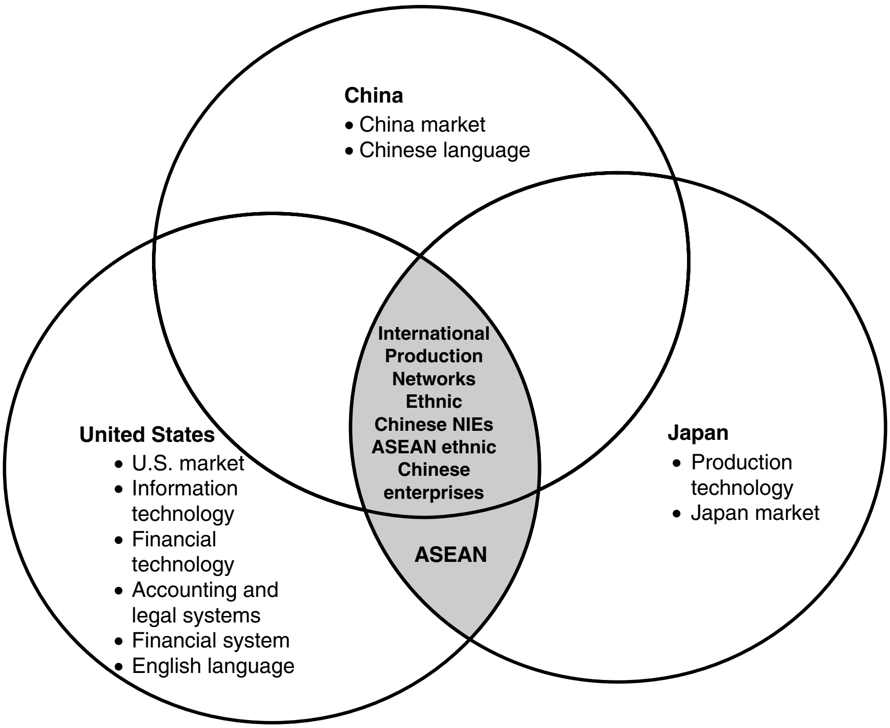
Positioning Strategically Toward the U.S. and China

The world-wide transition to the KBE is leading the East Asian economies to adjust their international strategies, which once focused on Japan as a source of production technology and on the U.S., Japan, and Europe as export markets. Now Japan's impact on the other economies of the East Asian region is shrinking, and how each economy positions itself with respect to the U.S. and China is becoming important (Figure 1). Korea, for one, seeks a spot in the middle, in-between the global value chains that connect high-tech development in the U.S. and the large and attractive domestic markets of China (Kim, 2001).

Japan's impact on the other East Asian economies has declined since the beginning of the 1990s with the long slump in its domestic economy, its lag in implementing deregulatory measures, and its failure to adapt to ICT. However, Japan still plays a major role in East Asia's economic development as a supplier of key components, materials, and machinery. Japan's trade deficit against China is offset by its trade surplus against Korea, Taiwan, and Hong Kong, which export to China by relying heavily on key components, materials, and machinery imported from Japan. On the other hand, the U.S. will continue to be critical to the East Asian economies for a long time as the major source of innovation in areas such as ICT, biotechnology, and finance, as the model for legal, accounting, and financial systems, and as a large market. China is emerging as a large market and as the largest manufacturing base in international production networks. The influence of the U.S. and China also arises

Figure 1

Image of international externalities in East Asia



because the English and Chinese languages are international standards that carry positive externalities for the production of many ICT goods and services. In this environment, the Asian NIEs that have large populations of ethnic Chinese—that is, Taiwan, Hong Kong, and Singapore—and ASEAN enterprises that are owned and managed by overseas Chinese are positioned at the convergence of the different international externalities and serve as hubs for international business and technology transfer.

Even the NIEs will depend on knowledge transfer from the advanced economies into the future, no matter how successfully they upgrade their indigenous innovation systems. One objective of the international strategy of East Asian economies in the KBE should be to link with the innovation systems in advanced economies. Linkage with the U.S., the largest and most advanced knowledge pool in the world, is by far the highest priority. Linkages can take a variety of forms such as corporate relations in international production networks, sending students to advanced economies, networking with universities or research institutions in advanced economies, and soliciting the locating of international business schools. Taiwan's links with the U.S., and with Silicon Valley in particular, are essential to the existence of its PC and IC industries. Most of Taiwan's PC output is OEM production for American brand firms, and more than one-half of the capacity of Taiwan's IC foundries was devoted to U.S. client firms

(Chen and Liu, 2001). This trans-Pacific industrial connection is supported by the ethnic and social ties between Taiwanese and other ethnic Chinese residents in the U.S. and in Taiwan.

The Asian NIEs are better than Japan in linguistic ability and overseas educational experience, areas which can significantly help an economy's efforts to link with external innovation systems. Their students score higher in English language proficiency and a larger percentage of their students study in the U.S. (Table 5). China is also reported to be experiencing a craze for learning English.

The appropriate positioning of the East Asian economies with respect to China is evolving along with China's economic development and the global transition to a KBE. How to cultivate the Chinese market and how to utilize the vast pool of human resources in China have become major strategic issues for firms not only in East Asia but also worldwide. Taiwanese firms have been particularly successful in utilizing the Chinese labor force by investing massively in southern China. Indeed, Taiwan is becoming concerned about the consequences of this success on its domestic industrial base. Despite the threat of hollowing out, however, Taiwan seems to have no option but to continue to gradually liberalize its high-tech investment in China. Proximity may give Korea entree to China's vast market, especially in mid- to high-value added areas that demand quality and accumulation of industrial skills, provided that Korea upgrades its economy so that it is not competing with China to supply the world with low-cost, labor-intensive goods (Woo, 2001).

During the 1990s China developed several local concentrations of manufacturing industries and related supporting industries and emerged as a leading base for labor-intensive production activities. Now, most ASEAN economies compete with China in labor-intensive industries and China is an increasing threat because of its large supply of labor, both unskilled workers and knowledge workers, and its efficient industrial clusters. The appropriate responses for ASEAN lie in such strategies as acceleration of AFTA to create a larger internal market, acceleration of domestic deregulation, and the upgrading of human resources.

Table 5: Linkages with the U.S. innovation system

	Average Score on TOEFL July 1998–June 1999	Number of Students in the United States per 1,000 Population
Japan	501	0.37
Korea	535	0.94
Taiwan	510	1.44
Hong Kong	524	1.53
Singapore	—	1.26
Malaysia	536	0.71
Thailand	512	0.25
Indonesia	545	0.07
Philippines	584	0.04
China	562	0.04
Indonesia	583	0.04

TOEFL is the Test of English as a Foreign Language. Source: Economic Planning Agency of Japan, *Asian Economy,* 2000, and Ministry of Home Affairs, *World Statistics,* 1999.

Japan's Responses to the KBE

Competitive Challenges to Japanese Firms

The Japanese economy is behind in making the transition to the KBE. Among advanced economies, the U.S., Australia, Denmark, Ireland, Holland, and Norway have achieved high economic performance by smoothly adapting to a KBE while France, Germany, Italy, Sweden, and Japan have performed poorly because of their delayed adjustment (OECD, 2000). Japan's predicament is due to its failure to adequately prepare the five supporting elements of a KBE. Until recently, the inadequacies of Japan's ICT infrastructure and its slow deregulation of telecommunications impeded Internet penetration, but since 2001 the rapid spread of broadband access through DSL (digital subscriber line) has improved this situation significantly. Japan's fundamental problems now come mainly from its sluggish accommodation to the transformation of international production, and innovation systems under the emerging KBE, and from the slow progress in organizational restructuring. In the new economic geography of the KBE, Japanese corporations were squeezed between the innovation-oriented American industries and the increasingly competitive alliances of OEM producers from the East Asian NIEs, many of them with manufacturing facilities in China.

Japanese firms have been slow to participate and develop their own international production networks of the kind that have emerged in the KBE. These networks revolve around the ICT industry, which utilize modular production technologies. In such industries, independent firms produce individual components, which are assembled by networked organizations that are linked through technology standards such as operating systems and communications protocols. And they rely heavily on business-to-business transactions among the network nodes. These newer networks are very different from the ones that developed around integral production technologies, in which Japanese manufacturers excel. Such traditional production networks consisted of a group of related companies that produced many non-standardized components and assembled them in a closely coordinated manner.

In many ways, the characteristics that made Japanese corporations successful in the heyday of integral production technologies were not suited to modular technologies and the international production networks of the KBE. Japanese corporations' primary strength has been in their ability to accumulate knowledge internally within the organization and related corporations and to collaborate efficiently. They tend to use unique and non-standard production processes and components and they are extremely quality-oriented. These traits are opposite to the requirements of modular production technologies for open networks. As a result they were not driven to take advantage of the supply of low-cost labor in China when it became available. Japanese firms have been slow to adopt business-to-business transactions in East Asia (Hara, Masuyama, and Teramura, 2001). The fundamental reason for the difficulty of Japanese firms in adopting modular production technology and the KBE, however, must be their slowness to change to flatter, network-type organizational structures. On top of this, public concern about maintaining employment levels at home made it difficult for Japanese firms to move manufacturing processes to China. Moreover, Japanese-style management did not work as well in China, at least in labor-intensive industries, as Taiwanese and Chinese management practices, which involve tighter discipline and larger economic incentives.

Because of delayed restructuring and reorganizing to more horizontal organizational structures, Japanese industry is feeling strong competitive pressure from Taiwanese and other Asian firms that have adopted new business models suitable for networked organizations, such as electronic manufacturing service (EMS) firms and IC foundries. Japanese firms are particularly threatened by Taiwanese firms that have taken on a central role as organizers of the manufacturing process in U.S. led production networks and have aggressively utilized China's low-wage labor supply. Moreover, Japanese firms have lost ground in innovation activities, which are the key element of the KBE for advanced economies. They lag behind U.S. firms in frontier technology areas of ICT and biotechnology. The lack of innovation capabilities has also constrained Japanese firms from evolving into broadly defined ICT service areas such as financial services.

Japan's innovation system has fallen behind because Japan does not have its own internationally competitive universities, or dynamic, high-tech industrial clusters such as Silicon Valley and Hsinchu Science Park, or close links with foreign innovation centers such as Silicon Valley. According to the OECD, collaboration between universities and firms is strong in advanced economies that are performing well in the transition to the KBE, such as Canada, Denmark, the U.K., and the U.S., but it is weak in Germany and Korea as well as in Japan (OECD, 2000). Language and culture also constrain Japanese firms in accessing foreign knowledge, which has become essential in the age of the KBE. For their part, Japanese firms' slow reorganization to a network structure hindered their performance in innovation.

Japan's declining competitiveness as a location for corporate activity has also undermined its participation in international production networks and innovation capabilities. First of all, Japan lags behind the U.S. and the East Asian NIEs in many policy areas such as the deregulation of information and telecommunications infrastructure and in areas related to innovation systems such as the caliber of universities, industry-university cooperation, human resource development and import, and international linkages. Moreover, labor market immobility and inadequate functioning of corporate governance in Japan slowed the overall restructuring of industries and corporations to accommodate changing production networks and innovation systems.

At the same time, Japanese corporations still have certain clear competitive advantages over those in the Asian NIEs and the advanced economies of the West. Japan is located much closer to China than the other advanced economies are and thus it is better situated to take advantage of China's vast supply of human resources and dynamic market. Moreover, compared to the Asian NIEs, Japan has a much higher level of innovation capability and a much larger pool of knowledge workers, which are critical for a KBE. In addition, Japan has by far the most developed corporate organizations in East Asia although they need some modifications. These corporations have a clear advantage in the areas where integral technologies are suitable. As the ICT revolution evolves to digital consumer electronics, it has become apparent that this area is indeed broad, as previously explained. It is no exaggeration to say that Japanese corporations are in the most enviable position, at least in East Asia, to be able to meet the demands of a KBE.

Agenda for Japanese Corporations to Adapt to the KBE and the New Economic Geography

Japan must respond to the emerging KBE not simply with an ICT strategy, but with a comprehensive strategy that includes adapting to international production networks, reinvigorating innovation systems, and facilitating industrial and corporate reorganization. In manufacturing, Japanese corporations need to position themselves to compete against or outsource to the EMS vendors and foundries of the NIEs and production facilities in China, and in innovation they need to benchmark against American firms. Rather than competing directly with low-cost producers in the NIEs and China, they need to build complementary relationships with them by moving toward more innovation- and service-oriented activities. They should increase product differentiation through innovation and at the same time they should make themselves able to tap into the low-cost production capabilities and pools of knowledge workers in these economies by building stronger and closer linkages with them.

The traditional strategy of Japanese corporations to make high-quality products cheaply in large quantity has ceased to be effective as a basis for competitive strength because many of these products are maturing to become, for example, commodities, which can be produced more cheaply in China. Japanese corporations are now forced to choose whether to compete as low-cost manufacturers or to compete by offering differentiated products. To succeed as low-cost producers, they need to pursue economies of scale in global markets; they need to capture a large share of China's market. To succeed as providers of differentiated products they need to enhance their capability for innovation and expand the service side of their businesses. In reality, Japanese corporations need to follow both approaches, but they should emphasize product differentiation, which is particularly necessary in order for Japanese industry to develop complementary relationships with industries in China. Even if Japanese corporations focus on product differentiation, however, they need to improve their linkages with international production networks so as not to nullify their achievements in innovation with failures on the manufacturing side.

This two-pronged approach means that Japanese corporations must adjust their production networks in three ways. First, they need to accelerate their re-organization into less centralized structures and their introduction of ICT-based systems such as supply chain management (SCM) and business-to-business e-commerce. To make the most of SCM and business-to-business transactions by networking with other firms, they need to use standardized parts and components and reduce the excessive emphasis on quality that necessitated specialized parts and components and resulted in uncompetitive product prices. To do this, Japanese corporations need to re-organize both their internal operations and their inter-corporate relationships such as *keiretsu* while keeping the virtue of an integral technology system. Second, they need make greater use of China as a base for low-cost production. And third, to pursue economies of scale with commodity products, they need to seek mergers and strategic alliances to increase the scale of their operations, utilize contract manufacturers such as EMS providers and foundries, and invest in large, strategic markets such as China. To gain market share in China, Japanese corporations should invest in local marketing and R&D facilities in China by attracting knowledge workers.

In fact, many Japanese corporations have already initiated such changes in their production networks to meet the challenge from American and East Asian corporations. They have pursued mergers and strategic alliances to reduce costs, changed their design and production systems, reviewed their parts and components procurement, shifted production to China, modified their vertical structures, and networked with external corporations. Japanese commodities producers in the steel, paper and pulp, chemicals, and semiconductor memory industries have carried out a number of mergers and strategic alliances. With regard to unbundling and networking, electronics firms, such as Sony and Matsushita Electric, have started to separate the production function from the product development and marketing functions. They have formed separate firms or departments that specialize in production to compete directly with EMS firms. Moreover, Japanese corporations are renewing efforts to utilize the production capability of China through both direct investments and contracted manufacturing. Some Japanese corporations, such as Matsushita, have even started to invest in local R&D facilities in China to develop products targeted at the domestic market. At the same time, Matsushita concluded an agreement with TCL to market Matsushita's products in China and Sanyo has entered a strategic alliance with Haier to market Sanyo's products in China and Haier's products in Japan.

Japanese corporations have not yet taken significant steps to expand their service businesses, although such moves should be the mainstream response to a KBE in high-wage countries such as Japan. In the ICT industries, some Japanese firms, such as NEC and Fujitsu, have moved to emphasize software and services over equipment production. Other Japanese corporations should reassess their view of the KBE and move away from excessively heavy orientation toward hardware.

To become more innovation-oriented, Japanese corporations should put more emphasis on product differentiation, concentrate corporate resources by changing to network-type organizations, and improve incentives for innovative employees. More fundamentally, Japanese corporations need to develop relationships with high-tech start-up firms, increase their cooperation with universities, and pursue strategic alliances as ways to improve their innovation capability by connecting more closely with the national innovation system.

Japanese electronics manufactures have actually made significant progress in product differentiation on the basis of their strength integral production technologies. By retaining product development and production capabilities for both final products and key components, mostly customized semiconductors, within their vertically integrated organizations, they can develop and produce products rapidly to earn early movers' returns. Moreover, keeping development and production in house, they can reduce the risk of technology being copied.

Japanese corporations can respond in two ways to the deterioration of Japan as a desirable and competitive location for production. They can lobby the government to improve the situation and they can increase their presence in other countries. To some extent, circumstances will force them do the latter, and specifically, to shift production to China. There is close interaction among players in an innovation system, and it is difficult for one player to function effectively apart from its domestic innovation system. This is particularly true for Japanese corporations, which are handicapped in becoming more multinational by language ability. Japanese corporations will not be able to restore their international competitiveness unless their base for innovation is raised through improvements in the university education system, particularly at the post-graduate level, life-long education, language and business education, transportation and telecommunication infrastructures, and goods and capital markets. Thus, Japanese corporations should increase their efforts to lobby for polices to improve these underlying conditions for competition and innovation within Japan.

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Part Three: Intellectual Capital for Regions

Chapter 12

Value Creation Efficiency at National and Regional Levels: Case Study—Croatia and the European Union

Ante Pulic, *President, Intellectual Capital Association, Croatian Chamber of Economy, Croatia*

Introduction

Rational value creation has been the main goal in all economic eras and, therefore, it is the goal of any modern company, institution, region, or nation. With the same resources of more or less value can be created, and any management, be it business or political, has the responsibility to aim at achieving the optimum value creation and efficiency at given circumstances, thereby preventing value destruction. This is actually the main challenge for CEOs and governments world-wide although many have not yet realized that the new economic reality—the knowledge economy (KE)—has changed the rules and laws and that new indicators are needed, which explain and describe reality in a more appropriate way, as well as an open mind for pursuing new ways of thinking and doing.

Today, many decision-makers lack the basic knowledge on matters that characterize modern economy, in particular, the role of knowledge and intellectual capital (IC) in value creation as well as the changed perception of value creation itself. Modern economy is facing a dangerous situation since outdated perceptions and measurement systems create distorted pictures of business performance, which in turn lead to wrong decisions and value-destroying outcomes. Many companies, as well as nations, are convinced of their economic progress while the reality might be entirely different which is due to the existing yet outdated paradigm. But business and political management are not to blame, as they do not know better. They are acting in line with the prevailing economic theory; a new theory, which would provide relevant guidelines for the KE, has not yet been fully articulated and defined.

For better understanding of the current economic situation we turn to the economic theory. The thoughts of each epoch are tied to the existing paradigm. Our current economic theory is still rooted in the grounds laid more than 300 years ago by Descartes, Newton, and Bacon. The attraction of the mechanistic paradigm is understandable—it was easy to find answers to questions, it was simple and worked out well. Furthermore, it helped to establish an order among phenomena and things in a way that made it possible to be confirmed by mathematical formulas and scientific examination. In the same way as Adam Smith built an economy based on Newton's and Bacon's notions (finalized by J.M. Keynes), the time has come to build new foundations for contemporary economy, which will pave the way for the next change of paradigm. The main problem with this is that once-accepted paradigms are rarely questioned and, even though an increasing number of phenomena cannot be explained by the existing worldview, they are very difficult to change.

The essence of the new paradigm is that there is a final separation with Newton's mechanics. In this context it is interesting to note that although the foundations of quantum theory in physics were firmly laid until the end of the 1930s of the past century, the mechanistic paradigm and the according approach remained dominant in all other scientific disciplines. Chemistry and biology were the next to accept and apply the new perceptions and it seems as if finally, with a considerable time delay, the economy is to follow. The new paradigm will be interpreting the existing reality in a new way in accordance with the following thought by Lester Thurow (1983):

> the prevailing economic theories are not dynamic—they can not follow the flow of time (. . .), it is therefore that reality is adopting to theory instead the other way round (. . .) in economy only a convincing theory can surpass the existing theory

It appears that the IC issue has finally shaken up economists and has become an interesting theme for political management as well since the well-being and prosperity of the citizens within the national boundaries of a country are one major underlying principle for governments and it is to expected that governments will seek concepts and metrics that ideally capture and reflect this concern.

Our existing conceptual apparatus is not capable of explaining everything that has been happening in the economy lately, at the micro as well as at the macro level. Therefore it is no surprise that more and more attention is paid to the attempts of economic experts worldwide to define certain processes and concepts in order to be able to develop a new economic theory, one that would offer satisfying answers, be more convincing than the existing one, and provide relevant guidance for all players in the economic arena.

A Powershift From Financial Capital to IC

Physical and financial capital—the basic presumption for entering the economic system—has always been the expression of power although it has started to lose its power position. In his book *Powershift*, Alvin Toffler efficiently describes the evolution and realization of power throughout history. Force is the rawest form of power; in its function it is primarily used for punishment and, therefore, represents power at its lowest level. Contrary to that wealth is a much subtler instrument for executing power and represents power at its medium level. Today, a new form of power is taking the lead, power at its highest level, which is represented by knowledge. Revolutionary changes in the relations between the presented types of power have occurred. As previously indicated, knowledge, in its role of key value creator, has taken over the power financial capital once had and, thus, the term "knowledge economy" has emerged.

But what is the role of IC in this context? In order to understand it we have to investigate the relation between knowledge and IC and its role in the KE.

Economic thought precisely defines what capital means. Not all money is considered capital. The money saved in a stocking or a safe is not capital; it consists of only the money or assets (plants, buildings, machine, raw material) which is used for value creation. The same analogy can be applied to knowledge. There are many people with considerable knowledge but if they are not capable of transforming their knowledge into value, it will never become IC. As we are dealing with the knowledge issue from an economic point of view, there has to be a relation between knowledge and value creation. Therefore, consider such knowledge which creates value and is valorized by the market to be IC. Although we are commonly referring to knowledge as the main carrier of power, this power should be attributed to its main form of appearance in modern economy—IC. As such, IC has become a powerful factor of contemporary economic reality.

IC: A Resource Equal to Physical and Financial Capital

The importance of knowledge, IC, and its role in value creation is commonly accepted although it seems more in a declarative way and less in a practical one. The employees—the prime carriers of knowledge in their new role as human capital—are still treated as objects, not as active creators of value in the new economy. Business reality proves that. No matter how much companies and governments claim that people's knowledge and skills are of crucial significance, the employee's official accounting position inside the company denies that. In accounting terms, the *most valuable assets* are recorded as any other cost position, such as material, spare parts, energy, and toilet paper.

In order to step forward it would be necessary to define a new status for humans engaged in value creation. Employees and their IC should receive the official status of a key resource meaning and be placed on the same level as financial and physical capital. This is not a hard thing to do. If we agree that IC is the key resource of the 21st century and that knowledge today is what was once were land, manual work, and money, then it would be only natural to give this resource the status it deserves—**an investment instead of a cost**.

Herewith, it would officially confirm what exists already in business reality. Companies invest in two key resources: the traditional one (physical and financial capital), and the new one (IC, mainly human capital). In my opinion this seems to be the only way leading to the inevitable shift towards a new economy. This way the idea of the knowledge worker as the most valuable asset of 21st century institutions would finally be realized in practice not only through rhetoric.

The shift from cost to investment has a psychological side effect and causes a major transformation in the mindset of the employee and the employer. In its nature, costs are burdens management tends to cut. It is a well-known practice when cost-cutting programs becomes necessary, the first one it affects are the employees. With investments, it is the other way round. If the employer considers their employees to be an investment, they will have high expectations of return on investment (ROI) in human capital, but value and respect their intellectual performance. This is stimulating for all the employees who *can and do* and represent the true human capital (HC) of the company. This way a "win-win" situation is established. The treatment of employees as an investment is the beginning and the end of the new, knowledge-based economy. In the same way as in the industrial era where people invested in plants and machines because they were the base for value creation, today's companies invest more and more in employees (education, training, benefits) who are becoming the key factor of value creation at the same level with financial capital.

Value Creation: The Ultimate Objective of Business and Political Management

IC management is not and cannot be a means to an end in itself, but must be in the function of value creation which is the prime objective of any business. Therefore, it is inevitable to deal with this important issue as well.

At present, business logic is based on achieving growth and long-term value creation. However, the problem is that the traditional indicators of business success, such as increases in revenue, cash flow, profit, market share, and technological leadership in fact do not provide information whether the companies truly create value for the shareholders and owners. Only when a company creates more than it has invested in resources can we speak of value creation. With this in mind, it is of vital interest to all stakeholders that business strategy is directed toward that objective—value creation—and that the measuring systems reflect the ability of management to achieve that objective.

However, increasing pressure and responsibility towards shareholders and employees imply the focus on value creation as the new criterion for business success (research carried out on stock exchanges prove that there is a relationship between value creation efficiency and the market value of the company). The ultimate objective is to enhance a company's abilities in the long term, which can be achieved by investing in intellectual resources (especially in human capital, which is a key factor in value creation in modern business) and increased mobilization of the internal potentials of the company (first of all, the intangibles).

The key premise for value creation in the company is that all the contributions to value creation but also value destruction can be measured without ambiguity, which frequently requires a new organization scheme and new indices. In addition to this, the processes of planning and decision-making must be focused on value creation. At the same time, responsibility and decision-making processes should be lowered, since value is being created and destroyed both at the highest and lowest levels (processes). Together with top management, executive management should, in addition to effective cost control, identify the possibilities of increasing value creation efficiency. Throughout this process all the available intellectual potentials within the company can be mobilized in order to achieve maximum value (both for the shareholders and the employees). Most of the companies, which adopt new systems, are under stress, since they are facing problems. It is a pity, since a timely orientation enables management to control the process of value creation, and instead of curing the consequences it can focus on a continuous increase of value creation efficiency.

Intangible value creation has to be considered as well, since it has an enormous impact on the overall performance of a company. Nowadays value is created through complex relations between supply and demand, the supply being today much higher than the demand. Peter Drucker (1999) describes traditional business activity as: "Buy cheap, sell at a higher price, and the difference is your profit." In this approach, the profits are lower because of costs: the lower the costs, the higher the profits. This is why special attention was paid to costs during the industrial era. Modern theory defines business activity as value added and wealth, which is far more complex than ever before. In order to create earnings, it is necessary to raise the relationship with the customers to a higher level. Moreover, it is also important to realize that the tangible form of value creation (income, value added) is dependent on intangible forms of value creation (increased time and effectiveness of communication, better relationship with customers, building and keeping a good reputation).

The key to success lies in creating cause-and-effect relationships between these two forms of value creation. It could be said that one of the main challenges for management is creating conditions which will enable successful generation of intangible values (knowledge, services, experience, benefits, speed, quality, image) and its transformation into tangible forms (income, profit, value added, shares, market value). Systematic value creation management is based on the premise that this concept is firmly embedded in the company as the ultimate business goal. It is important that it is "lived" on all the levels of business in day-to-day activities, and stimulated, rewarded, measured, and communicated. Such an orientation towards value creation is a long-term strategy, which by no means includes increasing profits over the short-term. On the contrary, the objective is to improve the ability of a company to create value over the long-term, which includes investments in IC. In the course of this process it is necessary to analyze and constantly improve the value added chain.

The logic of value creation is relevant for regions and nations as well since the standard of living, social well-being, attraction to business location, and place for living depend to a large extent on the ability of nations and regions to create value. Therefore, governments must develop a stronger focus on value creation and issues tied to IC if they want to create nurturing environments for the development and optimal utilization of intellectual resources.

The necessity of a mental shift from cost control towards the logic of value creation can be demonstrated by the image of a cake. Instead of fighting for the size of their piece (budget, funds) all the economic subjects ought to join forces in order to achieve a synergetic effect and, thus, increase the size of the existing cake. This way the size of the pieces will be bigger and the recipient will experience greater satisfaction.

The increase of the economic cake is in everybody's interest: employees, employers, shareholders, partners, labor unions, local and national government, cities, and counties. Only if there is value creation (meaning that the cake is big enough) will it be possible to share to everybody's satisfaction. The bigger the cake with fewer resources employed in creating it, the more will be for sharing (salaries and wages, benefits, taxes, research and development (R&D), sponsorship). There will also be more engagement, motivation, satisfaction, and collaboration and less fighting, frustration, and dissatisfaction. This should be a valid argument in favor of introducing the logic of value creation not only at the corporate level but also at regional and national levels.

Value Creation Efficiency of Intellectual Capital: A New Index

Experts agree that the existing measuring system cannot be considered as adequate output measures for IC performance. As business processes are becoming less based on tangibles, which have been the base for traditional management systems, the question arises of how to manage not only processes and companies but also regional or national economies in the case when intangibles have become the key factor of value creation. Trying to provide an answer to that question, many methods and approaches have appeared during the past 15 years (Andriessen, 2004).

Peter Drucker (1999) states that: "The most important, and indeed truly unique contribution of management in the 20th century was the 50-fold increase in the productivity of the manual worker in manufacturing. The most important contribution management needs to make in the 21st century is similarly to increase the productivity of knowledge work and knowledge workers. The most valuable asset of a 20th century company was its production equipment. The most valuable asset of a 21st century institution will be its knowledge workers and their productivity." For the further development of the KE, it will be crucial to reach the aforementioned goal.

I would like to introduce the VAIC™ (Value Added Intellectual Coefficient, also known as the Value Creation Efficiency Analysis) as my solution to the preceding issue. It meets the basic requirements of the contemporary economy of a "measurement system" indicating the real value and performance of a company, region, or nation, enabling benchmarking and predicting future abilities in a relatively objective way. It is useful to all participants in the value creation process—employers, employees, management, investors, shareholders, and business partners—and can be applied to all levels of business activity (Pulic, 2004). The basic parameters are created value and the resources creating that value, IC and physical/financial capital.

Value added is assumed to be the most appropriate indicator for desired business results and the British Ministry of Trade and Industry refers to value added as "the preferred measure of the wealth created by activities of a company" (UK Department of Trade and Industry, 2004).

Value added is calculated as the difference between output and input. The basic definition is as follows:

$$\mathrm{VA} = \mathrm{OUT} - \mathrm{IN}$$

where VA = value added for the company; OUT = total sales; IN = costs for buying materials, components, and services

Value added can be calculated from the company accounts as follows:

$$\mathrm{VA} = \mathrm{OP} + \mathrm{EC} + \mathrm{D} + \mathrm{A}$$

where OP = operating profit; EC = employee costs; D = depreciation; A = amortization.

Value added is a totally objective indicator of business success and shows the ability of a company to create value which needs to include the investments in resources including salaries and interests for financial assets, dividends to the investors, taxes to the state, and investments in future development. After value added for a company has been calculated, the computation of the efficiency of resources (IC and financial capital) is a matter of simple mathematics.

IC has two components: human capital and structural capital. All of the expenditures for employees are embraced in human capital. What is new about this concept is that salaries and wages are not considered to be part of input anymore.

This meets the demand for giving employees the status of key resource by treating them as investment and not as cost. They invest their knowledge and skills, which is valued by the market through the company's activities and reflected in the created value added. I have published this solution in a rudimentary form in 1993, and the expenditures for employees definitively renamed as human capital in papers written in 1997 and 1998 (Pulic, 1993). Today, this is accepted by most of the authorities in this field.

Efficiency of human capital is calculated as follows:

$$\mathrm{HCE} = \mathrm{VA}/\mathrm{HC}$$

where HCE = human capital efficiency coefficient for company; VA = value added; HC = total salaries and wages for company

Structural capital, as the second component of IC, is calculated as follows:

$$SC = VA - HC$$

where SC = structural capital for company; VA = value added; HC = total salary and wage duties for company

As the equation already indicates, this form of capital is not an independent size of human capital. It is dependent on the created value added and in reverse proportion to HC. This means that the bigger the share of human capital in the created value added, the smaller the share of structural capital. In some cases, structural capital does not even has to occur (e.g., if the value added is less than the investments in human capital). Since they have to be brought in the same position towards the value added, the efficiency of human and structural capital is calculated in a different manner. If structural capital were calculated in the same way as in human capital (value added/structural capital) an illogical result would be obtained, meaning that the efficiency of structural capital would rise with the fall of efficiency of human capital, which is simply impossible. Contrary to that it is logic that the efficiency of both human and structural capital rises as this increases the total efficiency of IC.

Structural capital, therefore, is calculated in the following manner:

$$SCE = SC/VA$$

where SCE = structural capital efficiency for company; SC = structural capital; VA = value added.

IC efficiency is obtained by adding up the partial efficiencies of human and structural capital.

$$ICE = HCE + SCE$$

where ICE = intellectual capital efficiency coefficient; HCE = human capital efficiency coefficient; SCE = structural capital efficiency coefficient.

I believe that today IC efficiency is for knowledge work and the knowledge worker similar to what was once productivity for manual work and the manual worker. In order to receive a full insight into the efficiency of value-creating resources, it is necessary to take physical and financial capital into account. Although it has lost its predominant position in the new economy, its relevance cannot be neglected. IC cannot create value on its own. Therefore, we need information on capital employed efficiency which can be calculated in the following manner:

$$CEE = VA/CE$$

where CEE = capital employed efficiency coefficient; VA = value added; CE = book value of the net asset for a company.

In order to enable comparison of overall value creation efficiency all three indicators need to be added up.

$$VAIC^{\text{TM}} = ICE + CEE$$

where VAIC™ = value added intellectual coefficient; ICE = intellectual capital efficiency coefficient (HCE + SCE); CEE = capital employed efficiency coefficient.

This aggregated indicator allows for the understanding of the overall efficiency of a company and indicates its intellectual ability. In simple words, VAIC™ measures how much new value has been created per invested monetary unit in resources. A high coefficient indicates a higher value creation using the company's resources, including IC. Therefore, we have a new way to understand organizational efficiency.

What is the benefit of such analysis? Apart from encompassing the concept of value added and enabling one to decipher the value added efficiency of a company's/nation's financial capital and IC resources, several other major reasons underscore the use of the VAIC™ methodology. First, VAIC™ provides a standardized and consistent basis of measure, thereby better enabling the effective conduct of an international comparative analysis using a large sample size across various industrial sectors. Alternative IC measures are limited in that they: 1) utilize information associated with a select group of company/nations (for example, stock data); 2) involve unique financial and non-financial indicators that can be readily combined into a single comprehensive measure; and/or 3) are customized to fit the profile of an individual company/nation (Roos et al., 1997; Sullivan, 2000). Consequently, the ability to apply alternative IC measures consistently across a large and diversified sample for comparative analysis is diminished. Second, all data used in the VAIC™ calculation is based on audited information; therefore, calculations can be considered objective and verifiable. Other IC measures have been criticized due to the subjectivity associated with their underlying indicators. Additionally, concerns have been raised about difficulties in verifying information used in calculating indicators comprising other IC measures. Third, VAIC™ is a straightforward technique that enhances cognitive understanding and enables ease of calculation by various internal and external stakeholders. Ease of calculation is a feature that has enhanced the universal acceptance of many traditional measures of corporate performance (such as return on assets, market-to-book value). Alternative IC measures are limited as they only be calculated by internal parties or rely upon sophisticated models, analysis and principals. Finally, the VAIC™ methodology is utilized in more and more studies as it is receiving increasing research attention (Bornemann and Franzen, 1998; Nova Kreditna banka Maribor, 2000; Williams, 2001).

However, VAIC™ is just a tool for scanning, like a blood picture or X-ray, which is why it is best if combined with other knowledge management and measurement tools.

Nurturing IC and Measuring Efficiency: The Croatian Case Study

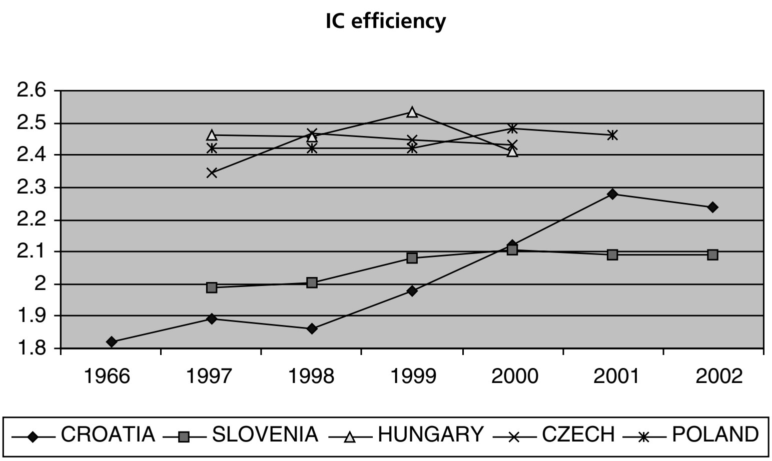
With regard to the EU efforts in preparing a successful transition into KE and Croatia's pending status as candidate for EU membership, the Croatian Chamber of Economy initiated the "Croatian Intellectual Capital Project," hoping to add additional impetus to the national economy and encourage focus on knowledge and IC in their role as key production factors. The project aims at increasing competitiveness and value creation ability of the Croatian economy through supporting, encouraging, and promoting new concepts, methods, and systems that facilitate all economic subjects to face the challenges of the KE more effectively.

The VAIC™ analysis—at the company, regional, and national level—has been a substantial part of the project and one of the key economic initiatives, providing the necessary insights into the utilization of key resources—physical capital, financial capital, and particularly IC—with regard to value creation and value creation efficiency (www.vaic-on.net).

In order to enable benchmarking for domestic companies with their international competitors the analysis was also extended to former Eastern European countries, countries of the EU, and top 500 EU companies in the second year.

So far two annual reports have been published, the *Intellectual Capital Efficiency in Croatian Economy* featuring the period 1996 to 2001 and *IC Efficiency on National and Company Level* featuring the period 2001 to 2002. The third annual report is about to be published in May 2004 and will be followed by quarterly reports in the

Figure 1



future; in this way the necessary orientation of the Croatian economy towards value creation and increasing of value creation efficiency can be supported.

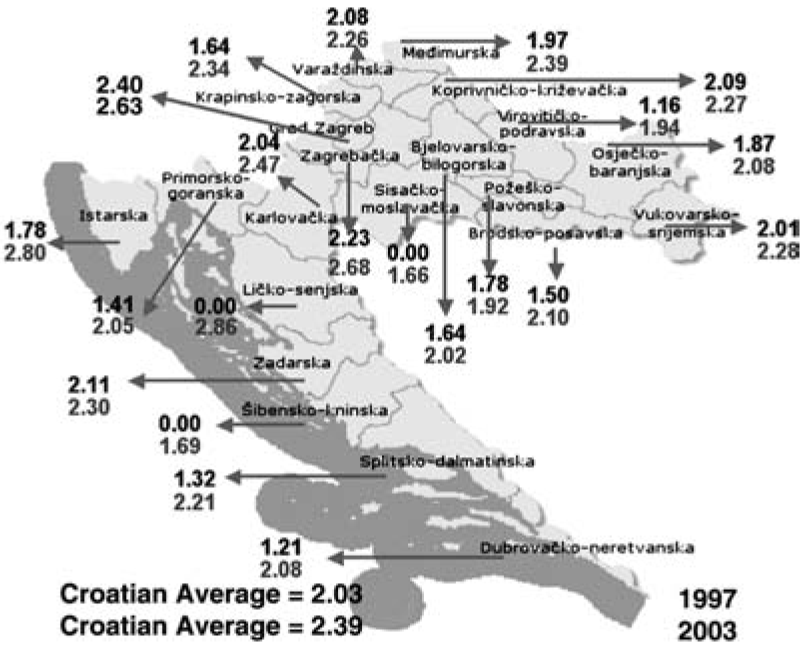
The analysis for 2002 shows that the Croatian economy manages to perform efficiently and successfully in global terms, which is, for example, clearly indicated by high efficiency levels of the Croatian banking sector. It is, indeed, higher than the European average. The leading Croatian companies show similar efficiency as their European counterparts and competitors and finally, Croatian branch offices of foreign companies clearly indicate that in terms of value creation efficiency they no longer lag behind their parent companies. The IC efficiency analysis (powered by VAIC™) has proved useful for all the economic players.

National and regional government has gained control over value creation in their area of supervision and can easily develop a competent national or regional value-oriented strategy by pin-pointing the underperforming value creation areas, which add to the decrease of the national or regional efficiency level. (At the national level, these have been regions, sectors, and big national companies, and at regional cities, these have been local companies.) On the other hand, the national and regional drivers of wealth creation have been highlighted as positive examples since they are ones who provide the basis for social and cultural well-being and secure the living standard of regions and nations. As laws and policies are made at the macro level and, thus, influence the performance of companies as well as the entire economy, it is has proved to be beneficial for government to receive information on our nation's ability to create value and efficiency; this has been done over the years. Each of the national IC studies has contributed to creating awareness for the fact that only if all parties responsible for a national economy pay due attention to IC issues they will be properly acknowledged and managed.

Regions have received the opportunity to detect sectors and companies which are main value generators in their area and, therefore, can be considered as candidates for rewards by means of tax or other regulatory benefits so that they remain with their business in the region and can contribute to regional wealth creation and social well-being in the future.

Figure 2

Intellectual capital efficiency in Croatian countries, 1997–2003



The companies have gained a new perspective on business performance, which has enabled them to orientate themselves better in their domestic but also global business environment. They are motivated to start applying the VAIC™ analysis at the company level and inside the company, which will help them gain control of value creation and cost control and prevent underperformance. By continuous monitoring of value creation efficiency, they will be able to avoid negative surprises, meaning value destruction, since timely action will be possible. In order to achieve higher levels of value creation efficiency with existing resources, companies will be forced to focus on activating the whole company's potential, which implies a strong focus on IC matters. This in turn will lead to increased attractiveness for investors, partners, and human capital. Research has also shown that there is a close relationship between a company's market value and its value creation efficiency.

The **shareholders** and **investors** of companies have gained more objective insight into the utilization of resources since value added and efficiency of value creation are more objective indicators of business success than the traditional ones of profit, revenue, and cash flow. This way they are capable of monitoring whether the company is securing high and sustainable ROI with regard to sector average and the greater business environment.

Partners and suppliers have received the opportunity to see whether the companies they co-operate with show stable value creation efficiency throughout the analyzed period. If so, it can be expected with high probability that they will add value to their business. In case of a falling trend it is probable that it will affect their businesses in the long run.

Customers could benefit from insights into value creation ability of companies in a way that the better the company performs, the better value propositions could be expected or asked for (no cutting down on them).

Employees could benefit from the value creation efficiency analysis as it has enabled them to monitor their company management's orientation towards value creation, which is of great importance for the security of their working place. The higher the human capital efficiency of a company, the better the value-creating ability of the working force; this can be tied to the remuneration systems. The human capital efficiency has also proved to be a very interesting topic for trade unions, which have only started research IC issues.

Other Activities Related to the Croatian IC Project

Within the Croatian Chamber of Economy the *Intellectual Capital Association* was founded in order to create a formal platform for IC-related activities and networking for companies and other interested economic subjects whereby the web portal of the association represents a valuable source of information on past and present IC activities, lectures, literature, and other. A simple handbook on IC and knowledge management was published soon after and has since been freely distributed. It is designed to be unpretentious and simple in form and language with a pragmatic and value-oriented approach in order to be appealing to a broad audience and provide the readers with a basic notion of issues related to IC and knowledge management, and encourage further reading, learning, and investigation, and, result in improved performance. Since the IC/knowledge management issue is a new territory for most of the economic players, lectures and discussions on IC management/knowledge management in each of the 20 counties were organized; in some areas even several times addressing different target groups such as middle management, top management, and local government. The main challenge was to deliver the message that it is vital for companies and governments to begin researching matters tied to the new economy. Furthermore, that knowledge management/IC management has to be approached systematically and with the same attention as management of money and physical assets. Due to the intangibility and fluidity of the matter, it proved helpful to establish a link between IC management/knowledge management and financial value creation pointing out that a company, region, or nation can only achieve higher efficiency with the existing resources if the IC in waiting is activated. These meetings provided a wonderful opportunity for discussion, clarification of misperceptions, and discussion of critical issues regarding opportunities and threats. Sometimes, however, it was more like a fight against windmills, since the audience was very hostile toward the new insights arguing that these fancy issues are a luxury only developed countries can afford to deal with.

Appointed staff of the regional Chambers of Economy received basic education on IC/knowledge management matters through lectures on the KI and related issues. They have been appointed to become members of the Chamber IC team, which assist local companies and governments with regard to IC matters (relevant information on projects, literature, experts, networks, best practice, domestic case studies, and initiatives). They have also been trained with regard to the VAIC™ analysis so that they can contribute actively to the realization of the annual and quarterly national IC efficiency reports. By now all of the regional Chambers of Economy have had VAIC™ software installed and can monitor value creation and efficiency of cities and companies in their area and companies can be warned as soon as negative trends are spotted.

We feel that the aforementioned way of approaching the IC issue has had several benefits. It was possible to capture a broad audience that now has at least abasic notion of what IC is about and what the benefits of managing it. Many people have started to appreciate the IC reports as a valuable source of information on corporate, regional, and national performance. Critical issues of national and regional value creation ability, economic policy, decision-making, priority setting and financial supporting have surfaced and are up for discussion. Herewith, a solid base for further IC initiatives, innovation, and increase of value creation and efficiency has been created which should be appealing to investors as well as the EU. The Croatian Chamber of Economy had the courage to initiate and finance such an initiative despite the critique of wasting money on irrelevant matters and now has the satisfaction of being a global trendmaker since no other government institution worldwide has yet approached the IC matter so systematically and nationwide.

There are three main lessons learned to be shared. Although IC represents the green card for becoming a relevant global player in the 21st century, particularly for developing countries and those in transition, it appears as if they have the least interest in seriously dealing with this issue and are still far away from making it a priority. Regardless of the IC project, which has been an isolated initiative, Croatia is no exception. This is partly due to their economic history and established value systems and partly to the ignorance of these issues by representatives of respected and influential international institutions, banks, or companies, who are the local models. Making IC matters a priority either for government or the companies is a process and, as each process, this one takes its time, especially as it is sometimes more a psychological phenomena. dealing with mind sets, than an economic one.

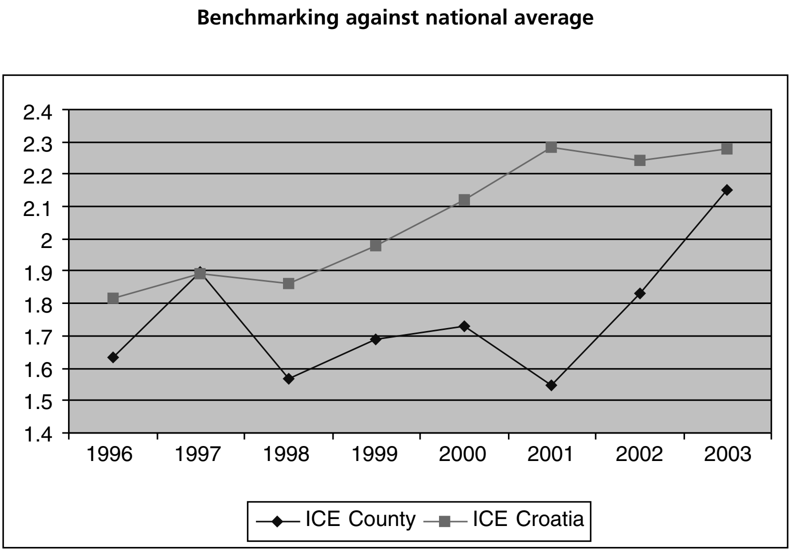
Any IC initiative, whether on a company, regional, or national level, is of relevance since it will influence important changes, first in mindset, then behavior, and finally in business results. According to the feedback from managers, students, and even government representatives, this is exactly what happened in many cases. Some even claimed that this new view on reality from a changed perspective has changed their lives as it opened a whole range of opportunities.

The most stunning reactions to the Croatian IC project came from two entirely different regions geographically located in the East and West of Croatia; according to value creation ability of their economies they are the worst and the best ones.

The best for years and the most promising county was performing under Croatian efficiency average several years ago but managed to reach the average in 1998 and surpassed it with remarkable efficiency in 2000, stagnating slightly in 2001 but increasing value creation efficiency by 80% during 2002 and continuing to rise in 2003. This county's government used these results published in the IC reports as an argument in order to achieve benefits in budget allocations and more freedom in designing their local policy. Furthermore, they started analyzing the efficiency trends in all the relevant sectors and the biggest state-owned companies in order to gain control over value creation in the region and receive valuable feedback on the validity of the course in which they have been leading the county.

The other county is a war-shaken region and their bad performance would have seemed understandable if it were not for the fact that during the immediate post-war period, 1996 and 1997, it was creating value more efficiently than it did in 2000 and 2001. It was obvious that physical and financial capital souring from government subventions and international aid was not the key to recovery. Analyzing everything

Figure 3

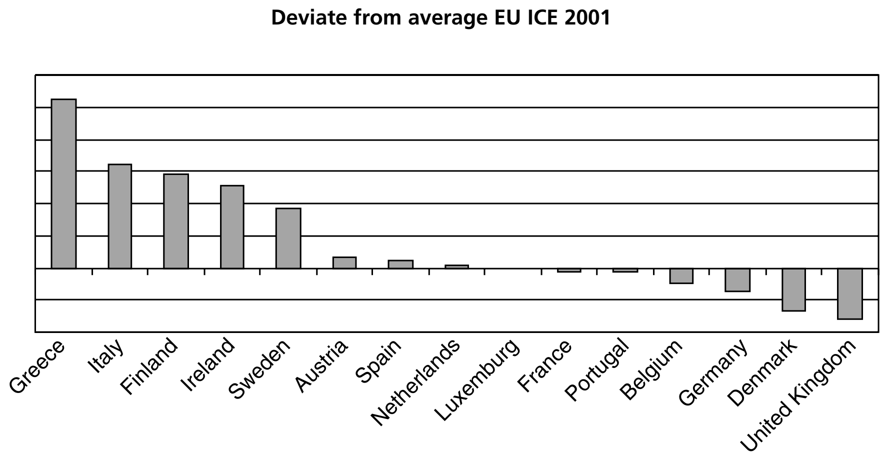


that was happening in their economy during the post-war period, county representatives have come to the conclusion that it is IC that their county lacked. Therefore, they have introduced concrete measures to create strong and productive IC in this region. One of the first steps was the creation of a SWOT analysis focusing primarily on IC and its ability to create value in order to receive additional insights, which would help in creating a better development strategy and thus overcome the depressing economic and socio-political situation. The focus on IC provided a new basis for discussion between local government, labor unions, leading companies, and representatives of the Croatian government, paving the way to the necessary orientation towards value creation as well as recognition of intangible resources as valuable value generators which ought to be deployed and cared for. The task is highly complex and responsible since it is not enough to think and act only in view of reconstruction, but with regard to the future. This means that a high quality base for the long-term positioning of the county in global terms, under the pressure of domestic and international competitors, has to be created. The result of this year's value creation efficiency analysis proves that this county has started its way in the right direction.

Conclusions

The more case studies there will be worldwide dealing with new concepts and related management and measurement tools, the easier it will be to convince decision-makers, who will set the tone and pace for action and activate the workforce, which is to realize the transition by applying their knowledge and skills. Governments and CEOs have to be aware of the fact that unless a critical mass of people understands what this is all about and what the benefits are, there will be no quantum leap into the KE. By

Figure 4



understanding the changes in the economy and acquiring knowledge of the new key economic factors in the KE as well as accepting new perspectives provided by new generation indicators, companies and governments have the chance to receive a more realistic picture of their ability to create value. This way they gain control of circumstances and will not be controlled by them.

As stated in the Lisbon declaration: "The European Union is confronted with a quantum shift resulting from globalization and the challenges of a new knowledge-driven economy. These changes are affecting every aspect of people's lives and require a radical transformation of the European economy" (Lisabon European Council, 2000).

I believe that this chapter can contribute in facing the aforementioned situation in several ways. First, it can help by forwarding understanding of the current economic changes and the position of employees, the main creators and carriers of knowledge. Second, it can contribute by presenting a possible model on how this important matter was approached at a national level and share the experience. Third, it can help by presenting some features and benefits of the VAIC™ index, a tool that aims at bridging the gap between the traditional ways of monitoring economic success and the new ones, which are capturing the key value creating factor of the KE, IC. And finally, it can contribute by demonstrating a chart featuring the IC efficiency of EU countries that ought to serve as thought food and as a basis for discussion and further research and investigation.

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Chapter 13

A European Regional Path to the Knowledge Economy: Challenges and Opportunities

Dimitri Corpakis, *Head of Sector, European Commission DG Research, Brussels, Belgium*[1]

Abstract

The progressive build-up of the knowledge-based economy in Europe calls for increased efforts for building capacity for research, technological development, and innovation in the European regions (sub-national entities). This is especially true not only in the less-developed regions (better known currently [April 2004] as *Objective 1* regions following the jargon of the community structural funds) of the European Union (EU) but also in those areas going through profound economic restructuring (currently known as *Objective 2*).

Efforts to reach this goal have focused traditionally in providing and improving research infrastructure (university and laboratory space and equipment) and improved communication facilities (transport infrastructure, telecommunications, and energy networks). Today, it is firmly believed that this policy, while necessary in the early stages of a process for building up capacity, is not sufficient and ultimately not sustainable if it is not coupled by a strategy that focuses on building technological and innovation capacity in a region in dynamic terms. The EU's past experience with both approaches (structural funds and the research technological development [RTD] framework program via the regional innovation strategy [RIS]/Regional Innovation and Technology Transfer Infrastructures and Strategies [RITTS[/RIS+ initiatives) makes it a world leader in supporting the knowledge-based economy in the regions.

[1] Disclaimer: "The views in this article are those of the author and do not express necessarily those of the European Commission."

However, major weaknesses are still encountered, namely on the delivery of these strategies and their successful articulation. While positive results may be registered in individual policies, sufficient synergies are not yet accomplished between respective community initiatives. In the context of the developing European Research Area (ERA), the 6th Framework Program (FP) for RTD (2002 to 2006) currently deploys a number of efforts at the national and regional level, to increase this synergy and make the most of the available community instruments. In the year 2003, the Commission also launched a Pilot Action ("Regions of Knowledge/KnowREG") aimed at demonstrating the central role of knowledge in regional development with interesting results (http://www.cordis.lu/era/knowreg.htm).

Activities that support and valorize the regional dimension of community research actions in relevant areas of the 6th FP and policy development surrounding the progressive build up of the ERA focus on implementation of the ERA-NET (http://www.cordis.lu/coordination/home.html) scheme (coordination and mutual opening of research schemes and initiatives at the national and regional level) as well as in other areas of the FP where the regional dimension may have an important role in stimulating or organizing better research efforts.

Improved interactions are also actively sought between RTD instruments and the structural funds, notably the European Regional Development Fund or Fonds Européen du Développement Régional (FEDER) innovative actions. The publication of the Third Report on Economic and Social Cohesion (February 2004) has also unveiled a significant turn of the future orientation of the structural funds towards research and development (R&D) and innovation in the regions of an enlarged Europe (2007 to 2013) (http://europa.eu.int/comm/regional_policy/sources/docoffic/official/reports/cohesion3/cohesion3_en.htm) (European Commission proposals still not validated by the Council of Ministers).

Introduction

The progressive build-up of the knowledge-based economy in Europe calls for increased efforts to establish RTD and innovation capacity in the European regions (sub-national entities). This is especially true not only in the less-developed regions (better known currently [March 2004] as *Objective 1* regions following the jargon of the community structural funds) of the EU but also in those areas going through profound economic restructuring (currently known as *Objective 2*).

Efforts to reach this goal have focused traditionally on providing and improving relevant infrastructure (university and laboratory space and equipment) and improved communication networks (transport, telecommunications, energy). Today, it is firmly believed that this policy, while necessary in the early stages of a process for building up capacity, is not sufficient and ultimately not sustainable if it is not coupled by a strategy that focuses on building technological and innovation capacity in a region in dynamic and structural terms. The EU's past experience with both approaches (structural funds and the RTD Framework Program via the RIS/RITTS/RIS+ initiatives [http://www.cordis.lu/era/regions.htm]) makes it a world leader in supporting the knowledge-based economy in the regions.

However, major weaknesses are still encountered, namely in the delivery of these strategies and their successful articulation. While positive results may be registered in individual policies, sufficient synergies are not yet accomplished between respective community initiatives. In the context of the developing ERA, the 6th Framework Program for RTD (2002 to 2006) currently attempts a major mobilization of actors at the national and regional level, to increase this synergy and make the most of the available community instruments.

This is notably attempted through activities that support and valorize the regional dimension of community research actions in relevant areas of the 6th FP, policy development surrounding the progressive build up of the ERA, and "the Regions of Knowledge/KnowREG" Pilot Action, that is independent of the FP.[2] In particular, these focus on implementation of the ERA-Net scheme (coordination and mutual opening of research schemes and initiatives at the national and regional level) as well as in other areas of the FP where the regional dimension has a role in stimulating or organizing better research efforts. This chapter will review this strategy and offer some options to overcome identified pitfalls.

R&D, Innovation, and the Knowledge Economy (KE)

During the last 20 years of the 20th century, the world's advanced economies have undergone profound changes in structural terms. These changes mainly concern the ways economies create value. Increasingly these are collectively known to be "knowledge based." The term "knowledge based" in itself may be considered a false neologism, since one could argue that economies have always been "knowledge-based." However, the term is justified, because for the first time, knowledge is not only at the root of products and services found in the market, it is actually embedded into them. This embeddedness also defines to a large extent the competitiveness of artifacts that give to respective producer economies their comparative advantage.

This knowledge embeddedness is the direct implication of an ever-faster growing accumulation of and reliance on formal scientific and technical knowledge affecting all sectors of the economy, with ever higher science and technology (S&T) content integrated in products and services and, as a consequence, need for more and better qualified human resources. These trends place increasingly pressure on education and training systems worldwide by raising the needs for quality standards, increased performance, more focused output, and optimization of available resources. In short, there are growing needs in intellectual capital (IC) worldwide.

At the same time, knowledge has escaped its traditional barriers and travels freely across frontiers. Much in part to the availability of powerful technical means for producing, transmitting, storing, and processing information through global information and communication networks, and diffusion and use of knowledge, that has brought improved efficiency to economic activities around the world. The Global Research Village works around the clock with important implications for the world economy, not easily captured by statistics. E-commerce, especially on a business-to-business basis, accelerates transactions and can ultimately create new rules in world trade, pushing laggards out of the competition. In addition, the increasing pace of trade liberalization and flows of goods and services, push world economies to focus on more knowledge-intensive activities.

These trends describe a world where competition is brought back to basics: high quality/high growth education and training systems become a sine qua non for keeping up with the increasing needs in knowledge follow-up. However, this is not enough because in principle, knowledge has to be able to be translated either in new intellectual structures that would spearhead new education, training, or research systems or to

[2] KnowREG has its own budget heading in the Union's budget and was introduced as an independent activity by the European Parliament in 2002 (for implementation in the year 2003).

"intelligent" output in new (or improved) products and services. These trends are by no means confined to individuals; they concern whole economies, and by this token, nations and increasingly sub-national entities (regions[3]). Local economies can be highly successful in keeping up with this pace, but dramatic failures may also occur, making whole regions redundant in terms of participation in the globalized world economy. In the EU these trends are translated largely by the ever-increasing gap between technologically advanced and lagging regions (current *Objective 1* regions in the terms of the EU structural funds).

The "Lisbon Strategy" and the "Barcelona Target"

To face these trends, European heads of state and government met in the context of the European Council in Lisbon (March 2000), under the Portuguese presidency in the Council of the European Union. An important albeit complex and difficult vision was set: within 10 years (that is by 2010), turn Europe into the most competitive and dynamic knowledge-based society and economy in the world, with more and better jobs, sustainable development, greater social cohesion; improvement of the labor market, better governance, improved lifelong learning, and people mobility. All this had to happen through the so-called "open method of coordination and benchmarking," a term that has been the topic ever since of many academic and political discussions (as it often happens with Community terminology introduced at the level of important policy discussions).

The term "open method of coordination" describes the process driving the "Lisbon Strategy": this is based on a loose coordination of efforts between member states of the EU, which would not be governed by binding or uniform decisions, applicable to all players through community legislation. Instead this is based on the principle of a learning pool and has to involve all players in a mutual, interactive learning process. This also involves metrics via meaningful indicators that attempt to measure comparative performance, but also include policy analyses to explain policy strategies and examine transferability of good practice.

The Lisbon Summit put research and innovation back on top of the policy agenda after a long under-representation as a priority policy issue. It also endorsed the proposed Commission strategy for building a ERA (2000) to achieve a more consistent and less fragmented European research policy.

Later on, the European Council completed this goal by endorsing the Commission's proposal for achieving an average of R&D investment at the level of 3% of gross domestic product (GDP) for all present EU member states (Barcelona, March 2002). On this particular objective, the Commission produced a communication (2002) that outlined critical policy areas where action is urgently needed if this objective were to be met by the member states. Furthermore, and on request by the European Council, an action plan was adopted by the Commission in 2003 calling for urgent action at the European and national level but also at a regional and local level and focusing on some 46 concrete measures. Thus, investing in R&D (which ultimately means investing in knowledge, talent, and creativity) may become one of the growth drivers for the European economy in the run up to the target year of 2010, with a strong emphasis on the (failing) European private sector and improvement of the overall framework

[3] Throughout this article the word "region" means "sub-national entity" and denotes a geographical territorial subdivision of a stat/country.

conditions for knowledge generation, R&D, and creativity at the national and regional level.

With consistent efforts now being deployed around the EU, it could be argued that the ERA project became one of the cornerstones of the Lisbon strategy, towards building the knowledge-based society in Europe. In this respect, it affects all policy levels, including that of the regions.

Structural Funds Versus the Community R&D Framework Program: Different Routes Towards Similar Objectives

In order for the EU regions to respond to the Lisbon challenge, a consistent deployment of all community policies has to be secured. This includes in particular the structural funds (the European Regional Development Fund (ERDF) in particular) as well as the Community Framework Program for RTD. This is not new, since by definition Community policies complement each other in strengthening capacity for the regions.

Considerable experience from the activity of the structural funds has been gained over the years in terms of building capacity in the regions. But as all evidence shows, investing in infrastructure and equipment alone is not sufficient for advancing in the KE. Although the last decade has seen about EUR 12 billion (USD 14.6 billion) allocated to Research and Technology purposes in the European regions from the structural funds, the gap between technologically laggard and advanced regions is still growing. More than 15 years ago, similar efforts in the EU have seen much success, through a number of schemes with an increasing emphasis on integrated strategies.[4] Thus, it is worth it to note that Community action is shifting from an "infrastructure-only" supporting mode to an "innovation-enabling" mode, a trend which has to be preserved in the context of the imminent enlargement of the EU to 25 countries, with a growing number among them in the current *Objective 1* range (regions that the development is lagging behind), despite pressures for the contrary.

The ERDF experience on innovative actions started with the old Article 10 of the previous regulation whose basic idea relied rather on the principle *of helping regions to help themselves through initiatives designed to mobilize local knowledge in a process of collective social learning*. The philosophy of Article 10 has been summarized as follows (Messina, 1997):

- function rather an experimental laboratory
- promote the innovative dimension of regional policy
- promote partnership between the private and public sectors
- enable the internationalization of regions and local authorities
- facilitate the transfer of know-how in the technical, economic, and scientific fields between the regions of the EU
- positive results of Article 10 projects should be incorporated in conventional regional policies

It is striking to observe how far this philosophy remains of importance today (and how far it would still remain especially because of the enlargement context). Building innovative capacity in the regions has thus been a common endeavor of the structural

[4] Regional technology plans, regional innovation strategies, regional information society initiatives, innovative actions.

funds and the RTD Framework Program over the years (notably through the Innovation and small and medium-sized enterprises [SMEs] specific actions). This is now continued in the context of the current ERDF innovative actions (2000 to 2006) and a new regional philosophy embedded in the development of the ERA project.

It is also significant to observe that the effects of the structural policies to the economies of *Objective 1*-dominated countries (Cohesion countries) differ: a recent study conducted for the Commission services noted that out of the EUR 135 billion (USD 164.5 billion) earmarked for *Objective 1* regions from the structural fund (STRF) (2000 to 2006) one should expect an increase in GDP by 3.5% in Portugal, 2.4% in Greece, 1.7% in the Mezzogiorno, 1.6% in the new German Länder (former German Democratic Republic [GDR] territories), and 1.1% in Spain.

The interplay between the multi-annual community RTD FP and the structural funds is more complex, because the instruments are very different. First and foremost, the FP has been traditionally an instrument based on a competitive approach and its main selection criterion has been by far scientific excellence. There are no national or regional quotas in the R&D FP in contrast with the structural funds. Thus, whereas the structural funds apply a "distributive" policy based on national quotas, the FP organizes open calls for proposals for transnational collaborative research projects linked directly to the research "performers" without any interference by national or regional governments. This reinforces partnerships between academia and industry at the European level on the sole criterion of merit. Despite this, "cohesion" countries originating partners do surprisingly good in FP proposals, by connecting themselves to networks of S&T excellence, without any geographical restrictions.

Complementarity between the two policy areas lies with the fact that the structural funds try to raise research capacity in the regions by funding productive investment together with help to initiate strategies for R&D and innovation based on local assets. The FP "tests" this capacity by stimulating a competitive approach and connects the players together in concrete problem-solving initiatives. The recent development of regional innovation policy initiatives in the context of the 5th FP (innovation and SMEs) confirms that a common ground can indeed be found between the two instruments, mainly based on strategy development. This trend is being further developed in the current context of the 6th FP and especially in the experimental Pilot Action on "Regions of Knowledge" (KnowREG) launched in August 2003.[5]

The European regional research landscape is rich in initiatives, with a wide range of players in the business and academic community. In addition, many successful implementations of cross-border cooperation in R&D have occurred in the past, mainly through the ERDF INTERREG (Interregional Cooperation) Program, without forgetting more independent initiatives like the one of the so-called four *motor regions*: Baden-Württemberg (D), Rhône-Alpes (F), Lombardia (I), and Catalonia (E). All of this happens through a large number of players: universities, businesses, local authorities, technology transfer organizations, or S&T parks (gathering in one place, universities, R&D organizations, multinationals, and SMEs).

Despite these trends, large regional disparities remain, as earmarked by the second and third cohesion reports (January 2001 and February 2004). The cohesion coun-

[5] The "Regions of Knowledge" Pilot Action is an activity independent of the 6th FP for RTD and the structural funds. Its main objective is to explore ways in which knowledge becomes central to regional development. In the context of the Regions of Knowledge Pilot Action, 14 transnational and trans-regional pilot projects are active as of February 2004. For more information, see http://www.cordis.lu/era/knowreg.htm.

tries'[6] technology gap (with more advanced ones) has widened and concentration in most indicators is general (in R&D expenditure, human resources, and patent applications).

The Concept of the ERA and Its Regional Dimension

The ERA concept represents in itself a new vision for European research calling for less fragmentation of effort, the abolition of the 15+1 policy framework for European research policies, an improved organization for research at European level, and a better use of scarce resources. As such it calls for a general mobilization of all relevant actors including the European regions. A new long-term partnership, therefore, has to be established between all operators: the EU's institutions, the member states, the regions, the public S&T, and the business R&D communities.

In this context, the regions have to play a new role: an active, supportive one, largely pro-active, based on public-private partnerships, strengthening actors, providing infrastructure and means, bridging in general the gap between **knowledge creators and knowledge users.**

This is now implemented in a new environment, dominated by new FP instruments aiming mainly at integration of research capacity across all European regions. The new priority instruments (networks of excellence [NoE] and integrated projects [IP]) have a special regional dimension as strong programming tools. These are complemented by a whole range of "smaller" instruments that largely draw on the existing and tested ones of the fifth FP (1998 to 2002) and who are believed to be better accessible to the "smaller" actors of the FP.

The community R&D FP has been traditionally a policy planning tool for RTD at the EU level. Historically it has been used as an instrument to promote transnational cooperation by supporting collaborative R&D. Now it primarily serves to build the ERA, an endeavor that spans well beyond its short life-cycle. In achieving an "internal market" for research in Europe, the FP activates three blocks of activities, of which two are completely new: thus, besides the "integrating" area (that houses the thematic priorities) the "strengthening the foundations of the ERA" and the "structuring the ERA" blocks have a profoundly structural role. It is important to note in this respect that together with innovation, SMEs, and the human factor support is given for the first time to develop initiatives in the areas of coordination of policies at the national and regional level, research infrastructure, and science and society.

The concept of the regional dimension which spans across all of these areas has been identified as important in all ERA-related commission policy documents (communications) right from the imitation of the whole ERA endeavor (January 2000). It has also become the target of a specific communication, presented to the Commission jointly by Commissioners Busquin and Barnier[7] in October 2001. The message it delivered was primarily addressed to the member states and essentially stated that when they design national S&T policies they should pay more attention to local and regional factors and operators, increasingly involving the regions in a European policy context.

[6] Greece, Ireland, Portugal, and Spain. Ireland will soon leave this group because of stunning progress.

[7] Respectively in charge of research and regional policy at the European Commission (1999 to 2004).

Creating IC in the Regions Through the Community RTD FP

Seizing the Opportunities of the 6th Community Research FP (2002 to 2006)

The new community RTD FP presents regional bodies with a host of new opportunities, offering them diversified possibilities of participation and faster integration in the emerging European knowledge-based economy and society.

These range from the newly introduced instruments of the community RTD FP to activities that foster networking, trans-regional cooperation, and a broadening of our knowledge base concerning the regions' potential in terms of science, technology, and innovation.

Taking Advantage of the New Instruments

The new funding instruments for community research actions emerge as key factors for structuring the ERA. In increasing the transparency and legibility of community research, they are expected to act as catalysts for the development of regional strategies, oriented towards the regional economic fabric while remaining open to the European and international dimensions.

Networks of excellence (set-up through calls for proposals) may allow for the reinforcement and integration of existing or developing scientific excellence in all EU regions. Bearing a strong programming character, they are expected to be particularly well adapted to regional research and innovation actors, allowing better connectivity between central and peripheral hubs of scientific competence, thus offering increased opportunities for collaboration, staff mobility, and information and knowledge exchange as well as positive spillovers to the local and regional economies. In addition, efficient networks of excellence are expected to function as strong barriers against inter-regional brain-drain (scientists moving from less favored to richer regions). They could positively influence the build up of multi-polar areas of innovation and excellence, indirectly supporting local development and economic growth, thus contributing to regional population stability and acting against inter-regional brain drain.

Integrated projects, equally set-up through calls for proposals, allow regional bodies to cooperate on a transnational basis around specific S&T objectives, aiming at concrete results. Regional bodies may be associated here in transnational partnerships to develop specific projects, of a substantial scale, aiming at integrating S&T efforts.

Networks of excellence have as their primary objective the durable integration of research activities of participating organizations. Integrated projects consist of a number of research components, executed in a coordinated fashion and allowing partners to respond to societal or competitiveness problems. They are managed in a flexible way and are open to participation of new partners. Both instruments aspire to drive the totality of the European territory towards excellence, through association of all meritorious teams as well as the diffusion of research results.

Managing the new instruments within the context of priorities set by the Commission is coupled with a number of consistent accompanying measures, ensuring that the funded activities are in the service of a global strategy of progressive integration of European research.

Regions may also take advantage of the new coordination-type activities foreseen under the topic of "strengthening the foundations of the ERA," using in particular the ERA-NET scheme.

Achieving greater cohesion in the EU, depends directly on the creation of the necessary conditions for the integration of research capabilities existing in less favored regions in the European research fabric. The sixth FP contributes to networking of a regional capacity by stimulating the establishment of networks of S&T competence and thus facilitating knowledge transfer. Activities supported under this strand of the FP have a real community added value, by virtue of their contribution to economic and social cohesion.

Conceived for both national and regional levels, the ERA-NET scheme largely intends to encourage and support synergies between existing research activities in several regions through coordination activities at the implementation phase and their mutual opening and access to research results. It also covers the definition and execution of joint activities. The FP is able to contribute to the coordination of research activities among research operators located in less-developed regions and those located in the other regions of the EU, with a particular focus on those located in cohesion countries and in the outermost regions.

To this end, the Community may support initiatives aiming towards networking activities by these regions, in accordance to rules foreseen for strengthening the foundations of the ERA. These would cover in particular targeted coordination actions, aiming at stimulating and supporting coordinated initiatives by different research and innovation operators in the countries and regions concerned. By way of example, they could comprise activities such as the organization of conferences, meetings, studies, staff exchanges, exchange and diffusion of good practice, and the establishment of information systems.

Establishing a Better Link Between Research and Innovation at the Regional Level

Encouragement and validation activities targeting local and regional initiatives are developed in the context of the FP, to promote development of new innovating businesses and transfer and exchange of best practice as well as the establishment of an environment more conducive to research and innovation. They focus on:

- trans-regional cooperation to facilitate the development of research and innovation.
- strategies as well as the initiation of program involving local actors; these activities are developed in close coordination with those of the EU's regional policy and the structural funds.
- particular attention is paid to the participation of candidate countries' regions in this activity type, notably in relation to the transfer of schemes that have proved to be successful at EU level to those regions; moreover, innovative approaches and experiences are introduced at a national or regional level to further study the complex process of innovation.

The development of research and innovation strategies, as well as inter-regional technology transfer, has greatly benefited so far from significant assistance from the community. The sixth community RTD FP is indeed an important tool in continuing this effort.

The European Investment Bank (EIB) and the European Investment Fund (EIF) are also instrumental in this respect, especially after their recent initiatives (I2I, Innovation 2000, and Innovation 2010) and the mandates provided by the Stockholm, Nice, and Lisbon European Councils for support to local and regional innovation initiatives through the provision of venture capital. The recent joint initiative between the Commission and EIB for reinforcement of RTD and innovation initiatives by mutual supporting activities will also play an important role in this respect.

Developing More and Better Trained S&T Human Resources

Within the context of research training networks and knowledge transfer, fellowships are developed under the context of Marie Curie human resources and mobility actions; therefore, more opportunities are offered to researchers originating from the less favored regions, including re-integration grants. These very measures also apply to researchers originating from regions of the candidate countries.

Thus, mobility and training schemes focus on the development and transfer of research competencies, the consolidation and widening of researchers' career prospects, and the promotion of excellence. As the activity is in principle open to all fields of S&T research that contribute to the community's RTD objectives, accessibility is by definition guaranteed to all EU researchers. However, the possibility of refining priorities, disciplines, participating regions, types of research organizations, and the level of experience of the targeted researcher populations, is retained, in order to respond to the evolution of relevant European requirements.

Special attention is also paid to a number of factors affecting the socioeconomic conditions of researchers, notably gender equity, linguistic balance, and career structure. The development of research activities in the less-favored regions of the EU and associated countries is taken particularly into account, complementing the efforts made in the context of the structural funds.

With a view to further reinforcing the human potential for research in the regions, human resource and mobility actions aim to attract the best and most promising researchers from third countries, promote the training of European researchers abroad, and stimulate the return of European scientists established outside Europe in their home regions.

Supporting the Development of Scientific Infrastructure in a Regional Context

Specific attention is paid to the valorization or the development of new scientific infrastructure in the regions, in collaboration and synergy with activities of the structural funds and the EIB. It has to be noted that modern scientific infrastructure is a key enabler of regional economic development (for example, S&T parks for efficient clustering and cooperation between academia and industry, or high-speed electronic networks and related facilities as a key gateway to the information economy).

In this case, a good example is electronic research networking. The EU-funded GEANT broadband electronic interconnection backbone is currently operational and linking all European electronic research and education networks with an average bandwidth of 10 gigabit/second (including networks in the candidate countries); this is due much in part to the community RTD FP pushing Europe for the first time in the lead in the field of electronic research networking worldwide. Additional support is expected to be provided by the EIB to regional and local upgrade networking initiatives, where appropriate. Researchers from EU less-favored regions and the candidate countries become thus able to cooperate under state-of-the-art conditions with their counterparts in advanced regions as well as with the rest of the world.

Increasing the S&T Knowledge Base in the Regions

In addition to activities foreseen from the regional actors' side, the European Commission services are active in developing a specific policy in order to develop understanding and knowledge about the different dimensions of research and innovation at regional level.

Offer Research and Innovation Services to the Regions

The Commission is in the process of gradually integrating the regions in its already undertaken benchmarking exercise in terms of performance of research and innovation policies. Extension of the scoreboards for research and innovation to the regional level are already available. This is to be completed by the analysis of the context of regional research and innovation policies and the diffusion of best practice (synergies will be developed with similar ongoing exercises in this field, e.g., RINNO [http://www.rino.com]).

Designing successful policies requires sufficient backing from statistics; working on the regional dimension of the ERA would require adequate work on S&T statistics and indicators at the regional level. In the past, the relevant Commission services have been active in the general area of regional statistics and much has been achieved but there is still work ahead in regional S&T statistics: better methodologies, better concepts, and a systematic incorporation of the regional dimension in the current surveys and data collections. The statistical results achieved during the last decade are promising; however, it is clear that statistical indicators able to describe the characteristics, structure, and performance of the knowledge-based economy are still lacking both at the national and regional levels. Based on such statistics, appropriate S&T indicators should be developed at the regional level.

The Commission has already launched studies and analyses as appropriate, in the field of regional research and innovation strategies (a study has been completed on the topic "Involving Regions in the ERA") touching on policies and strategies related to regional development.

Improve Communication Between Experts and Policymakers

The Commission is actively supporting the establishment of joint work and communication platforms between experts and policymakers at the regional level. For example, groups of experts have been established in the field of technology foresight at the regional level. The existing experience of projects like FOREN[8] has been used to guide further exercises in this direction.

[8] FOREN (http://foren.jrc.es) is a thematic network under the Commission's RTD FP (STRATA, strategic analysis of specific policy issues) that aims at promoting effective integration of foresight processes into regional development policy and strategy planning. It consists of a platform of experts and policymakers composed of representatives from two communities which are not used to work closely together: the technology foresight community and the regional development policy community. Its objective is to create and exploit synergies and action-oriented cooperation between actors in the two fields, primarily through the simulation of foresight-type activities. Experts and decision-makers representing both communities come from universities, research centers, and other foresight centers, as well as policy/decision-makers from regional development agencies and regional/local authorities.

Building a Regional Path to Prosperity

The challenge of designing a path for regional prosperity and growth has had many answers and many approaches. It seems that different views converge on the main concept of a *learning local economy,* because the overall variables defining the problem change constantly in a globalized world that is open to tough competition. By stimulating continuous learning for all local and regional actors (and especially firms), it is possible to create a solid basis on which innovative initiatives may occur.

Shaping the future at a regional level becomes possible when a rigorous analysis of all components of the local economic system is performed. Regional foresight emerges then as a prerequisite for a successful development strategy. The strengths, weaknesses, opportunities, and threats (SWOT) analyses are necessary as well as the establishment of different scenarios for the future. This way, regional policymakers may make informed decisions and increase their chances for a fruitful outcome, either by exploiting existing advantages or by creating new ones ("constructed advantage").

Establishing the appropriate framework conditions for R&D and innovation is another sine qua non for most regions aspiring for high growth economies. To the extent that their governance limitations allow, local policymakers can fine-tune overall conditions for technological innovation to grow (they may also influence national decisions towards this direction). This process may be immensely stimulated by a triple helix model, in which public private partnerships emerge as leaders. Local universities (2003) may play a very important role here.[9]

Towards More Integrated Strategies for the KE

Regions have by now come to be recognized as significant players in the effort to reach a KE in Europe. Building on their developing qualities, experience, and commitment, they will be increasingly present in Europe's efforts for growth and competitiveness. Enhancing this capacity and equipping them with the appropriate tools and strategies remains a challenge for the EU.

Regions are supported in their efforts by an increasing number of European policies, of which research, innovation, and cohesion ones emerge as decisive. While there is no doubt that cohesion policy is playing a major role for the regions, R&D policy remains instrumental for creating the necessary conditions for advancing the regions in the knowledge-based economy. Together with innovation, education, and training, research brings a new message to regional economies, allowing for new forms of advancement that keep pace with local but also international developments. Beyond regional development, regional research and innovation policies and initiatives may provide the essential ingredients for the emergence of agglomeration economies and of successful industrial clusters.

[9] An example of an emerging positive interrelation between universities and their "hinterland" is the so-called European Consortium of Innovative Universities (ECIU). Founded in 1996 by the University of Twente (Netherlands) it comprises 10 of Europe's most innovative and entrepreneurial universities. Its objective consists of developing dynamic interactions with the surrounding environment in such areas as education, research, information technology uptake, adult education, regional development, and various service functions. In itself it forms a model for the next generation of university networks. Source: F. Schutte and P.C. van der Sijde (Eds) (2000). *The University and its Region: Examples of Regional Development From the European Consortium of Innovative Universities*. Twente University Press.

The key message of this chapter is that European regions may now prepare to fully play their part in the new European and global economy by developing consistent agendas in research and innovation. To this end, integrated strategies supported by relevant Community policies (as it is the case with research and cohesion policy) will bring faster results, interconnecting regions into the fabric of a truly ERA.

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Chapter 14

Intellectual Capital Creation in Regions: A Knowledge System Approach

Anssi Smedlund and Aino Pöyhönen, *Research Assistants, PhD candidates of Knowledge Management, Department of Business Administration at Lappeenranta University of Technology, Finland*

Introduction

In the new economy, firms have to produce and distribute products faster to the market and continuously innovate new products to gain a competitive advantage. To extract value from intangible resources and capabilities are becoming increasingly important factors for the competitive advantage of firms (e.g., Drucker, 1988; Prahalad and Hamel, 1990; Quinn et al., 1997; Teece et al., 1997). In addition, it has even been noted that intellectual capital (IC) is a significant source of competitiveness on the national level (Edvinsson & Stenfelt, 1999; Edvinsson, 2002; Bontis, 2003). This has forced companies to form new kinds of structures. One of the new ways of organizing business is network-type cooperation in a regional cluster of small firms.

When successful, networks have numerous advantages for the participating organizations. Networks let the organizations produce more with lower costs by decreasing transaction and capital costs; organizations are able to learn the best practices and obtain market-related information from their partners; and the actors in a region are able to innovate new products in collaboration with others. In the heart of these processes is the capability to create and transfer new knowledge and use the existing knowledge in the network.

We have earlier conducted a framework for modeling and managing IC creation in regional clusters (Pöyhönen & Smedlund, 2004). In this framework, we argued that in order to maximize its value creation potential, a regional cluster of small firms has to create new knowledge, transfer existing knowledge, and implement knowledge at the same time. In this chapter, we will describe this topic in detail, and define a new approach for understanding regional knowledge creation and the dynamics of creating IC in a complex collaboration of multiple actors.

Three main themes appear in the different theories of the intellectual resources of organizations. These themes are: (1) intangible assets, (2) competencies and capabilities, and (3) social relationships in which the knowledge processes occur (Table 1). In this chapter, we study inter-firm networks by dividing a complex network of multiple actors into smaller units. This helps in seeing the essential structures behind the value creation on a regional level. We view IC as the capability of an organization to create, transfer, and implement knowledge. A capability approach is crucial to the new economy, where new innovations are an essential way to gain a competitive advantage.

The conception of knowledge is fundamentally different in each of the themes concerning the intellectual resources of organizations. In the intangible asset approach, knowledge is defined as a possession or property of the organization, typically consisting of human, structural, and customer capital (Brooking, 1996; Stewart, 1997; Sveiby, 1997; Bontis, 1999). The capability approach views knowledge as an ongoing and emergent process, where the capability to leverage, develop, and change intangible

Table 1: Three approaches to the determinants of competitive advantage in knowledge-based economy

	Asset Approach	Capability Approach	Relational Approach
Knowledge understood as	Possession or property of the organization	Ongoing, emergent process	Socially constructed and shared resource
Main interest	Identification and valuation of existing intangibles	Capability to create, develop and modify intangibles	Social relationships and interaction
Focus on	Investments, intellectual property rights, human capital, structural capital, customer/relational capital	Adaptive and self-generative capability of the unit of analysis	Characteristics of the social relationships connecting the actors and social capital embedded in them
Research trends	Intellectual capital, IPR management, human capital statement	Dynamic capabilities, dynamic IC, organizational renewal ability	Social capital, inter-organizational networks, communities of practice
Representative authors	Brooking, 1996; Stewart, 1997; Sveiby, 1997	Teece et al., 1997; Leonard-Barton, 1995; Eisenhardt & Martin, 2000; Ståhle et al., 2003; Pöyhönen, 2004	Brown & Duguid, 1991; Lave & Wenger, 1991; Nahapiet & Ghoshal, 1998; Cohen & Prusak, 2001

assets is important (Teece et al., 1997; Eisenhardt and Martin, 2000; Ståhle et al., 2003). Finally, in the relational approach, knowledge is understood as a socially constructed and shared resource. The focus of the relational approach is on the social relationships connecting the various actors and the social capital embedded in these relationships (Brown and Duguid, 1991; Lave and Wenger, 1991; Nahapiet and Ghoshal, 1998; Cohen and Prusak, 2001).

In this chapter, we suggest a new capability and relationship-based view to the IC creation in a regional cluster. The regional cluster of small firms is studied in accordance with the network theories and the influence of social relationships and interaction on organizational success.

Recent studies show that new innovations are created in networks which combine different actors and resources (i.e., Lundvall and Borrás, 1998; Powell, 1998; Miettinen et al., 1999). There have also been suggestions that regional competitive advantage is related to the formal and informal networks between the actors in the region (McDonald and Vertova, 2001). In our research on a regional cluster, we set out to determine how IC is created between the actors in a region, by dividing the regional cluster of small firms into distinct entities according to their IC functions. The main goals of the case study were to define the kind of knowledge and competence the actors have, the nature of relationships between the actors, how information is transmitted, and how these processes are managed and coordinated.

Our solution for a new approach for understanding regional knowledge creation is a concept we call the regional knowledge system. This system includes knowledge implementation, knowledge transfer, and knowledge creation levels in a regional cluster of small firms. The region needs all of the levels to be successful. On the one hand, new knowledge is transferred from the knowledge creation level to the knowledge implementation level via the knowledge transfer level. On the other hand, new ideas for innovation emerge from the knowledge implementation level and are transferred to the knowledge creation level. In the regional knowledge system, we call these levels the production, development, and innovation network of the regional cluster.

This chapter presents a classification of three types of interorganizational networks, illustrates them with the findings from a case study, and introduces a novel approach to IC creation in regions. The research is a case study conducted during the winter of 2002 to 2003 in a regional cluster of small firms in eastern Finland. The case of this chapter is based on a research project coordinated by the Finnish Association of Graduate Engineers, TEK, during the years 2002 and 2003.

The Benefits of Inter-Firm Networking

The social scientist Manuel Castells defines network simply as a "set of interconnected nodes" (Castells, 1996, p. 470). Actors form nodes in any network structures, and transmit various types of flows to other actors in the network. Castells' view about networks is related to his theory about the world as a "space of flows." According to this theory, the world is going through global decentralization and reallocation of operations. Regions compete against each other in global markets and try to attract important flows to themselves. The most important type of flow is capital. Other flows can be, for example, competent employees and information (Castells, 1996). According to Castells (1996), actors in the markets can be divided into two categories: insiders and outsiders. Insiders are the ones who have managed to get into a network with growth opportunities. Outsiders are the ones left out to get the lowest bids.

The idea about insiders and outsiders is related to the concept of "markets as networks." In this view, markets are dominated by alliances. These structures consist not only of buyers and sellers, but also of other actors such as consultants, service providers, and institutions. According to the markets as networks view, the markets of industrial products are complex networks of multiple actors. In these networks, relationships between the actors contain three main components: activities, resources, and actors (i.e., Håkansson and Johanson, 1992; Ford et al., 1998). The roles of the different actors in the network can be defined on the basis of this distinction.

The economists Shapiro and Varian (1999) also see networks as a prerequisite for succeeding in competition. In the new economy, the markets are dominated by networks that gain strength as more actors join the network. In the economy dominated by alliances and networks, the value of a product is dependent on the amount of other users of the product. It is better to be connected to a bigger network than a smaller one. Typical examples of this effect are communication technologies, such as telephone, email, and fax (Shapiro and Varian, 1999).

Alliances that several different actors form in the markets divide the old model of value chains introduced by Porter in 1985. When the markets are seen as networks, the actors in the network can consist of many other types of actors than traditionally thought. The actors include not only the focal firm but also customers, suppliers, hardware suppliers, institutions, and so on, which are all important for the whole network. The information flows between all of the actors in the network.

The Porterian value chain theory (Porter, 1985) is based on the old industrial tradition. In Porter's view, raw material is processed in different phases of production, where every phase adds the value of the final product. The Porterian value chain theory is usable with physical raw material, due to the fact that physical raw material can be moving only in a certain direction at a time and it can be located only at a certain point at a time.

The main difference between the Porterian value chain theory and the concept of value networks is that the value chain theory did not take into account the fact that the flows between the actors can also be intangible and the information can be flowing between all the actors. The value network generates economic wealth with complex exchanges between the actors involved in the network. The value chain and network are also different in terms of social relations. For example, Allee (1999) argues that in the old competitive business environment, one could sacrifice a relationship for the sake of short-term gain. In the transparent world of value networks, even an occasional loss of trust may be harmful in unexpected ways.

Network-based alternatives for the value chain model have been presented by numerous scholars (i.e., Prahalad and Hamel, 1990; Allee, 1999; Allee, 2000; Normann, 2001; Allee, 2002; Pirnes, 2002). The key components common for all value network-based models are that they emphasize the combination of different resources and competence. Small firms will be able to compete against big corporations only by realizing their core competencies (Prahalad and Hamel, 1990; Hamel, 2000). According to Hamel (2000), all new and revolutionary business models are a just a novel, innovative way to combine old ideas, resources, and competence from different actors and fields of businesses.

Being an active actor in a value network in a regional cluster of small firms provides the actors with numerous benefits. First, according to the theory of transaction costs and from the strategic alliance point of view, networks lower the transaction costs of the actors by allowing them to concentrate on their core competencies. Second, according to social capital theories and research, the networks in a regional cluster initiate learning from other actors with trustworthy and communicative relationships. Third, according to research on innovation processes, a regional cluster of small firms provides an opportunity to continuously improve products, production methods, and processes by providing conditions for combining different resources and knowledge.

The First Benefit of Networks in a Regional Cluster: Lower Transaction Costs

In a regional cluster of small firms, interorganizational networks lower the transaction costs by allowing the actors to concentrate on their core competencies. The actors form strategic alliances with each other. In strategic networking, cooperation is developed and organized according to the shared objectives of the actors involved. Strategic cooperation is extended to all levels in the subcontracting network and the relationships are seen as significant investments, which makes them long-term and carefully chosen. (Paija, 1999; Luomala et al., 2001)

Networking for strategic competitive advantage differs from other forms of cooperation. According to Hyötyläinen and Simons (1998), the other forms of cooperation are: 1) bidding contest for subcontractors, 2) subcontracting cooperation, and 3) partner-type of cooperation. All of the three other forms of cooperation are dyadic in nature, but in strategic networking dyadic relationships are expanded to the level of multilateral cooperation.

The transaction cost theory provides one solution for understanding inter-firm cooperation (for theory, see, e.g., Coase, 1937; Williamson, 1975; Williamson, 1981; Williamson, 1985). The basic idea behind the transaction cost theory is that organizations try to minimize their total costs, which are formed by production and transaction costs. Transaction costs can be seen as “friction of the economy,” and they have to be minimized. According to the transaction cost theory, as the cost of capital rises, the transaction costs also rise (Williamson, 1985; Schienstock and Hämäläinen, 2001). Market-based controlling of actions is good when the capital costs and transaction costs are low. In the market-based model, the firm buys the material and parts needed in production, and then sells the products in a market where the buyers and sellers stay anonymous. Hierarchies function best in the kind of businesses where high capital costs and high transaction costs prevail. In the hierarchical model, the firm controls the whole production chain from raw material acquisition to the selling of the product. Networks, on the other hand, are a good option to control actions when the business involves average capital and transaction costs (Coase, 1937; Williamson, 1975; Williamson, 1985; Schienstock and Hämäläinen, 2001).

In Jarillo’s (1988) opinion, networks are the ultimate way to organize business, if the company is able to create a system which lowers the transaction costs of the firm, outsources functions to the best subcontractors, and keeps the firm-specific core competence inside the firm. When networks are used consciously to gain competitive advantage, Jarillo calls them “strategic.” Essential for Jarillo’s strategic network is that there is a focal company which has started the cooperation. The focal company then maintains long-term relationships with the companies in its network to gain the trust of the subcontractors and to lower the transaction costs. The companies in the network specialize in their own core competence.

The Second Benefit of Networks in a Regional Cluster: Learning From Others

The second benefit that networking inside a regional cluster offers is learning from other companies through the mechanisms of social capital.

The basic idea behind social capital is similar to the old saying: "it's not what you know, it's who you know." A well-constructed social network opens doors to sources of information which would normally beunreachable. With this information, an actor gains a competitive advantage, because they know more than others. With the information gained from the social network, the social capital that the actor possesses is transformed into the personal human capital of the actor (Johanson, 2000).

Putnam (1995, pp. 664–665) defines social capital as "features of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives."

Nahapiet and Ghoshal (1998, p. 251) present the same idea in the context of organizations. Organizations foster social capital, and firms that have high social capital gain a competitive advantage. Nahapiet and Ghoshal also divide the concept of social capital into three different components slightly similar to Putnam's definition, although they call the components structural, cognitive, and relational dimensions of social capital.

In his comprehensive literature review, Ruuskanen (2001) argues that the components of social capital create advantages through two mechanisms that are connected to each other: trust and communication. In his opinion, trust towards other people and formal or informal institutions is essential. The information flow in the network and the capability of the actors to understand each other is also essential. In addition, Ruuskanen states that communication in the network and trust between the actors are especially important on a regional level.

The components of social capital have been argued to enhance learning and productivity among the actors in the network. Yli-Renko et al. (2001) have studied the power of social capital in explaining the development of a competence-based competitive advantage in new technology firms. They conclude with the data of 180 new technology firms in Great Britain that social interaction, customer network ties, and the quality of the relationships have a statistically significant connection to learning in key customer relationships. They also note that learning in the relationship significantly explains the competitive advantage (Autio, 2000; Yli-Renko et al., 2001). Autio (2000, p. 47) even states that the correlation between social capital and the learning benefits gained from social capital explain the fact that technology-based firms tend to be concentrated to specific regions.

However, as forging and maintaining social capital entails significant costs, it may not always improve financial success. When studying 143 Finnish firms Pöyhönen and Waajakoski (2004) found that social capital was related to organizational growth only in those cases where the firms either had extensive collaboration with their most important business partner, or belonged to an established interorganizational network. In other cases, the costs of social capital neutralized its positive effects.

The Third Benefit of Networks in a Regional Cluster: Continuous Innovation

A regional cluster of small firms provides an opportunity to continuously improve products, production methods, and processes by providing conditions for combining different resources and knowledge.

Innovations have a social character and innovations today require highly specialized knowledge from different fields. For example, in 1901 81% of U.S. patents were issued to independent inventors, but in 1980, individuals acquired only 20% of new patents (Whalley, 1991, p. 208). Powell (1998, p. 229) argues that new innovations are not even created in individual companies, but in the networks of multiple companies and actors. Miettinen et al. (1999) studied innovations in several Finnish projects, and the conclusion of this study was that most of the new knowledge creation occurs in networks. It has also been argued that regional networks have an important role in the competitive advantage and innovativeness (Lundvall and Borrás, 1998; McDonald and Vertova, 2001). According to Lundvall and Borras (1998, p. 109) the regional dimension is important for new innovations because of three reasons. First, the creation of human capital requires geographical proximity. Second, geographical proximity increases the possibility for casual and planned meetings, as well as spontaneous and structured information exchange, and thereby increases the emergence of formal and informal networks. And third, synergies can emerge from the shared cultural, psychological, or political perspectives of those engaged in the same industry within the same economic space or region.

Production, Development, and Innovation Networks

In this section, we will present the theoretical background for our theory of three types of networks in a regional cluster. According to the value network approach introduced by Allee, and some of the network theories previously described, we also suggest three main purposes for networking in a regional cluster.

Allee's Theory on Value Networks

Allee's work with value networks (1999; 2000; 2002) is one of the most recent contributions towards understanding the complex networks that generate value. In her opinion, any organization can be understood as a value network (2000). Her view is based on the idea that dynamic exchanges of goods, services, knowledge, or intangible benefits create value in a network. It is also possible to map all of these dynamic exchanges, which makes understanding and measurement of the value networks possible.

Allee sees organizations in new economy as living systems, which is a totally different point of view than defining organizations as traditional mechanistic ones. She describes organizations as living systems, and bases this account on Capra's (1996) theories about the definition of a living organism, and with the concepts of the autopoetic network and the dissipative structure of a living system from the systems theory literature. According to Allee's model, organizations are combinations of actors with tangible and intangible exchanges flowing between them. When compared to a living organism, tangible flows are flows of energy and matter in the organization. Intangible flows, such as knowledge, make the organization intelligent as a living system. The intangible flows also prove that the organization is capable of taking conscious actions (Allee, 2002).

By relating Allee's views about value networks with the theory about network-based alternatives for the value chain, to the concept of "markets as networks" and the social character of innovations, three main purposes for value networks can be described. A regional cluster can be seen as a value network where the flows between the actors are not only tangible, but also intangible.

The first purpose for a value network is to generate value, that is, to bring cash flow to the system and make a profitable business. As previously described, the value creation process in value networks is different from the traditional value chain introduced by Porter (1985). In the value network, intangible benefits and knowledge support the exchange of goods and services to money. This makes it possible to combine different resources and competencies in innovative ways to generate value for the network.

The second purpose of a value network is to ensure that information is transferred between the actors. Intangible flows, such as strategic information and process-related information, are byproducts of tangible flows, which help to form relationships to exchange information and make the organization run smoothly. According to Allee (2002), intangible flows are important, because they make the system "alive".

The third purpose of a value network is to bring different actors and resources together. According to the "markets as networks" (Ford et al., 1998; Shapiro and Varian, 1999) point of view previously described, the network is more valuable when it encompasses more actors, and according to theories about innovation networks (i.e., Lundvall and Borrás, 1998) new innovations emerge from the combination of highly specialized knowledge from different actors. Dynamic exchanges of tangible and intangible flows attract more actors to join the network.

Knowledge Environment of a System

In her 1998 dissertation, Ståhle proposed a theory about the self-renewal ability of groups and organizations. By analyzing system theories, she was able to define four basic determinants for organizations: (1) knowledge and competence, (2) relationships, (3) information flow, and (4) management and leadership method (Ståhle, 1998; also see Ståhle & Grönroos, 2000; Ståhle et al., 2003). Ståhle's main theoretical contribution is that in organizations there are different environments, where organizational determinants are different. These environments are (1) mechanic, (2) organic, and (3) dynamic. Ståhle labels them the "knowledge environments of an organization." Every environment has its own way to produce value with knowledge, which we call the "IC-related function" (Pöyhönen, 2004; Pöyhönen and Smedlund, 2004). In the mechanistic category, the IC-related function implements knowledge into practice as effectively as possible. In the organic category, it transfers knowledge inside the organization. The IC-related function of the dynamic category is to create new knowledge. In order to be successful, an organization has to have each type of knowledge environment present. This means that the organization has to: 1) implement knowledge, 2) transfer knowledge, and 3) create knowledge in order to continuously renew itself. With continuous self-renewal the organization is able to produce new innovations according to the needs of the markets and find a competitive advantage.

The differences between the knowledge environments and the organizational determinants are summarized in Table 2 below. In order to be efficient in knowledge implementing, the actors in the mechanic knowledge environment have to have defined, explicit knowledge about what they are doing. An example of an organization with mechanic system logic is a factory. In a factory, it is important to produce something that has already been designed as efficiently as possible. To do this the factory needs knowledge, relationships, information, and leadership similar to mechanic system logic.

To transfer knowledge between actors, the organic system logic has to be led with dialogue and empowerment. This means that in the organic environment, the relationships are of the consensus-seeking type, and the actors have their own tacit form of knowledge. For example, in a service organization it is important to learn from the experiences of others and improve customer service step by step. A service organization can be steered more towards organic system logic.

On the dynamic, knowledge-creating level it is important to have a great amount of intuitive and potential knowledge. Relationships are spontaneous and abundant. Information flow is chaotic and it is managed by networking and relinquishing of power. An example of an organization with dynamic system logic would be an advertising agency that has to constantly design new ideas.

Every organization has to have all of the knowledge environments present in order to be successful. This means that even if a factory has a mechanic systems logic emphasized, it needs characteristics from organic and dynamic knowledge environments as well. According to Ståhle and Grönroos (2000), the dynamic knowledge environment is in key position for continuous innovation. On the other hand, an organization needs an organic and dynamic knowledge environment as well to turn innovations into profitable business.

Production, Development, and Innovation Network

In a regional setting, three basic network types can be distinguished. These types function as knowledge creation, knowledge transfer, and knowledge implementation

Table 2: Knowledge environments, IC functions and organizational determinants (Based on Ståhle and Grönroos, 2000; Pöyhönen and Smedlund, 2004)

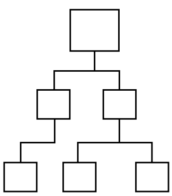
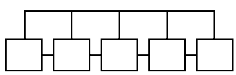
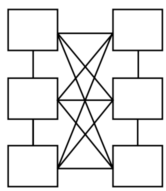
Knowledge environment	IC function	Knowledge and competence	Relationships	Information flow	Management and leadership method	Example
Mechanic	Implement knowledge	Defined, explicit	Determined by hierarchy	One-way, top-down	Orders, direct use of power	Factory
Organic	Transfer knowledge	Experiential, hidden, tacit	Reciprocal, seeking consensus	Multi-way, horizontal	Dialogue, empowerment	Service organization
Dynamic	Create knowledge	Intuitive, potential	Spontaneous, abundant	Chaotic, sporadic	Personal networking skills, relinquishing power	Advertising agency

levels in a regional cluster of small firms. As previously described in our first article about IC creation in regions (Pöyhönen & Smedlund, 2004), the three network types are different from each other in terms of their structure, IC-related function, and Ståhle's (1998; 2000; 2003) knowledge environment. The different network types are summarized in Table 3. We name these three different network types production network, development network, and innovation network.

In our approach, the sales process is always considered to be in the production network. In the production network, the flows between the actors are related to the production of a product, so they consist mostly of physical products or money. All of the information flowing between the actors is related to production, e.g., information about stock levels. The production network can be dominated by a single, central actor, or the network can be coordinated by a broker outside the actual network setting. The actors in the production network do not necessarily know all of the other actors involved. The relations in the network are based on dyadic relationships between an actor of the network and the dominating actor or the broker. The network structure is hierarchical. The essential characteristic of the production network is that it serves as an effective manner to produce a pre-designed product or service.

Ideally, a production network functions as mechanistic machinery (Ståhle & Grönroos, 2000), which efficiently produces permanent quality and achieves predetermined goals. In order to do this, the network necessitates clear and coherent rules and regulations. Thus, the essential knowledge of the production network should be in explicit form and circulated to all relevant actors. It is enough that information

Table 3: Production, development, and innovation network

	Production Network	**Development network**	**Innovation Network**
Illustration			
Structure	Vertical	Horizontal	Diagonal
IC function	Implement knowledge	Transfer knowledge	Create knowledge
Knowledge environment	Mechanical	Organic	Dynamic
Flows between actors	Tangible (i.e., products, money) Intangible (i.e., production-related information)	Intangible (transferable firm-specific information, know-how)	Tangible (i.e., innovation related products, money). Intangible (i.e., research knowledge, experimental knowledge, know-how)

flows in one direction, mostly top-down, because discussion and elaboration open up the possibility for modifications, which in this type of network are unwanted and mere hindrances to its effectiveness. This kind of operational mode is facilitated by centralized control and hierarchical structure.

The development network is a horizontal network construct that can be used for joining together firms in a regional cluster, even if they do not have cooperation in the production function. The actors in a development network can even be competitors. In the development network, the actors share information that benefits all of the actors individually. The flows between the actors in the development network are intangible by nature. The flows can be, for example, information about the production methods and customers, or personal know-how of the actors. The development network is the only type of network where there are no tangible flows between the actors. By learning the best practices of others, firms can achieve a higher level of efficiency. In a regional setting, a development-focused network can improve the actors' performance in, for example, marketing or acquisition of venture capital. The essential characteristic of the development network is its knowledge-sharing nature.

The development network resembles Ståhle's and Grönroos's (2000) account of organic knowledge environment within organizations. The continuous development conducted in the organic environment is based on tacit knowledge, lateral two-way information flows, double contingent relationships, and empowering leadership. Similarly, in the development network, the actors' capabilities develop over time as they learn from each others' experiences. The relations are reciprocal and based on trust rather than on detailed formal agreements. Cooperation is conducted in everyday casual communication between the actors, and active participation is encouraged. In the development network, there is no single dominating actor. However, there can be a coordinator that supports knowledge sharing.

In the innovation network, new knowledge is created and new solutions for problems are developed consciously in cooperation with the actors involved. The flows between actors are related to the innovation process at hand. The flows can be samples of products, research knowledge, or experimental knowledge. The relationship structure in an innovation network is diagonal. This means that the actors participating in the innovation network are from different production chains and different industries. The innovation network can also tie together institutional and entrepreneurial actors.

The innovation network should master the creation of knowledge that is novel for everyone in the network. This requires that there is room for creativity and that the operational mode of the network is not too structured and formalized. Along the lines of Ståhle's and Grönroos's (2000) description of dynamic knowledge environment, potential and intuitive knowledge, even self-transcending knowledge (Scharmer, 2001), should be highly valued. The relations are informal and rich and the actors' capabilities are multifaceted. The innovation network is ideally led by the actor who is the most suitable for coordinating the resources and knowledge, i.e., authority migrates according to expertise rather than position in the hierarchy.

The Case

The idea of production, development, and innovation networks was applied to a case cluster. The main research problem was to determine whether it is possible to divide the inter-firm cooperation which occurs in a specific region into these three network types. Our goal in the case region was to map all of the actors involved, model the relationships between the actors, and find the strengths and weaknesses of the cooperation.

Background

The case region is a relatively young cluster of small firms located in the eastern part of Finland. The firms in the cluster operate in the mechanical wood processing industry, which is a traditional field of business dominated by a few large corporations. At least in Finland, there has been very little network-based cooperation in this particular industry, and almost all previous attempts to form network arrangements between small firms have failed (Passila, 1998).

In March 2003, there were eight internal actors involved in the cluster. All of the internal actors were situated within approximately 100 yards from each other in the same industrial area provided by local municipalities. Four of the actors were small manufacturing firms that manufactured end products (sawn timber) to the market. All of the manufacturing firms had slightly different raw material requirements and products, so they were not in direct competition with each other. One of the actors was a service provider that managed one phase of the production (the drying of the timber) for the manufacturing firms. The raw material acquisition firm was owned jointly by all of the municipalities in the region. One of the actors rented labor and machinery to all of the other actors in the area. In addition, there also was a university's research laboratory in the same industrial area.

The case cluster was a collaboration bringing together several regional actors: local entrepreneurs, venture capitalists, and institutional actors. The main institutional actors were several local municipalities and a local university. Compared to their overall budgets, the local municipalities had invested heavily in the formation of the cluster.

Figure 1 provides an overall view of the region and shows what the relations looked like in March 2003. The illustration was been made according to Allee's value network approach recommendations, except that the flows are pictured with two-headed arrows. Allee does not like two-headed arrows, because they do not tell anything about the direction of the flow (Allee, 2002, p. 9), but we have used them in this overall picture to make the figure readable. In this picture, the arrows represent the existing relationship between the actors. Internal actors (actors within the same industrial area) are depicted as circles and external actors (actors outside the industrial area) are depicted as ovals.

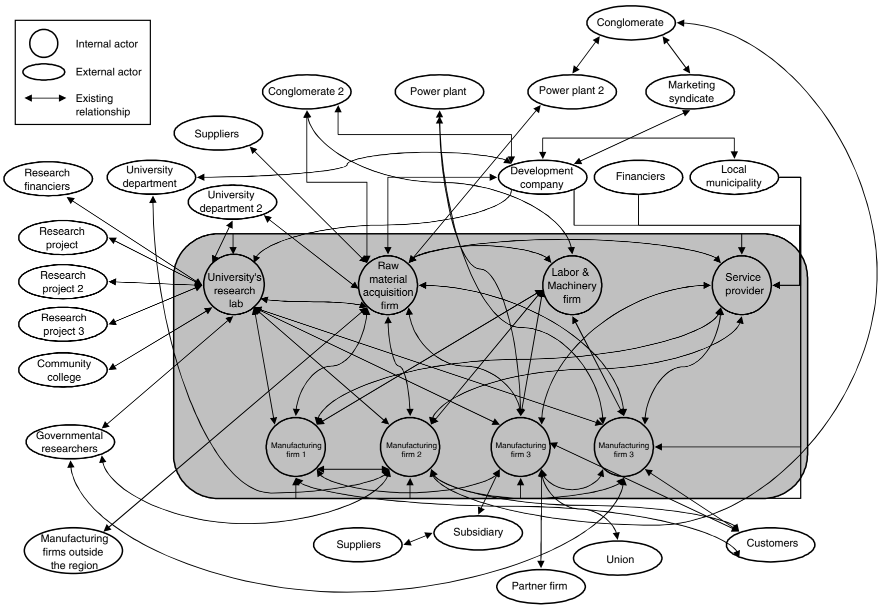
In designing a network graph, it is always difficult to decide which actors belong to the network and which do not. We solved this problem by including only the actors that the interviewees mentioned. The gray area in Figure 1 illustrates the industrial area. The actors in this area were located only approximately 100 yards from each other. The actors outside the gray area were located somewhere else, but the internal actors considered them important. The role of the development company owned by the local municipalities was considered important by the interviewees. The development company had been in an essential role in the formation of the region.

Methods

We examined the case region according to the socio-centric network perspective, which means that we assessed the benefits of networking from the viewpoint of the whole network, not from the actor-centric perspective of an individual organization (Adler and Kwon, 2002). The research method was a case study. The data was gathered with 11 theme-based interviews and site visits. As a part of the theme-based interview, the

Figure 1

Overall illustration of the case regional cluster according to Allee's (2002) value network model



interviewees were asked both to draw a graph of how they perceive the network and to verbally explain the connections and flows between the actors. Some of the interviewees commented on a graph made by us. Based on these graphs and the related explanations, an overall presentation of the cluster and the three network types identified within it were modeled using Allee's (2002) value network approach model. The interview themes were constructed on the basis of the knowledge environment theory by Ståhle and colleagues (Ståhle and Grönroos, 2000; Ståhle et al., 2003). The IC creation process in different network types was thus studied from the viewpoints of: 1) what kind of knowledge and competence the actors had, 2) what the nature of relationships between the actors was, 3) how information was transmitted, and 4) how these processes were managed and coordinated.

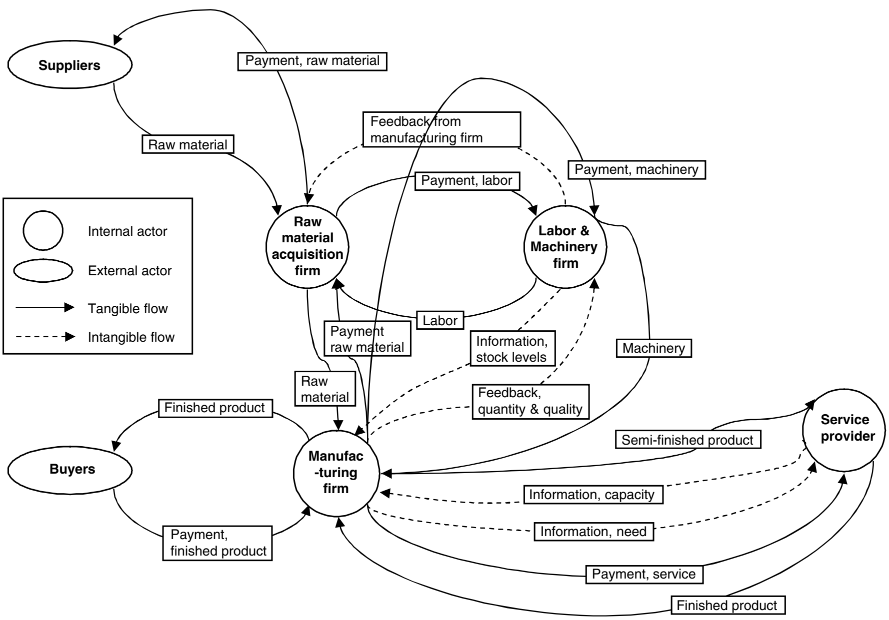
Based on the organizational determinants introduced by Ståhle, we were able to make two important conclusions about the case region. First, we were able to discern the systemic logic according to which the various types of networks within the cluster were functioning. And second, we were able to find specific strengths and weaknesses in the operation of the different network types. As a byproduct of the theme-based interviews, we also managed to define the strategic goals for the different network types.

Case Production Network

The production network was the heart of the whole region. With the operation of the production network, the final products were sold to the customers and money was

Figure 2

Production network according to Allee's (2002) value network model



flowing to the region. All of the manufacturing firms in the case region followed the production network logic described in Figure 2.

In the production network of the case region, the manufacturing firm buys raw material from the raw material acquisition firm, uses the service provider to make one phase of the production, and then sells the finished product to the customers. The labor and machinery firm provides labor and machinery services for the manufacturing firm and material acquisition firm.

Most of the flows in the production network are tangible (products, money, machinery, or labor). Intangible flows related to production are production-related information about stock levels, capacity, and need.

After drawing the picture of the typical production network in the region, we noticed that the production related information flow was not working properly. For manufacturing firms, it is important to know what type of raw material is available and when. Information about stock levels in the raw material acquisition firm helps the manufacturing firms in production planning and saves the costs of production significantly. In the case production network, information about the stock levels was circulated through the labor and machinery firm, which caused problems for the manufacturing firms. In the most favorable situation, the information would have to flow directly from the raw material acquisition firm to the manufacturing firm. On the other hand, the information flow between the service provider and the manufacturing firms was satisfactory. The manufacturing firms informed the service provider about the needs for services and the service provider told the manufacturing firms about the service capacity. The service provider had limited capacity, so it was important for it to know the service need and urgency.

Considering competence, the production network had good preconditions, because none of the manufacturing firms competed directly with each other. All of the manufacturing firms had different products and needs concerning the type of raw material. The only competence-related problem in the production network was that the core competencies were not clarified in every manufacturing firm. It seemed that some of the manufacturing firms had machinery that they did not necessarily need.

A lack of clear agreements about transactions caused unnecessary disputes between the raw material acquisition firm and the manufacturing firms. Despite the fact that the whole region was originally built around the centralized raw material acquisition firm, some of the manufacturing firms considered the centralized raw material acquisition as a threat. As a whole, the relationships in the production network were not very good. Some of this was merely caused by the lack of information from the acquisition firm to the manufacturers.

The management and leadership of the production network should always be in the hands of the firm who sells the final product to the customer. This was not the case in the region. The raw material acquisition firm had a too dominating role in the production network.

Case Development Network

The development network level represents the social and informal side in the cooperation between the actors in a region. In principle, all of the actors in the same geographical region should be included in a development network in some way or another. In the most favorable situation, the actors in the development network exchange information with all of the other actors in the same region.

In Figure 3, the two-headed arrows were used because of practical reasons to illustrate the development network in the case region. In this figure, the two-headed dotted line illustrates the knowledge exchange between the actors. Some of the actors had close relationships to a few external actors as well, so we included them in the figure.

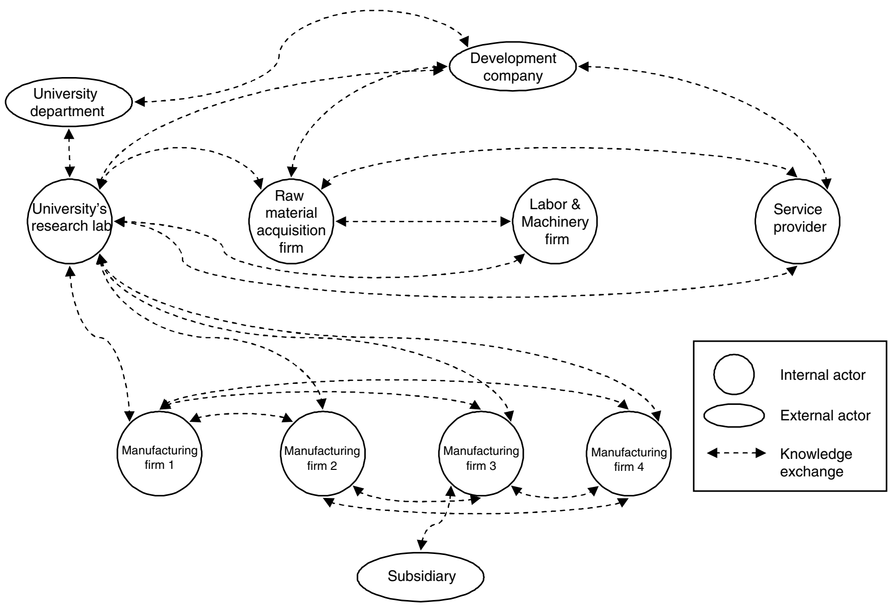
As with the production network, we can again make important observations about the information flow in the region just by examining the figure of the development network. In the development network setting, the manufacturing firms communicate with each other daily. The manufacturing firms exchange experiences continuously and the geographical proximity makes the knowledge exchange easy. The raw material acquisition firm, the development company, and the service provider also exchange information regularly.

The development company owned by the local municipalities was an important actor during the creation of the region. The development company still tried to lead the informal communication and knowledge sharing between the actors by bringing the actors together in common meetings. The entrepreneurs in the manufacturing firms did not like these meetings and some even thought that they were useless.

The university's research lab functioned as a link between the two cliques in the region. This setting had many negative consequences to the functioning of the whole region. Trust between the cliques was not very good, which hindered all communication and processes between the cliques. The role of the university's research lab sometimes seemed to be just that of a referee in the disputes between some of the

Figure 3

Development network according to Allee's (2002) value network model



actors in the region. For some reason or another, it seemed that the problems in the production network level caused friction to the relationships and a couple of persons had a bad reputation among the manufacturing firms. The university's research laboratory, on the other hand, was quite trustworthy in the eyes of the manufacturing firms. The researchers from the university had been sharing production-related knowledge since the foundation of the region.

All of the entrepreneurs in the region had different backgrounds and know-how about the field of business. Knowledge about the raw material the region processes was quite rare, and some phases of production were still unclear. The region used birch as raw material, but most of the manufacturing firms had experience only of pine wood. The region needed a good atmosphere for knowledge sharing, because the actors needed to improve their material and process-related knowledge constantly. The manufacturing firms learned some production-related issues from each other and technical problems were in some cases solved in a group. Some of the manufacturing firms were considering a united marketing force. In March 2003, the manufacturing firms had a couple of shared customers, but normally every firm was selling their own products to their own customers. It would be possible to form a shared marketing function, if the firms would share their marketing knowledge with each other. A shared marketing function between the manufacturing firms would benefit all of the manufacturing firms. Together, the firms could offer larger quantities of products to the market. A shared marketing function would also let the manufacturing firms concentrate more on their core competencies, because they could use each others' products in case a customer needed them.

Case Innovation Network

The innovation network combined different resources and knowledge to create solutions for production-related problems. Although the core of the innovation network was inside the region, it had actors from outside the region as well.

Figure 4 is just one example of an innovation process in the region that the interviewees shared with us. In our case (Figure 4), a manufacturing firm noticed a quality-related problem in the semi-finished product that the service provider handled. The manufacturing firm then told the university's research laboratory about this problem. The university's research laboratory used the manufacturing firm's tacit knowledge (know-how), theoretical research knowledge from other research projects, and funding from the financiers to solve the problem.

Some notes about the relationships and information flow in the region can be made on the basis of Figure 4. The university's research laboratory had a dominating role in this particular innovation example. Most of the flows between the actors were intangible by nature (information, research knowledge, and know-how) and the research laboratory seemed to dominate them. The research laboratory had the leadership of the innovation process. Considering the information flow, the region benefited from the short distances between the actors. The geographical proximity made communication easy, and face-to-face knowledge sharing was very common. Even the research knowledge was usually transferred in oral form. This was seen as a good thing, because written research reports tend to stay unread by the entrepreneurs.

The competence of the innovation network was the research laboratory's theoretical research knowledge and the empirical tacit knowledge of the entrepreneurs. The research laboratory and the other actors had symbiotic relationships in the region, and the interviewees thought that everybody benefited from the presence of the research laboratory in the area. From the point of view of the research laboratory, the region was quite a rewarding place for new research ideas. Day-to-day communication with the manufacturing firms provided many new ideas that are usually difficult for a researcher at a university to obtain.

The relationships in the innovation network were good. The informal relationships enhanced the communication between the researchers and the entrepreneurs. The manufacturing firms also used other types of services of the researchers frequently and the researchers were appreciated among all the actors in the region.

The Strengths and Weaknesses of the Production, Development, and Innovation Networks in the Case Cluster

By using Allee's (2002) value network approach and Ståhle's (1998; 2000; 2003) organization determinants, we were able to divide the regional cluster into three distinct network types according to the model previously. We were able to find the strengths and weaknesses of the operation of the different network types by using: (1) knowledge and competence, (2) relationships, (3) information flow, and (4) management and leadership method as criteria. The findings are summarized in Table 4.

In summary, the greatest weakness of the production network was poor information flow about stock levels between the actors. The relationships in the development network were not very good due to some production-related problems, and the leadership of the innovation network was still in the hands of one actor. To ensure the future success of the case region, the organizational determinants of production,

Figure 4

Innovation network according to Allee's (2002) value network model

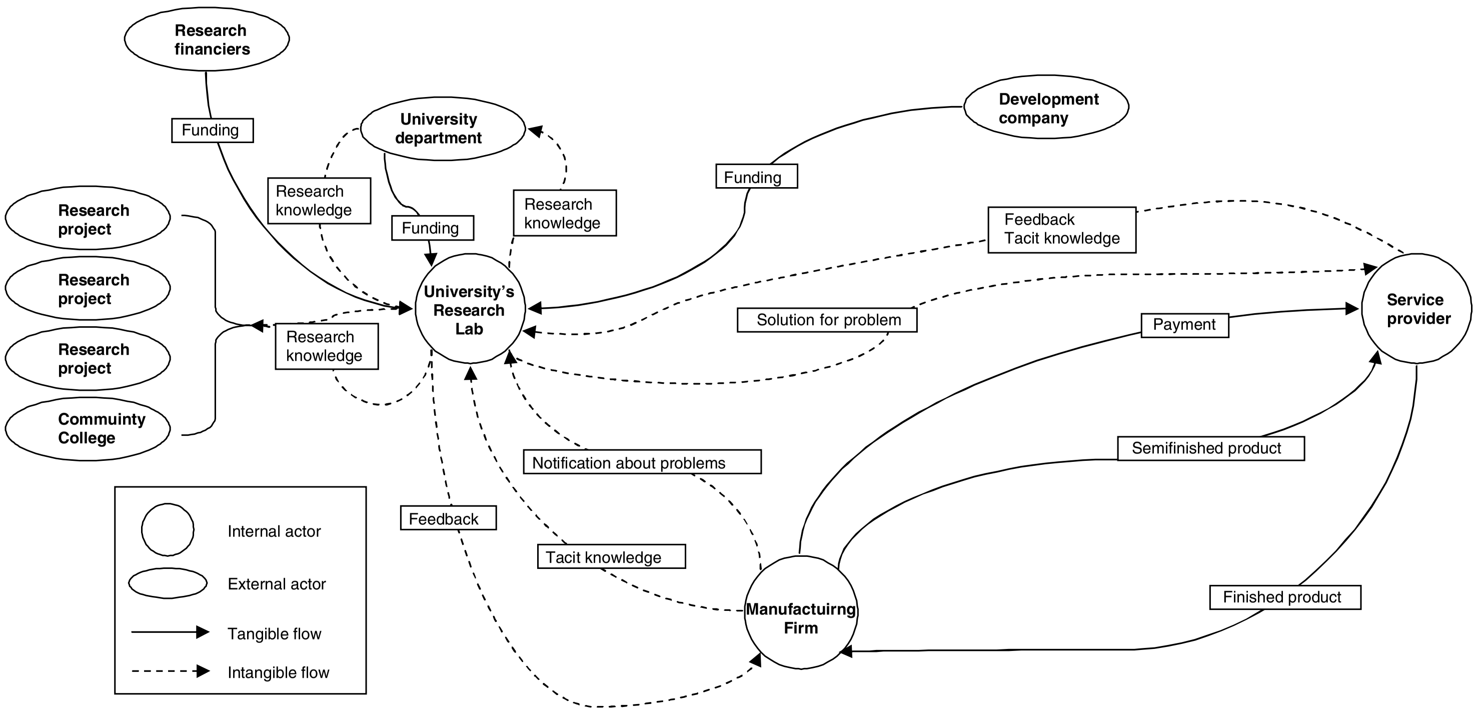


Table 4: Strengths and weaknesses in the operation of three identified network types within the case cluster (Ståhle et al., 2003; Pöyhönen and Smedlund, 2004).

		Production network	Development network	Innovation network
Knowledge and competence	CRITERIA	Defined, explicit	Experiental, hidden, tacit	Intuitive, potential
	CASE	Actors' core competencies have not been clarified and internal production processes are not as efficient as possible.	Formation of mutual experience-based tacit knowledge has not begun.	Tacit knowledge of diverse actors is combined with theoretical research knowledge to create innovations.
Relationships	CRITERIA	Determined by hierarchy	Reciprocal, seeking consensus	Spontaneous, abundant
	CASE	Agreements between the focal company and subcontractors are unclear.	Lack of trust between some actors hinders collaboration.	Plenty of personal and casual relationships between almost everyone. Researchers are highly appreciated by other actors.
Information flow	CRITERIA	One-way, top-down	Multi-way, horizontal	Chaotic, sporadic
	CASE	Information about stock levels is not circulated to all relevant parties.	There are two separate cliques in the area, which do not communicate directly.	A lot of real-time communication and problem-solving. Quick reaction time to problems arising from entrepreneurs.
Management and leadership method	CRITERIA	Orders, direct use of power	Dialogue, empowerment	Personal networking skills, relinquishing power
	CASE	The raw material acquisition firm has too much power over the manufacturing firms' processes, even though it is not the focal company of the network.	The development company has the leading position. The other actors are not empowered and active enough.	The university's research laboratory coordinates innovation process in a manner that respects the needs of the other actors.

development, and innovation network should be led towards the basic criteria determined by Ståhle (2003).

Strategic Goals for the Production, Development, and Innovation Network

According to the interviews and the observation, we were able to define strategic goals for the different network types in the region. These were to get the material flow as effective as possible, form a united market force, and develop new technologies for a certain phase of production.

The strategic goal of the production network in the region was to enable the raw material flow to be as effective as possible. The cooperation of the production network in the region was "strategic" in Jarillo's (1988) terms, because the production liaisons were seen as a long-term investment of a profit-seeking nature. The production network was "strategic" also in the line of Hyötyläinen and Simons (1998). In their approach, strategic networking means fewer suppliers with more power. In the field of business our case region functions, the raw material acquisition is very capital intensive.

The strategic goal of the development network was to form a united marketing syndicate to the region. Big buyers do not want to buy products, if they cannot be sure that they receive enough products regularly. The small firms in our case region had problems in providing enough products to the market by themselves. According to the "markets as networks" view presented earlier (i.e., Håkansson and Johanson, 1992; Ford et al., 1998; Shapiro and Varian, 1999), the region could form one alliance for the market. This means that the region would seem like a single unit for the customers. The marketing syndicate would provide the actors "the economy of scale" together with the flexibility of a small unit, thus combining the benefits of a small and big firm.

The strategic goal of the case innovation network was to invent a new production method for the drying of the timber. This phase is difficult in the region's field of industry. By reaching this goal the region would gain a pronounced competitive advantage against its competitors.

The Regional Knowledge System

Together, the different types of networks previously described form a system which we named the regional knowledge system. From the viewpoint of IC creation in regions, the regional knowledge system provides both a capability-based and a relational approach to the dynamics of regional IC creation. The system that the production, development, and innovation network together form in the region gives the region a better ability to create intangibles, renew itself, and adapt to the changes in the environment.

The region needs all of the three network types to reach a competitive advantage. On the production network level, the innovations invented in the innovation network are converted into profitable business. Innovation can be new products, production methods, or production processes. The role of the development network is to function as an intermediary between the production and innovation networks. With the social and learning-based character of the development network, new innovations are transferred to the actors, which can use them in production. Besides innovations, feedback and new innovation ideas are also transferred from the production level to the innovation network because of the knowledge-transferring nature of the development network.

The benefits, purposes, IC-related functions, and case-specific strategic goals of networking in the regional cluster can be put into practice with the mindset the regional knowledge system provides.

Benefits, Purposes, IC Functions, and Strategic Goals of the Different Network Types

The network type of cooperation creates benefits for a regional cluster of small firms. These benefits were previously drawn from the existing network literature. When combined with the network typology presented in this chapter (also see Pöyhönen and Smedlund, 2004), we can link them to the production, development, and innovation networks in a regional cluster. First, the benefit of a functioning production network in the region is that it lowers the transaction costs by letting the actors concentrate on their core competencies. Second, the benefit of the development network is that this network type enables learning from other actors, with trustworthy and communicative relationships between the actors. Third, the benefit of the innovation network is that it facilitates continuous improvement of products, production methods, and production processes by combining different actors, knowledge, and resources.

Using the value network approach by Allee (1999; 2000; 2002) with the ideas from the "markets as networks" theory and the social character of innovations, we were able to argue that network based cooperation has three purposes. By linking these ideas with our network typology, we can bring these purposes to the regional level. The purpose of the production network is to create value by selling the products to the customers. The purpose of the development network is to ensure that the information, supporting the value-creating process is transferred between the actors, and finally the purpose of the innovation network is to bring the different actors together to raise the value of the network as a whole.

We previously argued that every systems theory-based knowledge environment (Ståhle et al., 2003) has a distinct IC-related function. These can also be transferred to the regional level with the idea of our network typology. The IC-related function of the mechanic production network is to apply knowledge into practice as effectively as possible. The IC-related function of the development network, which functions according to organic systems logic is to share firm-specific transferable tacit knowledge. Finally, the IC-related function of the dynamic innovation network is to create new knowledge in collaboration with different actors and resources.

We were able to determine the strategic goals of our case region by analyzing the interview data. In our case region, in March 2003, the goal of the production network in the case region was to obtain the raw material flow as effectively as possible. The goal of the development network in the case region was to form one united market force to introduce more products to the markets than one actor could produce by itself. The goal of the innovation network was to develop better technology for a certain phase of production.

The three network types in the regional knowledge system function as: (1) IC implementation (production network), (2) IC transfer (development network), and (3) IC creation levels (innovation network) in the region. Each network type creates a certain type of knowledge-based competitive advantage and has its own operational logic and effectiveness criteria. Table 5 illustrates the benefits, purpose, IC-related function, and goals of the different network types in the case region.

Table 5: General idea of different network types in a regional knowledge system

Network type	Benefit	Purpose	Intellectual Capital-Related function (Pöyhönen & Smedlund, 2004)	Goal in the case region
Production network	Lowers transaction costs by allowing actors to concentrate in their core competencies.	Bring cash flow to the region. Make profitable business.	Apply knowledge into practice as effectively as possible.	Raw material flow as effective as possible.
Development network	Increases learning through trust and communication between the actors.	Ensure that information is transferred between actors.	Share firm-specific transferable tacit knowledge.	United market force.
Innovation network	Enables continuous improvement of products, production methods and processes by combining different actors, knowledge, and resources.	Bring together different actors and resources to raise the value of the network.	Create new knowledge.	R&D of new technologies for a certain phase of production.

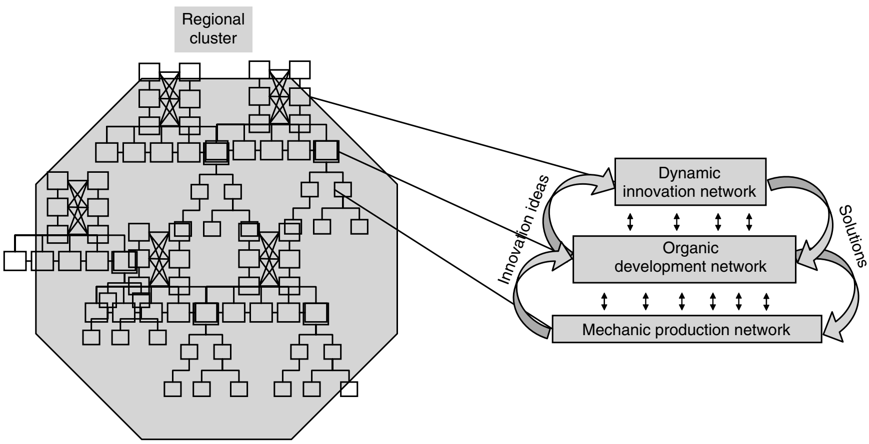
The three network types are not closed systems inside the region. A regional cluster consists of many overlapping production, development, and innovation networks, and some of the networks also have actors from outside the region. An actor in the regional cluster can simultaneously be a member in every type of network. In Figure 5, the ideal regional dynamics of the production, development, and innovation networks are presented. When the innovation network finds a solution for an individual actor's specific problem, the solution is diffused, before long, to other the actors due to the knowledge transferring nature of the development network. On the other hand, innovation ideas constantly emerge from the production network when the actors share their day-to-day problems or ideas with each other. When the innovation idea reaches the right actor, that actor will form an innovation network with or without the original actor where the idea originated and try to find a solution to the problem.

Our findings in the case regional cluster indicate that the key to a successful regional knowledge system is a functioning development network. If the development network does not work properly, new ideas will "die" on their way to the person who might be able to offer a solution to the problem. The main task of the development network is to keep the communication and trust between the different actors on a good level. If the actors do not trust each other, they will not share any ideas or solutions.

According to Ståhle and colleagues (Ståhle, 1998; Ståhle and Grönroos, 2000; Ståhle et al., 2003), an organization must have all of the knowledge environments

Figure 5

The regional knowledge system



present in order to be successful. According to this idea, the innovations are born on the dynamic level of an organization with the right combination of information, competence, and creativity. On the organic level, the innovation is improved step-by-step, and on the mechanic level the innovation is put into production. In other words, innovativeness per se is not enough, but the organization also needs an organic and mechanic level to turn innovativeness into money. Similarly, the regional knowledge system needs production, development, and innovation networks in addition to the right actors to make the region competitive.

In our case regional cluster, the production network was dominant, but not the most important type of network in the cluster. The development network generated trust and communication between the actors with the sharing of knowledge, and the innovation network solved production-related problems. In our case region, the ideas for innovations were derived mainly from the production function. The presence of the university's research laboratory and the joint projects with research financiers and firms also provided innovation ideas that the production function in the region would not need in the short-term. Naturally, all of the network types of cooperation between for-profit companies have a very clear main goal: to make profit. But without learning, sharing of knowledge, and continuous innovation, the production network cannot have a future.

Discussion

In this chapter, we presented a systems theory-based view for understanding the creation of IC in a regional cluster of small firms. In our opinion, a single actor can simultaneously be a member of different kinds of networks. In order to be successful, the regional cluster has to be able to: (1) make use of existing knowledge as efficiently as possible in a vertical production network, (2) transfer firm-specific knowledge and ideas in a horizontal development network, and (3) invent new knowledge, products, production methods, or processes in a diagonal innovation network.

The production network forms the core processes of the region. On the production network level, knowledge is implemented to production to make products or services for the customers. With the development network, the actors in a region share information with each other and improve the social capital of the region. In other words, on the development network level the actors form relationships, find a common language, and gain trust with each other. The new innovations produced on the innovation network level are transferred to improve the production methods with the knowledge-transferring nature of the development network.

When these network types are all present in a region, new innovations are transmitted to all of the actors to benefit each of them individually, and new innovation ideas constantly emerge. In this chapter, this cycle of innovations and innovation ideas between the production, development, and innovation network was named the regional knowledge system. Every network type in the region should lead towards the optimal situation in terms of competence, relationships, information flow, and leadership defined by Ståhle and colleagues (Ståhle, 1998; Ståhle and Grönroos, 2000; Ståhle et al., 2003) in their theory about different knowledge environments. When a regional cluster of small firms takes this into account, it makes the creation, transferring, and implementing of knowledge effective. In the optimal situation, the regional innovation network reacts to the problems in production almost immediately.

As a small cluster, our case region provided an easy opportunity to model different types of networks, and evaluate their critical factors. Our case region was dominated by a lack of trust and communication between the actors. This was partly due to the young age of the cluster. Some of the production-related problems caused trouble and made cooperation difficult. The main conclusion of the case study was that the development network level was the most important level in the case cluster. The development network can be seen as a prerequisite for trust and communication. If the development network in the region is not in good shape, the other types of networks between the actors are difficult to manage as well.

The idea of a regional knowledge system described in this chapter provides a new set of tools for understanding the regional dynamics of IC creation. With this mindset, the strategy process of a regional cluster can be improved. When the complex value network inside a regional cluster is divided into smaller entities according to their IC function, it is possible to manage and understand the whole region more effectively.

The regional knowledge system allows us to identify the structure of a complex regional cluster more easily. By separating the production function from the learning or innovation levels, it is easier to improve each level separately. With our view, it is also possible to discover the core processes and competencies in the region that need improving. When successful, the regional knowledge system approach allows the combination of innovativeness and efficiency in a regional strategy process. Products can be produced at the same time as innovation processes occur, which improves the competitive advantage of the region.

To validate our approach to regional clusters, the idea of the regional knowledge system should be applied to a larger number of clusters. With more cases, we strongly believe that it would be possible to create an assessment tool to manage the overall strategy of a regional cluster. One promising route for future research could be the formation of standardized, quantitative measures.

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Chapter 15

Ragusa or How to Measure Ignorance: The Ignorance Meter

Klaus North and Stefanie Kares, *University of Applied Sciences, Wiesbaden, Germany*

Ragusa: Intelligence Ensures Sustained Prosperity

When the pagan Croats conquered and settled in Dalmatia, Roman refugees from Epidaurum and Salona founded the city of Ragusium in 614, which is now known as Dubrovnik. The city was besieged several times and learned to live in a fragile equilibrium between Byzantine rule, the Croatian Duke, and later the Venetians. While Ragusa at times was forced to temporarily accept Venetian or Neapolitan sovereignty, the city in effect was an independent republic based on maritime trade. Ragusan traders enjoyed trading privileges all around the Adriatic Sea and in the eastern Mediterranean. The town was a center of Catholicism in a region surrounded by Bosnians and Serbian Orthodox Christians. In Ragusa, Roman (Italian) and Slavic population elements lived together.

We argue with Dedijer (2002) that Ragusa was an intelligent city. Bruges in the 13th century and Tuscany in renaissance times are other examples of cities or regions that prospered based on the exploitation of their intellectual capital (IC). What do these cities have in common and what has contributed to make them independent and find a place in a fragile, political, and economical environment? The intelligent cities of the past have been able to develop an openness and a learning capacity. Connectivity and cohesion contributed to integration across religions and ethnical roots.

How do today's cities and regions score in relation to the Ragusa benchmark? Knowledge regions such as Styria in Austria (Wissensregion Steiermark, 2003), Barcelona (Metropolitan area of Barcelona, 2004), or the learning regions concept within the European Union (EU) (OECD, 2002) have been proclaimed. But do we understand what makes a knowledge region or an intelligent city?

Intelligence is defined as the "*power of learning, understanding, and reasoning*." In an "intelligent" region, IC management is applied to the regional context.

The development of IC should occur in all relevant activity fields of a region: education, business, research and development (science and technology), mobility and communication, health services, social system, energy and environment, and culture, arts, and leisure.

Approaches to managing knowledge and capabilities, lifelong learning, and innovation are strongly linked with each other. Knowledge can be created, transformed, and shared by lifelong learning, and the transmission stimulates innovation. Figure 1 shows this interrelation. In examining the Internet for a "knowledge region," one automatically finds data on lifelong learning, innovation, clustering, and networking.

The term 'knowledge region' is used in different manners, but common definitions state that knowledge resources are integrated into value creation for the benefit of the economical and social future of a region. Knowledge regions mainly focus on clusters of knowledge and networking of institutions that want to improve the region's performance. Yet, there are several knowledge regions and they widely differ in their activity level and stage of development (OECD, 2002).

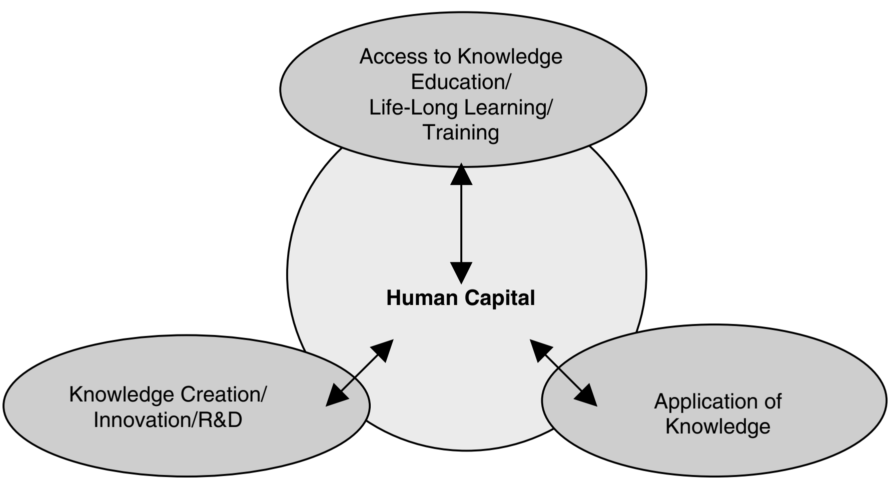
Reviewing the models on measuring IC of organizations (North, 2002) and the few approaches to measure the IC of cities, regions, and nations (Bontis, 2002; Malhotra, 2000; Viedma, 2003) we find a number of more or less meaningful indicators or a process model; however, none of these models focuses on the invisible enablers—the capabilities that the organizations in a region and the individuals forming them have to develop and make use of to enhance value creation based on IC.

What enables networks to become operational? What are the underlying motivations for detecting the best ideas regarding effective health care systems? Why does cooperation between research and business lead to impressive results in one region but does not work well in another?

We argue that intelligent regions should posses certain "character traits" or personality which governs and underlies the behavior of the actors in that region. What are

Figure 1

Interrelation of knowledge, lifelong learning, and innovation



the traits that either make a region "ignorant" or contribute to an outward orientation in a dynamic setting?

Concepts on how to create knowledge regions or regional knowledge networks are worthless, if the actors do not share commitment, develop joint visions, and create a bias for action in a boundary-less manner, just to paraphrase some statements which try to explain the success of General Electric. What is needed is a *knowledge ecology or knowledge culture approach* (North, 2002).

This approach states that you cannot manage knowledge or even create intelligence but you can shape enabling conditions for creating and sharing knowledge. Similar to a plant which you cannot order to grow, citizens need the right ecology or community culture to produce knowledge and to share knowledge with their fellow citizens. Therefore, managing means creating an environment of trust and openness and developing incentives that align individual interests with the interests of the community or stakeholders and foster boundary-less behavior. However, this is a long-term and complex task in social systems.

The Region as a Knowledge Market

In regions, new knowledge is continuously created: people learn and gain experiences, thus developing a wide-ranging offer of knowledge. On the other hand, people are continuously seeking information and knowledge in order to solve specific problems. Knowledge moves between people, and through and across organizations; it is exchanged, bought, found, forgotten, lost, generated, and applied to work (European Commission, 2002a). Therefore, we can describe regions by the metaphor of knowledge markets, which helps to understand the driving forces and barriers of managing knowledge and to develop effective enabling conditions and market mechanisms for generating and exchanging knowledge. We might argue that an intelligent region is one that is able to create well-functioning knowledge markets.

Following this metaphor, in and outside the region we have knowledge sellers, knowledge buyers, intermediaries such as knowledge brokers, and knowledge media which allow knowledge sellers and buyers to interact. In order to create knowledge markets and make them work we have to define enabling conditions as well as principles and rules and develop the supporting knowledge media and infrastructure. In the following text, we will deal with each of these aspects.

The knowledge ecology approach holds that you cannot manage knowledge but you can create conditions that enhance knowledge flows. Apart from the physical information and communication infrastructures, these enabling conditions relate to soft factors such as strategic vision, values, attitudes, relationships, objectives, and incentives. A regional strategic vision should clearly formulate the contribution of knowledge and people to a sustained regional competitiveness and quality of life. Values that create the right spirit for knowledge creation and exchange include trust, openness to change, professionalism, a passion for excellence, and self-confidence.

Vision and values are easily proclaimed but it is difficult to practice them in daily life. As values become manifest in behaviors, it is advisable to describe the desired behaviors of people in education, business, research, health care, and so on. To reinforce the right behaviors taking route across a society, incentives and sanctions need to be devised that align the interests of the individual, group, community, region, and society at large.

Intelligence Upside Down: Measuring Ignorance

Instead of asking what the underlying capabilities of intelligent regions are, we might also ask what makes a city or region ignorant.

Ignorance is defined as the "lack of knowledge, education, or information about something and the unawareness of certain circumstances."

Which capabilities are lacking in such an entity or community? Sometimes it is easier to describe the ingredients which are lacking than to devise a list of intelligence factors.

Based on the analysis of so-called "knowledge regions or intelligent cities" (European Commission, 2002a; 2003b) we have compiled a list of factors either enabling or disabling the development of such cities or regions and integrated in what we call *"the ignorance meter."*

The idea emerged in a dialogue with Leif Edvinsson and has been further elaborated by the author.

Our list is still tentative and lacks empirical validation. In this first stage of research, our ignorance meter is thought to stimulate discussion regarding the validity of measurement concepts for IC applied to cities and regions.

The aim of the ignorance meter is to measure and map the current position between ignorance and the intelligence of a city, region, or nation. It measures throughout different activity fields such as education, business, R&D (science and technology), mobility and communication, health services, social system, energy and environment, and culture, arts, and leisure.

It clearly shows in which fields (enabler criteria and activity fields of the region) intelligence lacks and tracks the weaknesses down to its roots. Therefore, it can also be understood as a knowledge or IC management tool that offers advice on where and how to improve the IC of an organization, city, region, or nation.

Disablers and Enablers

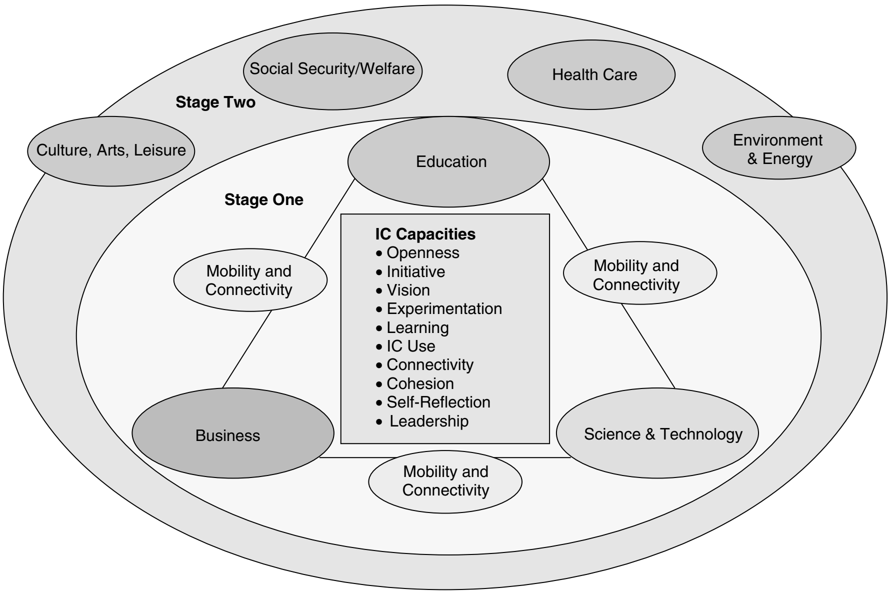
To assess ignorance versus intelligence, we propose 10 pairs of criteria, that represent anonyms. The first one represents ignorance and is the disabler and the second one represents intelligence and is the enabler. These criteria are:

- autism versus openness
- blindness versus vision
- followership versus leadership
- disintegration versus cohesion
- vanity versus self-reflection
- abuse versus use of competencies
- regression versus learning
- disruption versus connectivity
- lethargy versus initiative
- no-risk versus experimentation

In the following, each disabler and enabler and some of their effects will be explained. Although we chose the regional level to explain the disablers/enablers, we believe that the criteria can also be transferred to individuals, groups, communities, or organizations.

Figure 2

The basic model of assessing intelligent versus ignorant regions



Autism Versus Openness: The (In)Capacity to Capture New Ideas, Trends, and Developments

According to the *Oxford Advanced Learner's Dictionary*, autism is an illness of being unable to communicate and form relationships with others. An autistic region is stuck in its own world and is not capable of capturing signals from the outside and give them meaning. New ideas, trends, and developments are not detected. The region is unable to maintain or develop a rich communication with the outside. Such regions are somewhat behind the trend. Until they realize that something in their environment has changed, trends or new ideas have already become standard. They are hardly ever pioneers. Autistic players also have drastic lacks in communication and in forming relationships outside of the region and with other economy participants. Knowledge cannot be received and cannot flow freely in this kind of setting. This means that the base for networking across regions is not given.

Openness, on the contrary, means that regions have established mechanisms to actively scan the outside world, integrate multiple contacts, and develop a meaning for the region.

Communities exist that are open-minded and are capable of capturing new trends, ideas, and developments. They are even able to "feel" the slightest change in their environment. In addition, they watch their environment cautiously in order have advantages to capture new tendencies. It is very likely that they are among the group of pioneers or early adopters. Communication and relationship-building is essential to this kind of organization since it is very curious to discover or capture new ideas. This capability presents an important factor of being a suitable network partner. If we examine intelligent cities or regions in the past as well as analyze some of the presently and mostly self-proclaimed knowledge regions it is striking, that these towns or regions, are harbor or border towns with a high flux of traders and interactions; compare Ragusa, Bruges, Barcelona, Syria at the boarder to Slowenia, or the Twente-Osnabruck (www.Wissensregion.net; Woltering, 2003) region bridging the German Dutch border.

Blindness Versus Vision: The (In)Capacity to Develop Shared Visions and Shared Values

Blindness is the incapacity to see and form mental ideas or pictures.

One could argue that blindness is not a disability if a region is able to develop compensation mechanisms to overcome this impairment, as many blind people do. However, what matters is the ability to form mental pictures or future visions. Is there a process by which the leaders within a community and the community at large develop joint mental images of the future? Are there metaphors which are used to express this vision? To our understanding many of the approaches towards intelligent regions are quite abstract and academic. What is the right metaphor to convey the relevance of “IC Management” to a community? Blind regions lack imagination and the capacity to create mental images of the desired future

Vision comprises the ability to view a subject, problem, and so on, imaginatively and builds on foresight and wisdom in planning. Visionary regions are able to imagine future scenarios and create processes of joint understanding. The difficulties in advancing in political reforms in Europe are rooted in the inabilities of leaders to devise means of creating a shared vision. The AGENDA 21 initiatives established in many cities around the world following the Earth Summit in Rio in 1992 are an example of how to foster interaction of communities with a bias for action.

Followership Versus Leadership: The (In)Capacity to Motivate and Lead Transparent Decisions Towards Shared Goals

To explain followership and leadership we should briefly review what happened in Bogota, the Colombian capital in past years. Over the decades, Bogota was considered to be the most dangerous and inhabitable capital in Latin America. Political class and drug barons blocked each other in a climate of underdevelopment until things became so ungovernable that an independent university professor was elected mayor of the town. He developed a coherent plan for Bogota’s development, and made transparent, ambitious, and daring decisions which were irrevocable once approved. Bogota has completely changed to a city which is now much more disciplined, where education counts, universities play a role in local development, and business is confident again. It would be daring to call Bogota an intelligent city, but it could be on the way.

In the absence of leadership, often by a few charismatic persons, regions tend to degrade to be rather slow in adopting new policies and actions. Particularly in situations where antagonistic political parties block each other, a region rather floats than have a clear direction.

Leadership also requires effective governance and consensus mechanisms.

Disintegration Versus Cohesion: The (In)Capacity to Bridge Gaps Between Young and Old, Poor and Rich, Locals and Immigrants

The disintegration versus cohesion anonyms relate the concept of IC to the concept of social capital. We argue that regions that are unable to create a means of bridging the gaps between young and old, poor and rich, locals and immigrants score high on the ignorance side. In Europe, we witness aging societies which retire most of their labor force at an age younger than 60 years and do not create opportunities to make use of the rich experiences, and talents and thus, lead to disintegration.

On the other hand, birth rates in the western world are declining, even though there are marked differences between "dynamic" regions with a young active population and regions which become sclerotic.

In most regions, policies and monitoring of how to integrate locals and immigrants, employed and unemployed, highly educated and those who can barely read, are lacking. Developing intelligent regions does not mean elaborating elitist concepts of how to build networks among the "inteligencia." These approaches will fail if the social disruptions are not addressed.

Disintegration means that there are obvious differences between groups and there is no initiative to bridge the gap. There is no sense for community and improving the working and relationship climate. Connectivity lacks and borders are drawn strictly. Such regions are not suitable for networking, since their emotional intelligence is underdeveloped.

Cohesion in its strict sense describes the tendency to stick together.

Regions that are cohesive are able to close those gaps and practice integration without forcing different strata of society to relinquish their identity and subcultures, which may be a rich source for questioning the present and are a basis for innovations. There is a strong sense of community and equality. The region provides a means to socialize, network, communicate, and care about the 'disadvantaged'. Individual benefit is assessed in relation to the overall benefit for the region. An identity of belonging to the region is developed. Trusting and sharing are practiced values.

Vanity Versus Self-Reflection: The (In)Capacity to Assess One's Own Strengths, Weaknesses, and Limitations

The *Oxford Dictionary* defines vanity as having too high of an opinion of one's abilities. Vanity is often associated with a kind of autism or selective perception of the environment. We argue that a number of self-proclaimed knowledge cities or regions have done so without carefully assessing what this concept comprises and without establishing benchmarks with other regions. Nice brochures and marketing concepts are created and local actors seem to believe that the proclamation is more important than putting the concept into practice. Such regions show great weaknesses in reflecting the efficiency of their activities. They do not examine a situation objectively and see no need in comparing themselves to others that have institutionalized better practices. In our research into the different concepts of knowledge or learning regions or intelligent cities, we found widely differing criteria and approaches, which need to be actively discussed.

Self-reflection is the ability to judge oneself "objectively." A self-reflective region is able to draw a realistic picture of its strengths and weaknesses and can admit mistakes and see them as a chance for improvement. It is open to criticism and reflects its situation regularly by a widespread dialogue within and between communities. Constant measurement of performance is an important issue in such regions.

Abuse Versus Use of Competencies: The (In)Capacity to Make Full Use of IC in a Responsible and Sustainable Manner

The development of an intelligent region also has an ethical dimension. Is there a reflection on and a "charter of responsible use of IC"? In education systems and research institutions is there a widespread discussion on the consequences of knowing and applying it? Genetically modified food, cloning, environmental protection, protection of intellectual property, the use of the Internet, and the necessary abilities to assess the quality of website contents, the ethics of sending spam mail and information, the use and misuse of cellular phones to the detriment of meaningful conversations, the loss of abilities to write correctly due to a widely spreading "e-language" ("How r u?"), are just a few examples of the issues to be discussed regarding use and abuse of IC. Does the region encourage such discussions, and are there policies, strategies, and measures?

Regression Versus Learning: The (In)Capacity to Draw Lessons and Innovate

Regression is defined as returning to an earlier stage of development.

Regions which recede have been unable to develop a new mental model which is adapted to changing conditions in the economical, political, and social environment. There may be a sudden disruption as many regions experienced with the fall of the eastern block. Some regions were able to actively engage in a new mental model and renew itself, others are still sticking to the old pattern trying to maintain the old times. Other regions might experience a slow degradation over decades as we see for example in cities like Buenos Aires, which has been one of the richest regions in early 20th century. Richness has been built on a feudal agriculture system; cultural richness followed and still exists. The country, however, has not learned to understand the new competitive forces which require higher investments in education and social equality. The awareness about knowledge as a prime production factor is not widespread. Short-term survival and short-term financial success counts in a volatile and receding economy.

Regions that actively learn, create mechanisms not only to link formal education and practice but also create an awareness of the importance of learning by doing. Intelligent regions are able to create what is described as characteristics of communities of practice: the relationships of mutual engagement that bind members together into a social entity, the shared repertoire of communal resources (routines, sensibilities, artefacts, vocabulary, styles, and so on) that members have developed over time (Wenger, 1998). In the north of Germany a city engaged unemployed youngsters to build a Hanseatic ship according to old plans, not only to learn the basics of shipbuilding, but also to develop an identity related to the history of the region. Learning, social cohesion, and sharing an identity with the past are not opposed.

Intelligent regions are also able to draw lessons from mistakes. Discussing "lessons learned" is common in and across all organizations.

Disruption Versus Connectivity: The (In)Capacity to Build Networks of People (Communities) and Use Connective Powers of Information and Communication Technology (ICT)

While the anonyms of disintegration versus cohesion assess the social dimension of bridging gaps between people, the criteria of disruption versus connectivity appraises the (in)capacity to build networks and communities, i.e., learning or business communities or communities of practice, forums, networks, clusters of institutions, firms, professionals, and so on. How is the concept of the intelligent region translated into practice by developing such organizational artifacts? In studies on communities of practice and business we found that many of these communities have been created artificially without gaining acceptance and meaning. That is why we have to assess the effectiveness of such organizational arrangement for value creation in the region. While measurement approaches of IC tend to count the number of networks, communities, or clusters, we propose to asses their effectiveness (European Commission, 2002b).

There is a second dimension to the disruption versus connectivity assessment: the effective use of information and communication technology. Again, the amount of cellular phones or Internet connections does not relate any information about the ability to make best use of these provisions. The accessibility of knowledge and the existence of help desk, and knowledge scouts as well as the acceptance of training on ICT for all of the population groups may be indicators reflecting meaningful connectivity.

Lethargy Versus Initiative: The (In)Capacity to Mobilize People and Create a Spirit of Renewal

Lethargy is an extreme lack of energy or vitality. Initiative is the action taken to resolve a difficulty. An ignorant region is built upon lethargy: “We cannot change things,” “others decide upon us,” “nowadays, things are worse than in the past,” “what do I get if I do something”—these are all phrases which belong to a society, where there are no attractive goals for the future. People may have experienced that is not desired to take initiative or they do not see the benefits of becoming active. Economic liberalism as well as social overprotection can have both similar effects on significant groups of the society. Values and incentives play an important role to move people. What is the kind of incentives or sanctions needed in an intelligent region to liberate entrepreneurial behavior? Who gains reputation in the region: the one who takes risk to try out new initiatives or the one who leans back in a “wait-and-see” attitude?

Initiative-taking regions spread optimism and encouragement. They are open to change and able to mobilize and motivate people. They take action to improve.

No-Risk Versus Experimentation: The (In)Capacity to Try Out New Solutions, Give Freedom to Play, and Allow Errors

Regions that do not want to take risks, always try to stay on the secure side, and rely on facts and numbers. They are afraid of change or afraid that it may not bring the desired outcome. So they do not risk anything and do not allow creativity. In these regions, discussions about reform always result in endless debates about the disadvantages, undesired side effects, and who will take responsibility if an initiative fails.

Experimenting regions always try new ways of doing something. They are constantly renewing and allowing the freedom to play with ideas and to commit errors. They are able to learn from mistakes. This experimentation effort increases their innovation potential. Which sites, mechanisms, and fields for experimentations are created in a region?

An Indicative Questionnaire

At this stage of development of the ignorance meter we have not decided whether we would like to propose a more detailed set of indicators, as we have been discouraged to some extent by the failure of IC measurement approaches to devise meaningful indicators. Therefore, we propose a simple questionnaire to raise awareness of the underlying enablers or disablers of intelligent versus ignorant regions.

In order to assess a region's intelligence, this questionnaire could be completed by regional leaders, representatives of communities, and companies or institutions of the region's important activity fields as previously defined.

The questionnaire consists of 10 questions that have to be answered by marking scores on the 7-point "Ragusa" scale. The low numbers represent a tendency towards the disablers or ignorance and the higher numbers a tendency towards the enablers or intelligence. So, 1 = "not at all" and 7 = "very high." For each pair of disabler/enabler, we have formulated only one question.

On a scale from 1 to 7 (1 = not existent, 2 = very low, 3 = low, 4 = fair, 5 = good, 6 = high, 7 = very high) **how would you rate your organization's/region's capability to...**

1. **capture new trends, ideas, and development?**
2. **develop shared visions and shared values?**
3. **motivate and lead transparent, honest decisions towards shared goals?**
4. **bridge gaps between young and old, poor and rich, locals and immigrants?**
5. **assess one's own strengths, weaknesses, and limitations?**
6. **make full use of IC in a sustainable matter?**
7. **draw lessons and innovate and change?**
8. **build networks of people (communities) and use connective powers of ICT?**
9. **mobilize people and create a spirit of renewal?**
10. **try new solutions, give freedom to play, and allow errors?**

Evaluating the completed questionnaires, the scores can be entered into an ignorance versus intelligence profile (Figure 3).

When examining the example of the profile, one can clearly see where the problem lies; in this case, disintegration, abuse of IC, and no-risk are the critical issues of the region. Therefore, these three topics should be the principle aim of improvement.

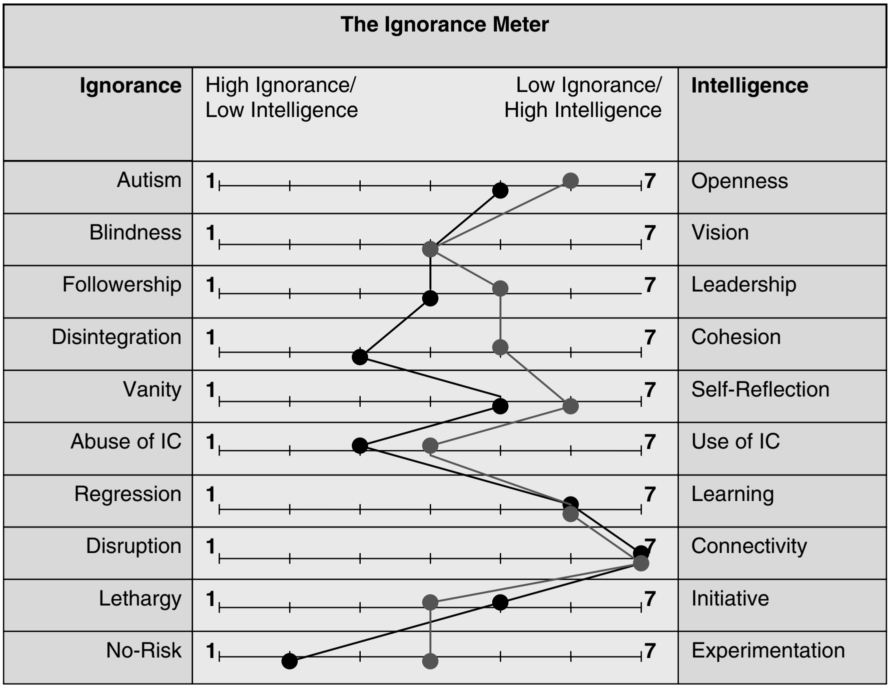
Based on the assessment of ignorance versus intelligence focused measures can be taken to improve the criteria. After a certain time a reassessment should be performed. By entering the result again into the ignorance model, changes will become visible.

Conclusions

The application of approaches to manage IC to communities, cities, regions, or nations is quite young. It seems that their have been efforts to measure IC at this level without understanding what makes an intelligent city, region, or nation. Indicators developed

Figure 3

The ignorance meter: profile for two periods



reflect this uneasiness with the concept of intelligence applied to wider social systems. Particularly, the underlying enablers or disablers remain in the dark.

We want our "ignorance meter" to create awareness that IC management requires the understanding of the underlying factors that inhibit or promote value creation in regions. Value should not only be defined in economic terms but in terms of well-being and use of human talents.

The association of the terms intellect, capital, and management should not let us forget that we are discussing people and their interests and interaction.

More research is needed to establish widely accepted models of the intelligent region based on a sound theoretical ground.

Only when we know what we are referring to are we able to devise meaningful measurement and management approaches.

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Chapter 16

Can the State Stimulate the Creation of Regional Networks? Experiences From the Virtual Marketplace Bavaria Initiative

Hans-Joachim Heusler, *Bayerisches Staatsministerium für Wirtschaft, Munich, Germany*
Hans Schedl, *Ifo Institute for Economic Research, Munich, Germany*

Introduction

E-government can create significant intellectual capital (IC) for the government and, to a certain extent, its citizens and enterprises by integrating all stakeholders—including the different levels of government—into a network which can offer easy-to-search, complete, and up-to-date information and enable various kinds of time-saving transactions, provided the multitude of different players and the vast range of activities can be integrated into this network.

The early stage of development and the different requirements of activities—covering segments from legal executive, education, public health, taxation to administration and tasks from information via communication to virtual and physical transactions—has led so far to a number of unconnected solutions which, ideally, would all be merged into one knowledge network in a final stage of development.

According to the different tasks we defined three network types for analytical reasons: 1) *the information network*, which offers one-way information; 2) *the communication network*, which is enabled for interactive use, e.g., the exchange of documents; and 3) *the* commercial *transaction network*, which allows for virtual (e.g., financial) or the search, contract and logistics parts of physical (e.g., material goods) transactions. They comprise different degrees of complexity and need extended infrastructure and standardization, although they may all be realized on a single platform. The information network needs the lowest standardization and implementation efforts.

From the array of existing e-government initiatives we selected the Virtual Marketplace Bavaria (VMB) for its aim, to provide a gateway to the development of e-government, its comprehensive approach including all stakeholders, and its ambitious scope of tasks to be integrated. It is the entry point to more than 40 Bavarian e-government initiatives. The VMB will serve as a model to study the states' ability to stimulate the development of such a network.

In a first step, we show the basic concept and the potential advantages of a regional knowledge network for the stakeholders, depending on network type. In the next part, we will describe the chosen organizational form, the requirements to be met and the actual development of the VMB. We then discuss potential reasons for partial failure. Preliminary conclusions and the limits of governmental influence on network creation will be discussed in the last section.

The Concept

Basic Aims and Options

The defined aim of Bavarian e-government activities is to improve public services and their quality for all citizens and the economy. Information on public services should be available independent of opening hours and location. Administrative processes should be lean, flexible, and cost-efficient. In addition, the VMB also aimed to provide a gateway to the development of e-government.

For this purpose, public services and administrative processes had to be explicitly described and forms had to be standardized throughout all levels administration from the communal and regional levels to the central level. The resulting *information network* on public services would include information on public service locations, opening hours, responsibilities, and administrative requirements (Figure 1).

The three differing parts of each network—for example, the three intersecting blue spaces of the information network (intra governmental, enterprise, citizen)—reflect the differing data protection, access, and security requirements. Thus the information network exists of three more or less independent subnetworks which only partly overlap.

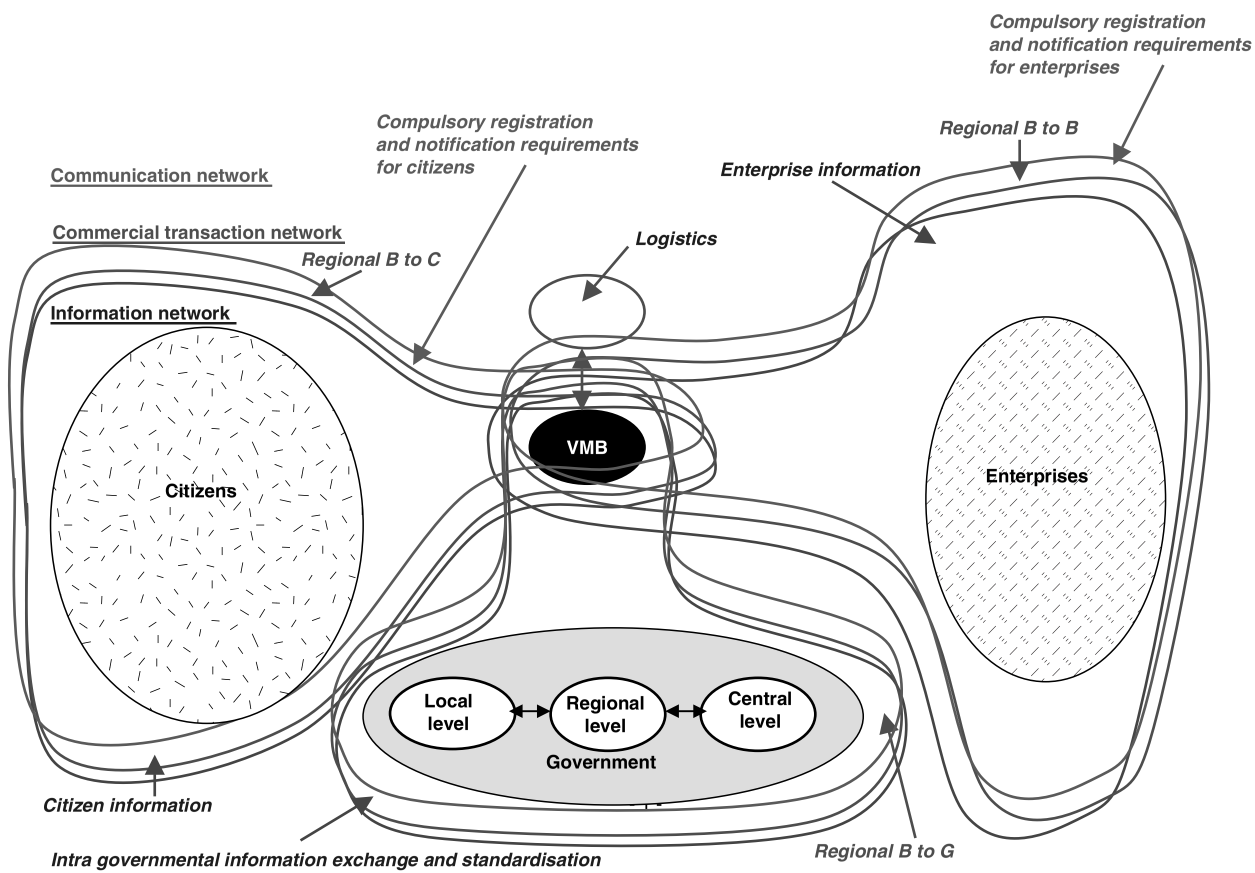
Strategic concepts for e-government like the Condrinet study (CAP Gemini Consulting, 1998), commissioned by the European Union (EU), underlined the necessity to increase the information network's attractiveness by offering additional content which was thought to help it reach a critical mass of users and services. One important option was the integration of e-commerce. Accordingly government should:

- facilitate the right business and market infrastructure for network commerce.
- prepare the network for transactions with public suppliers as well as for transactions among third parties.
- support businesses in the creation of open and common technological standards.

As the underlying portal solution was able to handle a regional *transaction network*—allowing for business-to-business (B2B) and business-to-consumer (B2C) transactions—based on the same structures, it was decided that the platform should also be opened for this use. Another important reason for this step was to enable small- and medium-sized enterprises (SMEs) to use the advantages of a new form of business—the

Figure 1

Initial design of the VMB



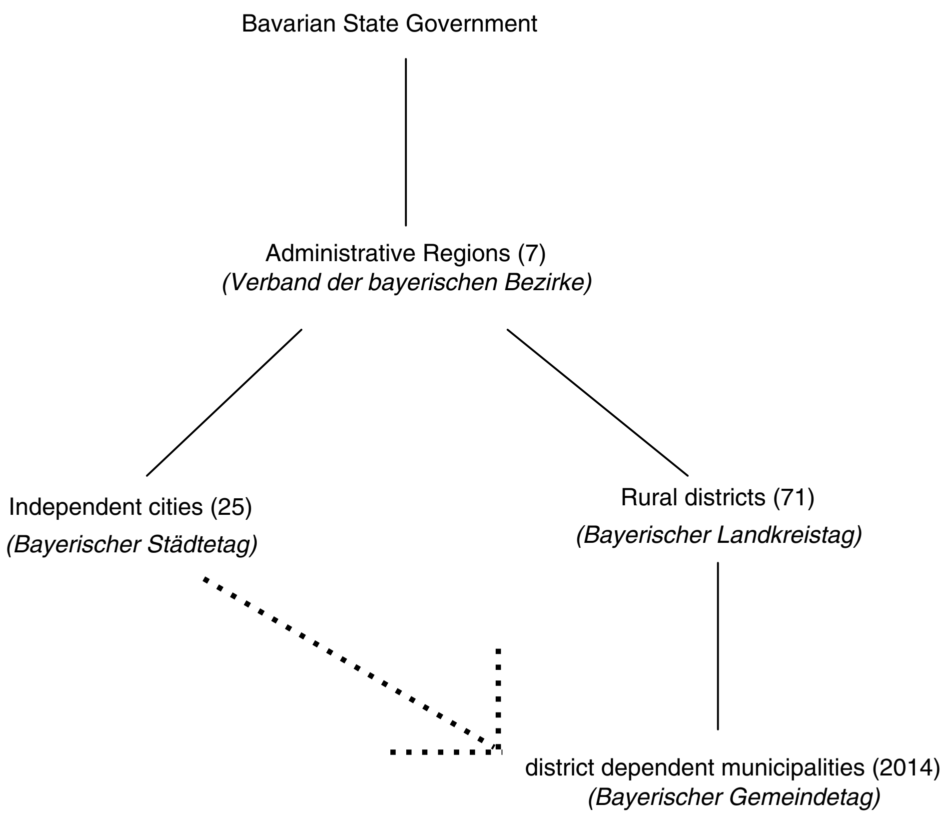
independent public exchange—which, under normal circumstances, would not have come into existence due to financing problems. Business-to-government (B2G) transactions are linked through test projects for public purchasing and merchandise management in different segments (ELBE, Netpapier, the marketplace police, and the purchasing of medical products for university clinics).

The functions of a *communication network*—for example, for compulsory notification and registration requirements of citizens and enterprises—were also integrated via links to existing solutions, e.g., for income tax declaration (ELSTER) or trade registration (GEWAN).

In a preparatory step, all administrative levels had to be convinced to participate in a common effort on a voluntary basis—the local level is legally independent—to simplify and ameliorate administrative processes for citizens and enterprises. Therefore, an agreement on the necessary measures had to be concluded between the Bavarian state government and the associations of regional and communal administration. Figure 2 shows the levels of administration and the representing associations:

Figure 2

Administration levels (and representing associations) implied



7 regions with 71 rural districts and more than 2,000 municipalities, some of them joint in administrative cooperation, had to be covered by the agreement. The agreement was signed in 2000.

Advantages for the Stakeholders

Government

The main advantage for government arises from the creation of the *communication network*: it is the increased transparency and efficiency of administrative processes through the extension of the public service network. This is achieved by the provision of basic components:

- standardization and interoperability of the system
- the definition of standard processes
- the harmonization of voice and data communication
- the adaptation of legal requirements

Standardization and interoperability of the system address the potential savings from creating standard forms and processes for all levels of the administration, standard interfaces, and the use of standard software throughout the whole public service network. These features have to be centrally provided.

The *definition of standard processes* reflects the possibility of rationalizing similar processes by the same solutions. On the one hand, this applies to the multitude of recurring and similar administrative routines (e.g., the provision of forms on application, the issuing of a notification, or the collection of administrative fees) where processes remain similar for very different administrative tasks, be it a building permit or the issuing of a passport. On the other hand, this applies to a multitude of similar processes (such as personnel management, the administration of registers, archives, material, and real estate) where different solutions have evolved in different parts of the administration.

The different networks still in use for voice, data, and mobile communication can be integrated into one *harmonized network* which can lead to significant reductions in fixed costs.

The cited advantages can only be realized if *rules and regulations* of administrative procedures can be *adapted* to the environment of e-communication. Certificates, testimonials and supporting documents still have to be provided in paper form even though e-documents are technologically feasible. The Bavarian state government has started this process in 2002 by drafting a law for administrative e-processes. The aim is to eliminate all potential barriers in state law. Difficulties arise from regulations which cannot be influenced by the state government (e.g., from German federal law).

The advantages of the *information network* stem from the increased richness, reach (Evans, 2000) and availability of information. Search is facilitated and the complete information is accessible from all authorized points at any time.

The advantages of the combination with a commercial *transaction network* were thought to be the financing of the information network through private fees from the transaction network in the longer run and the development of an integration base for independent B2G e-commerce solutions, which would reduce fixed information technology (IT) cost significantly.

Citizens

The *information network* brings significant time-savings through simplified search and minimized ways for all citizens with Internet access. The increased richness of information makes it easier to find the appropriate agency and the requirements to be fulfilled. An adoption of search criteria to typical life situations makes it easy for the user to find the appropriate service. This task was quite complicated before, as it was not clear to the user which administrative level was responsible.

The *communication network* functions make tasks such as tax declaration easier: forms do not have to be bought, they can be downloaded from the Internet, and sent in part[1] electronically to facilitate further processing.

The coupling with regional supply information in a *transaction network* was thought to serve regional demand with more complete information than the yellow pages can provide, make the market transparent through catalogue functions, and inspire trust through the mix with official information. This could help to reduce existing inefficiencies on traditional markets, where the customer is confronted with a non-transparent situation.

Enterprises

The main advantage for enterprises was thought to be the cost-saving potential of centralized service provision in the *transaction network*. The enormous growth of websites on the internet make it quite costly for an enterprise to differentiate its own offer from the competition in order to be found by search machines. This could be overcome by a professionally managed exchange. By bundling a virtual marketplace with an official information site, the introduction cost of an Internet presence could be enormously reduced, it was also expected that the *information network* would create additional business opportunities. Application service provision was thought to be a further advantage: the firms would not need to have specific e-business or IT know-how. Thus SMEs would be initiated to e-commerce without having to face all of the technical problems.

The planned moderate cost of service provision for the individual supplier was thought to result from a central provision of server capacity and standard business software and a great number of participating Bavarian enterprises. The government would pay the cost during a test period of several years. After this time it would be up to participating suppliers to foot the bill.

Additional advantages of the VMB were regional logistics solutions coupled to the exchange. This way one of the difficult problems of e-business could be solved in an efficient way.

The *communication network* facilitates compulsory registration and notification requirements for enterprises.

The Chosen Approach

Organizational Model

The VMB was planned as a public-private partnership where the Bavarian government would provide the domain (www.baynet.de) and links to the Bavarian server. The

[1] A signed identification has to be sent by fax.

VMB Ltd. would provide the set-up and management of the civil service guide. After initial financing from the state government it was planned that the service would be financed in the longer run through the gains from the economic activities of the VMB: advertisements, hosting, and transaction fees.

The VMB was embedded in a portal solution covering an information, a communication, and a transaction network. The information network comprised various segments from information on government services for citizens, other informational services including news, maps and links of interest, holiday and leisure information. The innovative search solution was an user interface connecting administrative actions and commercial information to situations of life (e.g., birth, mobility, finance, health). This allowed for intuitive use of the search facilities of the VMB (Figure 3).

The multiple service offers were designed to attract more traffic and to establish the portal as a site where "everyday" demand could be satisfied without having to search at other web sites.

The commercial transaction network offer was thought to serve the same purpose. Experience from another project (the citizen network initiative) suggested that demand would be mainly targeted at the surrounding region. Therefore, regional virtual marketplaces (RVM) with own subdomains were planned from the start. They would be integrated into the VMB and interlinked among each other so that the user would perceive them as one service. As an adequate starting point, administrative districts of Bavaria were chosen as a model for RVMs.

Although the communication network was the backbone of e-government development, it had the potential to increase the overall traffic on the network with growing online public service offers and to open the networks to commercial "cross-selling" opportunities.

The voluntary character of the participation of regions made it necessary to offer a platform with sufficient scope for individual variations without sacrificing interoperability: standard interfaces, central management of content and style suggestions were necessary to allow for an overall "identity" of the site.

Requirements to Meet

This made a basic standardization of RVMs necessary. At least four components should be provided:

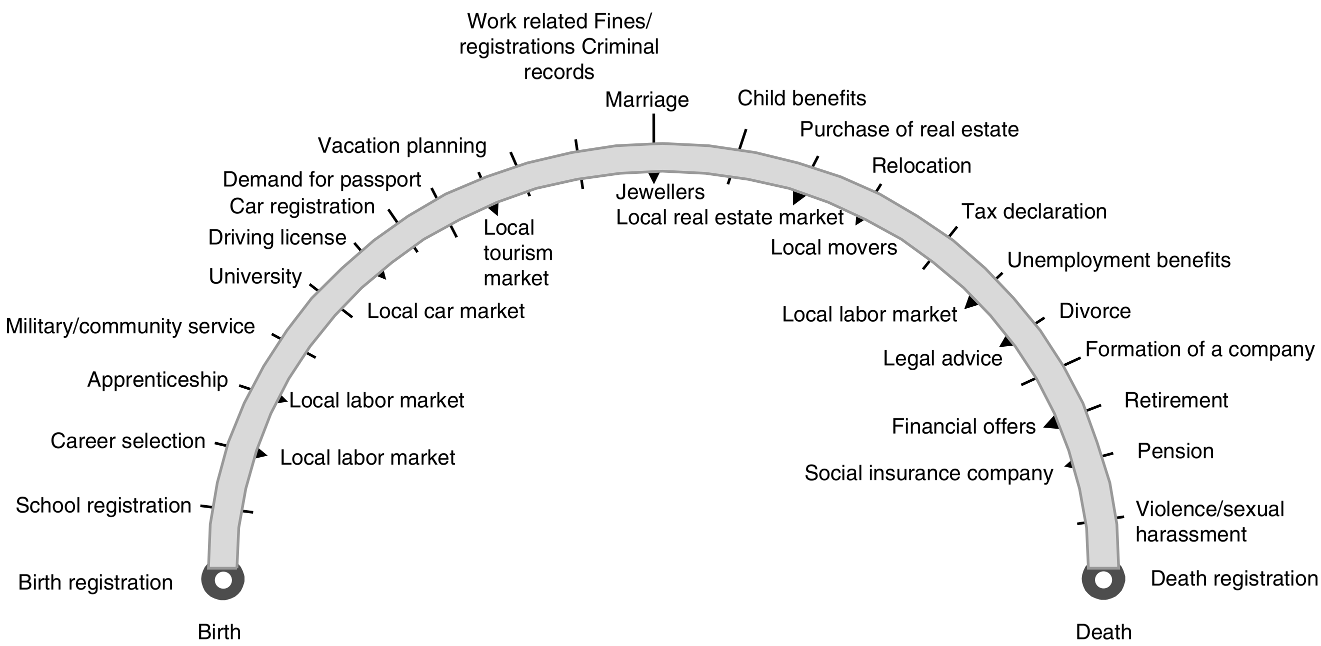
1) a multifaceted bundle of offers including commercial, governmental, and community services
2) supporting instruments for the users, e.g., search facilities, e-purchasing applications or helping functions
3) secure settlement systems
4) a logistical concept for the region in order to optimize the delivery of goods

Decentralized updating had to be enabled. To safeguard against illicit changes of content, an authorization structure had to be implemented. The VMB would not only have the role of the administrator, it would also provide the technical infrastructure, and assume responsibility for central functions such as marketing, management, and controlling.

In order to facilitate the use by SMEs the VMB offered application service provision: the server could be used as an IT basis for the firms, SAP/R3 software was available for transactions, and content management was accessible through Windows NT servers.

Figure 3

Situations of life interface



The Development

The concept for the VMB was developed in 1998. A regional pilot project was started in 1999 in Straubing. In November 1999, a European call for tender was published by the Bavarian government which led to more than 20 proposals. The tender of a consortium of SBS and SAP was accepted in early 2000. At the same time, all 96 district governments had signed for the VMB.

By the end of 2000, the domain (www.baynet.de) went online; one year later, all 80 regional portals were also online. By 2003, the VMB network offered

- information and communities (e.g., news, events, Virtual Campus Bavaria)
- e-commerce pool: 700,000 Bavarian companies
- e-government gateway to all public authorities in Bavaria connected with 927 product sheets and a growing number of forms and online applications (e.g., for tax declaration or trade registration)

In 2004, the Bavarian cabinet decided to stop the funding of the commercial transaction network as it became clear that the targets set initially could not be reached.

Different explanations seem possible for this failure: public exchanges mainly offer advantages for SMEs as larger enterprises prefer portal solutions. As the project B2B Metrics (2004) indicates, overall use of exchanges for buying and selling is quite low and prevailingly concentrated on portal solutions. This is consistent with IBM findings on B2B net markets (Maver and Latimore, 2002). Regarding B2B e-business, SMEs either do not have the consciousness of the potential or do not fulfill the necessary preconditions from using standards to offering catalogues.

Eggert and Kolmar (2004) have analyzed voluntary interaction among agents in economic environments that can be characterized as a contest: the missing information on the number of participants, their competitive strategies, and the potential gains may additionally have led to a wait-and-see attitude of business participants.

Preliminary Conclusions

The VMB demonstrates that the state can successfully stimulate the development of regional knowledge networks. The cost is justified by the long-term savings potential from administrative reform and the amelioration of public service. It is obvious that the development of the larger concept will need more time as will the acceptance of the network.

The initial assumption that the network could be financed through fees from a commercial transaction network after a period of transition did not sufficiently take into account the difficulties in the creation of a public business exchange. A later re-integration cannot be ruled out at the moment, although a business model does not yet exist. It is also unclear if the addition of a transaction network would have increased traffic significantly. The network externalities have been overestimated.

A further stimulus for network development would probably come from the introduction of secure digital identifications which would allow for a huge extension of the communication network with citizens and enterprises.

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Chapter 17

The Region's Competence and Human Capital: Lessons From the Collaboration Between Three European Regions on Competence Mapping and Intellectual Capital Management

Lars Karlsson, *Department of Education, Lund University, Sweden*
Paolo Martinez, *Firenze Technology, Chamber of Commerce of Florance, Italy*

Introduction

This paper mainly builds upon the experiences from the cooperation within the Regional Competence project,[1] between the three European regions: Florence, Italy; Komen, Slovenia; and Blekinge, Sweden.[2] It contains a comparative reflection and analysis of some central aspects of the interregional cross-learning[3] that occurred.

[1] Regional Competence is a three-year innovation project funded by the European Commission. For more information about the project visit our sites: http://reg.kompetens.net/; http://promo.kompetens.net; http://blekinge.kompetens.net/; http://individuell.kompetens.net/; http://italia.kompetens.net/; http://www.komen.si/ang/reg_comp.htm; http://slovenia.kompetens.net/; http://castillayleon.kompetens.net/.

[2] Castilla y Leon in Spain also participated. The activities in the Spanish region are very similar to those in Blekinge, so we have chosen not to make any separate presentation. For more information, visit the Spanish site http://castillayleon.kompetens.net/.

[3] We use "cross-learning" in a sense that is very close to the concept of "benchlearning" (i.e., continuously improving through comparing one's own activities with the experience of someone else). Find more information about benchlearning at www.karlofconsulting.se.

In line with the focus of the project, we will direct special attention to how the partner regions were able to learn (together and from each other), how to better manage their regional competence for strengthening the region's competitivity, and as an instrument for regional intellectual capital (IC) growth.

This chapter begins with a short description of the conceptual basis, contextual conditions, objectives, and trajectory of the Regional Competence Project. It continues with a case description from the three presented regions (Blekinge, Komen, and Florence).

It ends with a summary analysis of the project experience and an outline of some perspectives.

The core activities of the Regional Competence project have been related to mapping competence, i.e., "to adapt and further develop tools, methods, and procedures for the verification, registration, and validation of competence at individual and structural level." The resulting data from the competence mapping are primarily meant to be used when planning the competence and IC development of the involved individuals, companies, and regions.

The starting points of the Regional Competence project were two database systems and software tools, developed and tested in Blekinge in South Sweden—the Individual Competence Database (ICDB) and the Regional Competence Database (RCDB). What might initially have appeared as a relatively straightforward transfer and further development of a successful experience made in one region in one European country to other regions in other European countries, was to be much more demanding than expected.

When we wrote the project proposal, we naturally catered to cultural and other forms of diversity and possible related barriers; some have surfaced and been relatively and successfully dealt with.

But what was to become a recurrent challenge was the concept of competence itself—how to define and delimit the competence of individuals, organizations, and regions.

The common experiences during the project have emphatically confirmed the fact that, when attempting to understand the concept of competence in the increasingly knowledge-based society of today, one has to consider a growing complexity of interrelated contextual factors as well as other factors.

An additional challenge here is that, in the present situation with a work life in continuous and accelerating change,[4] we are dealing with a "moving target."

Presently, it is even more obvious than before that competence as well as knowledge are perishable goods with a "best-before" date and that we have a need for a continuous re-supply. In other words, a competence without an opening towards change and development is mostly condemned to become gradually obsolete.

This is also true for established traditional skills and competence. It does not help very much if you are the best shoemaker but are overtaken by technological developments or if your services are so time-consuming and costly that no one can afford them.[5]

[4] This continuous and accelerating change and growing complexity can be observed in most spheres of modern life.

[5] This was as a matter of fact something that threatened the survival of the shoe industry in some Spanish, Greek, and Italian regions. Very costly bottlenecks were, e.g., the last-making and making of mould prototypes. With the complementary use of new technology and competence (plastic processing material technology from Italy, process technology from the Spanish toy industry, and CAD/CAM solutions from Spain and other countries) the prototyping costs and

The increasing complexity, and allusiveness is already striking when we try to find definitions for the competence of the individual, and the complexities grow when we widen our perspective to the analysis of organizations and then move on to entire regions.

When we set out to particularly "audit"[6] a region's competence, factors such as mentality, inter-relational competence, stakeholder contributions, and competence structures grow in importance.

The continuous discussions during the Regional Competence project of how to best describe and audit the regions competence have positively contributed to the internal cross-learning.

These discussions and issues raised are also reflected in this chapter.

Context, Conceptual Framework, and Objectives of the Regional Competence Project

In the present knowledge and competence-intensive e-society, new and different combinations of skills divide, and sometimes even erase professional frontiers as they are currently and traditionally recognized and it is increasingly difficult to rationally measure competence by any of the types of formal qualifications, titles, or even job-titles as they are currently understood and applied.

Thus, there is a growing demand for new methods of defining, describing, and mapping competence together with criteria for assessing and validating both traditional and formal, as well as non-traditional and non-formal competence (attitudes, skills, and knowledge).

The indicated objectives of the Regional Competence project have been to adapt and further develop tools, methods, and procedures for the verification, registration, and validation of competence at the individual and the structural level. The resulting data is primarily being used for the competence and IC development of individuals and organizations as well as regions and society in general.

The initial technological focus and starting point of the Regional Competence Project was two open source database systems and software tools[7]: the ICDB and the RCDB.

The prototypes for these databases were developed by the information and communication technology (ICT) consultants Samurajdata AB in Karlskrona and tested in Blekinge, Sweden.

The project's methodological focus, given the complex cultural and cross-sectoral diversity of the partners and local actors involved, has been to combine the development of the use of the databases with the application of a number of participatory techniques. Thus, the objectives were to support internal cross-learning, but also in a collaborative way to design and test adequate methodological tools for the stakeholder deliberations around competence mapping and development.

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time to market could be reduced by 50%. For more information about the Innovation Project T-SHOE, see http://www.tshoe.inescop.es/tshoe/t1.htm.

[6] A "regional competence audit" implies the weighting of the effects of different interacting competence factors in order to make a comprehensive balance of the region's actual and potential competence.

[7] The ICDB free software may be downloaded in English from the project web site at http://reg.kompetens.net or in Italian at http://italia.kompetens.net.

The main partners involved in developing and spreading the regional competence experience to other European regions have, together with Blekinge, been the provinces of Florence in Italy, Komen-Karst in Slovenia, and Castilla y Leon in Spain.

A key partner for the further dissemination of the regional competence tools and systems is the Council of European Municipalities and Regions (CEMR) that federates 100,000 local and regional authorities through 43 associations in 30 countries. The CEMR acts as their representative voice vis a vis the European institutions and promotes an exchange of know-how and interregional cooperation.

The free, open-source nature of the tools and methods of regional competence, facilitates their dissemination, organic adaptation, evolution, contextualization, and continuous improvement.

This has also been possible much in part to the contributions and knowledge of a growing community of users. For instance, a community of DG Enterprise European Innovation Projects has adopted RCDB to support their competence-based clustering processes. This community[8] involves 700 organizations from all 25 European Union (EU) countries as well as from Iceland and Israel. It represents a kaleidoscopic cross-section of most possible socioeconomic players.[9]

When the Regional Competence project draft was elaborated, the main points of departure and contextual references were the experiences from the attempts of the small Swedish county region Blekinge to use competence mapping to understand the individual competence in companies and organizations and to create an improved basis for IC management in the regional small- and medium-sized enterprises (SMEs).

The Blekinge Tools

The original initiative to the competence mapping in Blekinge was taken by the regional trade unions (LO-distriktet) in the 1990s, when in the work with the programs of the Europeans Social Funds they saw the opportunity to offer the employees with the most need, a continuous competence development. The question was “who” were these who most “needed” a competence development.

It was clear that the answer could only properly be given in the framework of a contextual prospective analysis, where the actual and projected needs of the individual employee as well of the organization is considered—preferably also within the framework of a forecast of, e.g., the general technological development.

In an attempt to create a tool for gathering the data necessary to answer the “who” question the ICDB was developed.

This is a system and software aiming at the mapping of the competence of individual employees, combined with a participatory procedure for using and analyzing this data.

The competence mapping and completing the data form in Blekinge is done in the context of a “development discussion” between the employee and a staff member or development officer. During the conversation, an individual competence development plan is also ideally established and agreed upon. The integrity of the employee is respected; the personalized data stays at the company level and it is not published on the web. However, a precondition is a certain relation of mutual confidence between the employee and the employer.

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[8] The cluster of innovation projects may visited at www.eucluster.net.

[9] The cluster community includes, for instance: SMEs, large companies, research centers, universities, trade unions, chambers of commerce, local authorities, environmental organizations, consultants, company associations, technological centres, and so on.

The information from the individual mappings has primarily been used to identify the need for specific training and competence development measures, but can also be used to build the company's competence profile and help assess the human capital as part of the company's IC.

At approximately the same time as the regional Blekinge trade unions decided to implement the individual competence initiative, the county authorities began discussions about making a mapping of the economic activities in Blekinge.

After some discussions about the usefulness of such a "catalogue," it was decided to both go a step further and deeper and also map and present the competence existing in the regional companies and organizations, with the extended objective to describe the competence of the entire region.

The resulting RCDB is a regional company competence database, where the competence profiles of SMEs and other organizations are published on the web. The main objective is to further regional competitiveness, e.g., through improved cooperation between SMEs with complementary competence profiles.

The RCDB not only supports the elaboration of regional competence profiles, but also delivers material for the drafting of regional competence and IC development strategy plans.[10]

Regions Learn Together

The project work has offered multiple openings to perform comparative reflections and learn together with additional opportunities to widen the intercultural competence of the involved regions. But the bulk of the more specific cross-learning within the Regional Competence Project has mainly been related to competence and IC development in a rapidly changing knowledge-intensive society.

Although the central ambition during the more than three years of Regional Competence Project, has been to further develop and complement the Blekinge tools into truly European instruments and systems for mapping regional competence and the related IC, the project partners quickly expanded their common reflections to not only cover descriptive elements but also take position to different aspects in relation to questions about definitions and delimitations of individual competence and regional competence and IC management.

There was an articulated need to gain better control over what a region's competence and intellectual capital really consists of and the particular potential role of the different regional actors. Another central issue was if the regions can create enough framework security and safety nets for the different actors in a situation of continuous and accelerating change and growing contextual complexity.

A particular challenge has been to find ways to map and truly describe, not only the competence of individuals, companies, and organizations, but also the multi-layered "regional" competence and IC, including concepts as attitudes, mentality, identity, image, and change and innovation capacity.

It was here that the need to develop further instruments for "regional competence audits" was proposed.

Such an audit would include the weighting of the summarized effects of different interacting competence factors in order to make a comprehensive balance of the

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[10] There is no automatic connection between the company-based individual competence and the open Regional Competence databases, but the average values from the ICDB can be used, e.g., when the company competence profiles are elaborated for the RCDB.

region's actual and potential competence. The perspectives that the regional competence audit alternatively could be developed into a full-fledged regional IC audit were also suggested.

In the development discussions and learning processes the partners introduced additional and complementary theory as well as practical experience. For instance, the Florence team was strongly influenced by the concept of acting by competence, thanks to the support of Guy Le Boterf (2000), a French expert in competence mapping and development.

Participatory Learning Tools

The Study Circle (Karlsson, 2000) approach has, together with other related tools, e.g., Scenario Workshops (Martinez, 2000), proven to be an efficient instrument for raising awareness, stimulating the collective intelligence, and enhancing the involvement and motivation among internal and external stakeholders.[11]

From its very beginnings in Sweden in the dawning 20th century, the Study Circle was a vehicle both for raising public awareness of a changing reality and for solving problems related to new technologies and science (Karlsson, 1985; 2000), in working life and in society as a whole. So in Blekinge it had been natural to fall back on the Study Circle format when the massive campaigns for computer literacy were started on the initiative of the trade unions.

In Tuscany and Slovenia as well, there is great interest for different participatory and collaborative methods. Methodologies in lines with the Study Circles principles of cooperative learning are being developed and used in both regions.[12]

The practical applications of these principles have been extremely useful in the Regional Competence Project when facilitating the stakeholder involvement in the bottom-up co-design of the competence and IC mapping process.

There is some reason to expect that applications of the basic principles of the Study Circle format, with its social learning curriculum, will have a renewed and even stronger significance in a society where "networking" (i.e., creative contacts between individuals and groups) is increasingly seen as crucial and consciously promoted, for example at European level.[13]

The Study Circle format is, through its mixture of structure, versatile flexibility, and social support, a functioning model for the creation of a sense of local unity and a safe framework for reflection, in the face of a continuously transforming global context.

The common discussions within the Regional Competence Project about the Study Circle go far beyond the mere export of a Swedish model. The participatory thinking behind the Study Circle format soon entered into its own dynamics, where the resulting multiple ways to work with common learning has attained enriched European dimensions.

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[11] In the Regional Competence Consortium, we have a wide stakeholder spectrum with representatives of, e.g., SMEs, chambers of commerce, trade unions, local and public administration, universities, and Pan European organizations. In the practical project work, we have also had a direct involvement of individual employees and employers.

[12] The mentioned Study Circle principles are essentially the same as those behind most successful cross-learning.

[13] The Study Circle principles are also driving the cluster of European innovation projects in www.eucluster.net.

Extracts From the Internal Discussion and Cross-Learning Process

Definitions and Challenges

In order to continue the internal development discussions it was necessary, as a first step, to try to arrive at common definitions in a number of fields. In particular, to identify and describe competence components that as far as possible cover the specific regional IC and allow a differentiation in relation to the competence and IC that is better described as part of the IC of individual organizations.

Many of these particular "regional" concepts are of course also applicable to private enterprises and organizations. But the concepts vary in significance according to context, not the least due to different roles of different regional stakeholders and particularly the division of labor between private and individual initiatives versus the public sector and general public in a wider sense.

From the start, it was obvious for the project partners that it is not sufficient to merely present regional competence and IC as a sum of the competence and IC of the different regional actors in a sort of adding exercise. When adding the IC of the perceived IC of different regional actors to each other, the real sum of 1+1 could be 3 or even 0.5. It is necessary to consider the relational qualities of the actors' IC in order to understand how this brings added value (or not) to the region as a whole.

The existence, imbalance, or a lack of certain profiled form of IC among the regions' actors will naturally add up to something that influences the IC profile of the entire region. But often this manifests itself more indirectly and as something that at first sight would not be easily recognized as part of the common regional IC.

Mapping Competence and IC

An important role of the regional competence and IC management is to keep track of the human resources of the actors in the region. You have to know what you are good at and where there might be weaknesses. It can also be useful here to know where a certain actor might be "over-capitalized" and where temporary or more permanent gaps exist.

This knowledge is not only a precondition for a functioning planning of regional competence and IC development, but also for the establishment of competitive regional competence alliances based upon complementarities of different actors.

In Blekinge where such mappings have reached a certain development, this has allowed for the temporary exchange of employees in order to meet different demands on competence combinations.[14]

Such results and innovative approaches in the mapping of competence and exchange of personnel, have been found extremely interesting by the Tuscan partners of the Regional Competence project and are, despite some initial skepticism, leading to the adoption of similar models by their local companies.[15]

When we take a closer look at how a regions competence and IC management takes concrete shape, it is important to distinguish between pursued functionalities and the institutions that might be part of delivering these.

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[14] The "employer's ring" was set up in the Blekinge area to foster the exchange of personnel within a group of independent companies.

[15] See the Tuscan case study.

A regional vocational education and training center or a university can be an infrastructural contribution to a positive development of the regional competence and IC (and often is), but the key growth poles for regional competence and IC are more often found in an interaction between a number of private and public actors.

Since Socrates there have been critics saying that people do not learn as the schools now are organized. With the new technology we have the chance to develop educational systems and institutions, which better conform to how we really learn. The new ICT-supported pedagogy cannot as before be mainly concentrated to particular "physical" educational institutions and isolated periods of life.[16]

If in earlier times information to a certain extent was to be considered a scarce resource and the knowledge to absorb was relatively defined. Today, it is more a question of how to continuously choose from an overwhelming and changing abundance of information. We have to be very selective when we decide which parts should be a part of our actively applied and updated competence. It is in general terms crucial to adopt a pedagogic attitude, which helps in dealing with continuous change and readjustments.

Implicit and Explicit Competence as Part of the Human Capital

When mapping the competence of individuals and organizations a serious and frequent obstacle has been so great that part of this competence must rather be considered "implicit" (tacit) than "explicit."

But it is not only in individuals and organizations that a significant proportion of the competence and in consequence also of the human capital can be found in the domains of implicit competence, i.e., non-codified competence.

As a matter of fact, the importance of implicit competence is mostly even more accentuated when we arrive at the complex web of human and structural capital that adds up to the regional IC.

It is obvious that the existing explicit competence—the conscious skills and knowledge to achieve defined objectives and to perform certain productive and value-generating activities—are central components in the regional IC. The population's explicit competence can be an important basis for the regions perceived identity(s) and projected images(s).

This explicit competence as part of the human capital is quite possible to define, describe, and map. But we must also consider and weigh in the other, perhaps more allusive and non-codified but still crucial part of the regional IC.

Much of the competence to relate and interact with our surrounding contexts has to be situated in the complex field of implicit knowledge and human capital. It is probably even so that when we start to consider attitude competence factors as regional mentality we should probably treat this as a region's implicit structural capital.

It is essential that we must also find ways to describe these implicit structural components of the region's competence and IC.

[16] However, this does not necessarily mean in that school institutions, at least for the younger ages, will become superfluous. There will still be a need for tutored learning, particularly in cultural techniques as reading, writing, and calculating. The schools' social function will be enhanced while the pupils learn how to search, identify, and structure relevant information on their own and together.

Attitudes and Mentality, Identity and Image

In the attempts to describe the competence and IC of a certain region, we have also met the challenge to study a quite illusive pattern of phenomena as "regional traditions" or "entrepreneurial spirit," that in turn can be manifested in the form of behavior as, for instance, a particular openness or resistance to change.

These attitudes also include the level of trust that a community maintains and builds, what Putnam (1993; 2000) defines as the social capital. These and other attitudes and self-definitions add up to something that can be best described as the predominant regional mentality. This predominant mentality can in turn be a key element in the regions' implicit structural capital.

The existence of, and possible changes in, a predominant regional mentality can be a decisive factor, not only for the actual regional IC, but also for the conditions under which this IC can be properly "invested," reproduced, regenerated, and developed.

Another central part of the regional IC has its roots in the regions self-identity and projected image. The way you perceive yourself and how others look upon you can become a key asset but under other circumstances it can become a liability.

If you consider yourself "backwards" or "advanced" then it is very probable that you behave accordingly. If you base your identity and image on certain skills or natural resources, then this will influence the regional strategy to meet the future. The same holds true if you consider yourself as, e.g., a cultural or mass tourist region, etc.

A region with a predominant self-identity and image mainly based upon glory from the past and strong traditions that cannot combine this with openness for relevant change, risks losing many trains.

The identity and image can also naturally be transformed over time as we clearly can observe in the case of Blekinge in Sweden (see the following text).

Competence Investments and IC

For a region to keep up the relative value of its IC, there will be a need for continuous investments both in spearhead competence and in the broad competence among the general public. A crucial question here is how one can best combine the 'top' and 'base' ambitions.

In the present situation where the innovation cycles become increasingly shorter, there is also a growing need for an accelerated functioning communication and interplay between the top competence and the broad competence base. We must find ways to stimulate a cooperation between 'top' and 'base' and find natural meeting places for mutual profit.

The 'top' competence can probably function as a "pulling force" for the 'base', while the 'top' needs the communication with the 'base' (e.g., for questions of science accountability and the non-technological aspects on technology applications). The 'base' may also express a demand that could stimulate a diverse organization and new discoveries or approaches in the 'top' competence.

Strategic Regional IC Management

Particularly in the present situation that is increasingly characterized by continuous and accelerating change and growing complexity, we do need a truly holistic attitude to IC, and we need clear concepts, tools, and procedures for strategic regional competence and IC management.

A central function of the strategic competence and IC management of a region should be to guarantee favorable contextual conditions and supporting the investment, reproduction, regeneration, and development of the competence IC of its individual actors. In the elaboration of a strategic plan for a sustainable competence and IC development, the Scenario Workshop[17] methodology can play an important role.

Guiding key dimensions in the elaboration of a impulse scenario for such a workshop on sustainable strategic regional IC management can be:

- attitudes and mentality
- identity and image
- change and innovation capacity
- strengths and weaknesses
- resources and deficiencies

Regional Case Studies

The difference of size and history of our three European regions are enormous, but as we come closer to human functions, there is enough room for comparability and mutual learning; in the regional IC, you find nearly the same components and factors in all the three regions, but in somewhat different manifestations.

For example, we have been able to observe the decisive role of individual "regional entrepreneurs," i.e., persons who are taking entrepreneurial initiatives, not for an individual company, but for the development of the region where they live and act. The difference is that in one case this entrepreneur might be a trade unionist, in the other a SME interest organization leader, and in the third a municipal program manager.

We have chosen to primarily integrate both lessons learned and obstacles we encountered in the three case studies. However, we will return to these together with the perspectives in the conclusions section.

What the involved regions have in common is that crucial factors affecting the regions' IC (in the positive as well as in a negative direction) have been phenomena that might be possible for us to describe, but can be very difficult to map or quantify as, e.g., mentality, identity, image, tradition, and so on.

This together with the central importance of "soft skills" as part of competence and IC does not eliminate the need for proper tools for mapping competence, but it definitely puts these tools in a new perspective.

Case Study: Blekinge (Sweden)

Blekinge, with approximately 152,000 inhabitants, has often been described as the garden of Sweden, but also as a Sweden in miniature. In Blekinge, there are towns and rural areas, fishing, farming, crafts, tourism, practically all forms of industry and commerce, military installations, schools and a university, and a very long and varied coastal line. This region is one of the densest populated areas of Sweden and does even contain sparsely populated parts where there is a great distance between the isolated dwellings.

This picture of Blekinge as a miniature image of Sweden is particularly significant in relation to Blekinge as an ICT region, and especially when considering it as a full-scale laboratory or test-bed for the emerging knowledge and information society.

[17] See the description of an EASW scenario workshop under Case Study: Florence, Tuscany (Italy).

During the last decades, industry and other economic activities in the southern Swedish province of Blekinge have gradually undergone comprehensive, even dramatic, structural transformations.

As a consequence of this, the general work-life conditions and the labor market have also changed. The traditional key industries have been losing their importance by comparison with production and services related to ICT. There has been a significant switch from more straightforward manufacturing to activities, which rely strongly on innovation and continuous research and development (R&D).

Blekinge follows the general trend away from the big workplaces to an increased number of smaller ones. Today in Blekinge there are approximately 10,000 registered enterprises, of which approximately 6,500 are "active." Around 5,000 of these have <15 employees. Many of the small enterprises are family based—a fact that can influence their ways to deal with the introduction of, e.g., new technology.

For people living in the Blekinge region, a multitude of practical ICT applications are increasingly part of their normal daily life in the workplace, in the home, and in connection with leisure activities. For some of them one could even suggest that the concept and application of ICT have become an integral part of their day-to-day existence.

One could also sustain, that during the last decades, Blekinge, or at least a significant part of the active population, seems to have undergone a corresponding transformation in it its self-understanding and perhaps even mentality. The often and quite gloomy atmosphere and pessimism about the future from the early 1990s seems since to have radically transformed into widespread, active development optimism.

The reasons behind these transformations are manifold, but most observers seem to agree about some positive key factors.

One key factor is the establishment of the regional university college in Karlskrona/Ronneby, now called Blekinge Institute of Technology BTH, that specializes in ICT.

Other factors include: the establishment of a number of new high-technology enterprises around the development centers (TeleCom City) in the provincial capital, Karlskrona, and Soft Center in nearby Ronneby, and the multimedia activities in Karlshamn.

The allocation of the Swedish main facilities of the mobile telecom provider Europolitan/Vodafone is a further contribution to a strong regional ICT profile.

These public and private initiatives have certainly contributed decisively to the development of the regional information society and to the general positive attitude among the general public towards technological development. They have also resulted inthe considerable critical mass of ICT intelligence and know-how that has been brought together in a manageable public domain. In Blekinge, a number of working models, tools and best practices have been developed, applied, and validated. This leads to the topic of regional competence and IC growth poles.

But there are of course a number of additional interrelated key factors supporting the process of structural transformation in Blekinge. One important factor is the general support received from local and regional authorities and organizations. This may often be taken for granted, but plays a significant role in the overall picture.

One important decisive factor has also been the recognition by individuals involved in the labor market where there is a strong common interest in developing skills and competence, particularly where ICT is concerned. This clearly implies that there is a need for a renewed social model based on pro-active cooperation between the social partners and those both in and out of work.

In Blekinge, one important factor is that the regional trade unions and the TUC secretary (LO ombudsman) Sterne Johannesson had a very early understanding of the value of the competence development of its members. They have often taken the leading initiative, e.g., to promote general computer literacy and use of ICT and to support the employees' individual and collective competence development processes.

It should be noted that there has been widespread awareness and adoption of an "ICT for everyone" perspective in the region. The aforementioned ICT training initiative reached more or less all trade union members and the present basic "computer literacy" rate among them is approximately 80%.

The general process has strongly supported the creation of a very favorable regional climate for innovative SMEs. There have also been a number of other positive effects in terms of awareness, regional competence development, and competitiveness.

The Blekinge region seems to have moved beyond the pessimistic and pacifying "no-go-mentality" (det-gaur-inte) and onto a new mentality of positive reactions to innovations and recognition of opportunities through new technology. Perhaps it would not be all wrong to sustain that the region is not only accepting the recent transformations, but is somehow preparing itself mentally for the even more dramatic changes to come in the emerging e-society. This can be considered an important improvement of the regional IC.

The massive establishment of ICT-related activities is obviously not a panacea that solves the situation for Blekinge forever (Manchester and Spinning Jenny). It will be interesting to follow Blekinge through the transformation of the last decades as it accepts ICT as part of the regions identity and is better prepared to accept further innovative initiatives using, e.g., nano- or biotechnology.

Case Study: Komen in the Karst Region, Slovenia[18]

The municipality of Komen is situated in the Southwester part of Slovenia on the border to Italy (Trieste). It is part of the so-called Karst limestone plateau ("Kras") and covers an area of approximately 100 km^2 with only 3,700 inhabitants distributed in 35 villages. There are 120 SMEs active in the area, from which 3 have approximately 100 employees each.

The area is well known for its rich cultural heritage (small old villages with stone houses, churches, and castles), its unique and well-preserved nature with the special Karst caves, and its agricultural products, particularly the dried ham ("Prosciutto") and the Teran wine.

The main urbanizations of Komen are the administrative and economic centre Komen and the medieval town Stanjel.

The municipality is very active in building its infrastructure (water supply, sewage plants, tourism, and so on). Komen is also closely cooperating with its Italian neighbors. Among the immediate projects is the renovation and revitalization of the medieval town Stanjel and the establishment of a regional/local cluster of tourist service providers. Komen is also trying to attract a university campus for post-graduate studies in restorative architecture and arts.

The municipality sees the development of its ICT resources and dissemination of corresponding competence among the population as a strategic key issue in order to

[18] The Komen/Karst case study has been elaborated together with and based upon texts from the Programme Manager of the Municipality of Komen—Erik Modic.

support a local qualified labor force, promote the specific agricultural (wine, prosciutto, cheese, honey) and other local traditional products (handicraft), and develop a network of tourist services (bed and breakfasts, apartments, inns), which are in harmony with the cultural and natural heritage of the region (extensive tourism).

Additional to the more mainstream project activities related to the development of the specific databases, another central objective in Komen has consequently been the continuous training of the end-users in ICT technologies.

As there already had been made other (commercial) attempts with competence mapping from various private organizations in Slovenia, it was crucial for the Regional Competence project to find the right way to motivate the SMEs to be involved.

To make the decision of participation easier for the SMEs in the Karst subregion, they were invited to attend in e-training courses where learned additional information on the importance of using ICT tools for competence mapping followed by training in the use of the databases.

From the beginning of the project it had been clear, that due to the economic structure of the SMEs in the Karst subregion (municipality of Komen and neighbor municipalities) it would be necessary to enlarge the existing Swedish prototype of the SMEs database with tourist and agricultural elements in order to involve as many SMEs as possible in the Regional Competence project. It had also become evident, that the municipal Tourist Information Center needed a very complex tourist and agricultural database in order to meet its own high ambitions on tourist issues.

A work group consisting of the local IT subcontractors of Komen and the head of the Tourist Information Center together with a representative of the Agricultural Advising Service Sezana elaborated together an integrated concept for the tourist and agricultural database and the use of the developed databases for further applications.

The prerogatives of that new upgraded database should be:

- to have the possibility to map the competences of different sectors *(principle of universality)*
- to enable national/regional administrators (and not only the general administrator) to freely add new data fields *(principle of flexibility)*
- to have the possibility to be run in different languages *(multilingual principle)*
- to enable the creation of an additional level of monitoring and collecting of the data *(principle of multilevel data control and data filling)* (which means beside the level of the general database administrator and the end-user there can be one or more different local/regional section carriers (i.e., public tourist organization of region A for competence mapping of tourist service providers in region A and a public agricultural association in region B for competence mapping on agricultural issues in region B and so on) and national/regional administrators, which shall make the network of databases more efficient and up-to-date)
- to be accessible on the web with dynamically generated personal web pages *(principle of up-to-date presentation)*, which means, that all changes and modifications of the database are shown immediately in different applications.

The result of the Komen development activities became a new open source software tool—the database VODNIK (Slovene expression for GUIDE) and the tourist web pages.[19]

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[19] Database: http://vodnik.kras-carso.com/index_vnos.php.Tourist webpage: http://vodnik.kras-carso.com/

The database VODNIK is a so-called meta-database, which enables easy and fast upgrading, changing, or adding of data fields. It maps the complete regional competence of the tourist sector and of all of the sectors indirectly connected with tourism (agriculture/wine production, art, cultural, natural and ethnological heritage, and so on).

The tourist web pages are directly linked to the meta-database and provide access to all public competence data. (Some competence data are not public and, therefore, are accessible only to some public institutions and are not presented on the web pages).

The database will be running in four languages—Slovenian, English, German, and Italian. Both end-users from the municipality of Komen and from its Italian partner community Duino-Aurisina have begun to complete their data in the database.

As the Municipality of Komen needed to develop additional software (based on open source) including adequate testing and implementation, it was agreed that the municipality should install its own Linux Internet server. The partner Samuraj data AB from Blekinge offered the municipality full technical assistance in installing the server.

Komen can now boast to be at the forefront in Slovenia regarding open source.

The participation of Komen and the Karst subregion in the regional competence cooperation has strengthened the regional IC on many levels, but not merely through a simple transfer of the Blekinge experience. Komen not only adapted and further developed the existing, but also took some considerable qualitative leaps forward in dealing with regional IC management. Now when the Regional Competence project is coming to an end, Komen is building an extended cooperation with nearby regions for new initiatives around competence and information, particularly for rural quality products and tourism.

Case Study: Florence, Tuscany (Italy)

Florence is situated in the Tuscany region in Central Italy. Its Province covers an area of approximately $3,500\,km^2$ with approximately 934,000 inhabitants distributed in about 34 municipalities.

There are about 85,000 active companies registered in the Province of Florence.[20]

But 92.02% of companies in this region are extremely small, with up to 5 employees.[21] These are mainly family businesses or artisan and craft workshops. The remaining company sizes are as follows: 4.62% with 6 to 19 employees, 1,1% with 20 to 49 employees, 0.22% with 50 to 99 employees, and 0.18 with over 100.

These simple data and especially the very small company size give a clear picture of the challenge facing anyone working with the promotion of innovation, competence and IC development.

We are in fact dealing with a region where people are aware of their strong tradition, set of values, meaning, and history. Listri (2001) tries to summarize some of the main experiences and know-how of the region in terms of attitudes, history of art, faith, music, politics, cooking, and so forth, but these may also be perceived by any one who spends time in Tuscany.

At the same time, perhaps also because of this, it is sometimes difficult to reach a general, systemic, future-oriented regional awareness that may lead to the valorization

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[20] The sectors for these companies, were: 30,000 artisans and craftsmen, 11,150 construction, 17,100 manufacturing, 7,400 agriculture and the remaining were in commerce, logistics and other sectors (Chamber of Commerce statistics 2001).

[21] These data are provided by Unioncamere Toscana—the network of Tuscan Chambers of Commerce and relate to the year 2001.

of these elements while including also new ones. The risk is that the local economic, cultural, and social system may be facing hard times, in the near future. Globalization may be hitting hard on the local traditional industrial model, which includes leather treatment and leather work (bags, shoes, garments), textile and fashion, craftsmanship, furniture, glass, mechanical works, among others. Many such activities are cheaper to produce in countries with lower labor costs or controls; this is leading to the closure and delocalization of several firms.

The classic small entrepreneur is a self-made person who in the past has been able to identify some interesting niche in which to operate. This person may have had a great idea or might have just had the intuition that what his neighbor was doing was successful and, therefore, should be copied. This may have also led to buying new, advanced machinery or performing incremental innovations. An empirical day-by-day serendipity approach that has made Toscana one of the wealthiest and most pleasant regions in Italy.[22] But now this is not sufficient any longer.

People working and interacting with firms, such as members of SMEs, trade associations, and the Chamber of Commerce realized that the difficulty to cope with fast and accelerating change required means to support the awareness, proactiveness, and innovativeness of the local SMEs and organizations.

Such systemic awareness and community learning processes require a long time as well as people with a vision, patience, and a clear incremental (or radical) strategy.

The "Roberto Berti Factor"

As Roberto Berti,[23] the local coordinator of the artisans trade association (CNA) of Mugello, a rural area north of Florence, once explained "most local entrepreneurs have a farming tradition... for them an innovation was simply introducing a new equipment or machinery, just like a tractor. Technological innovation is much easier than strategic innovation. Now the big challenge" he said "is to make a strategic and cultural innovation by raising the competence and valorizing the human resources and intellectual capital of the territory." The first time I[24] met Roberto was in the year 2000 at a bar under the office. He was working on a project[25] to help a group of small subcontracting mechanical companies in Mugello to cluster so as to be able to respond and manage the increasingly complex tenders. These were submitted by large companies that once had their headquarters in Florence but had now been bought by larger multinationals and, therefore, were obliged to do any procurement for products or services worldwide. This placed the local companies under great stress. Some of these had been created by former highly skilled employees of this large local company that turned into a branch of a multinational.

We invited Roberto Berti to attend a workshop organized by the European Commission in order to present a series of participatory methodologies that had been used successfully to help local stakeholders in any context to overcome barriers to change, learn, and elaborate innovative solutions through participatory and interactive methods. Here we had our first significant and interesting cross-cultural and cross-regional result. Roberto was struck by the European Awareness Scenario Workshop

[22] Toscana has 3.5 million inhabitants. It produces 6.5% of the national gross domestic product (Istat, 2001). It has 125,000 university students (7.3% of the national enrollments) spread over its tree, University poles of Florence, Siena, and Pisa.

[23] Roberto Berti has been also the town Mayor of Vicchio, the birthplace of Giotto.

[24] The I in this case stands for Paolo Martinez, one of the co-writers.

[25] Lucilla Cinelli of Cesvit, now at Firenze Tecnologia, coordinated this project.

(EASW) methodology. The method was originally developed by the Danish Board of Technology and disseminated by the European Commission[26] in all the EU's 15 languages (Andersen, 1996; 1999).

The EASW allows a group of stakeholders (policymakers, entrepreneurs, technical experts, and citizens) to interact in a very constructive way, to identify a common ground and common language, to reach consensus and, to set priorities on specific actions to be taken to face the challenges and problems of the group.

The method was applied with great success in Mugello with approximately 40 local stakeholders and prepared the ground for the launch and participation to a series of initiatives and projects, such as the Regional Competence project (Martinez, 1996; 2000; 2004).

But Where Is Regional IC Here?

Innovation and change are the result of the people who take them forward. The participation to the Regional Competence project required the involvement of some of the major key players in the Florence Area.[27] The EASW workshop that was held in Mugello laid the foundation for future initiatives. It involved and convinced several key persons of the importance of supporting the development of the organizations through competence and IC development. The first round of consultations when presenting the Regional Competence project was attended by the Florence municipality, the Province, the Mugello Mountain Community, the association of industry, the craftsman association, the CGIL trade union, the Chamber of Commerce, and a research institute. The project was submitted and approved by the European Commission.

The Tuscan Connection

The approach adopted by the Tuscan team has been that of integrating all of the local cultural, normative, and procedural characteristics into the tools and methods developed in Sweden to cater for the very demanding (and sometimes quite skeptical) local users. The adaptation and adoption is being performed through an action research approach based on meetings with end-users to analyze the needs and to co-design the tools or dissemination methods.[28]

Given the large size of the regional community, the local strategy is that of the bonfire: start by lighting small sticks and then gradually add bigger ones. The ambitious challenge of assessing and developing the regional IC requires time, periods of reflection to collect feedback, and launch new, wider rounds. But the results are extremely interesting and very encouraging.

The overall local methodology has been that of engaging local actors by letting them define, through a series of interactive workshops, the visions and objectives for the future relating to competence and regional IC. This is done both within organizations and among organizations. An interesting outcome of these workshops has been the spontaneous establishment of a local community of cultural, social, and economic

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[26] Francisco Fernandez is the leading European Commission project officer fostering and promoting the development, dissemination, and adoption of participatory methodologies to support innovation.

[27] Perhaps Machiavelli is now part of the structural capital of the region.

[28] Values, norms, and definitions as well as procedures and templates of both ICDB and RCDB together with the identification of methods for the local implementation of organizational and regional development action plans have been identified and co-designed through a process involving approximately 500 regional socioeconomic actors.

actors interested in analyzing and promoting the development of regional IC through a series of initiatives. This open and growing community has self-named itself the "Mosaic of Competence" and has monthly meetings, similar to a study circle. This interactive process is establishing a chain reaction where more and more such transdisciplinary groups (Nowotny, Scott, and Gibbons, 2001) may be formed so as to cater to intra-organizational, inter-organizational, and local regional IC requirements.

Learning Through Interaction With Other Regions

The participation of the Florence area in the Regional Competence Project through the adoption, adaptation, and dissemination of its tools and methods has been a very stimulating interactive learning process among regions. Several suggestions and ideas emerging locally were also influencing other partner regions. For instance, the need to deal with very complex, large, and sometime skeptic, if not static, communities of regional players led to the adoption of participatory methods to define forward and future-oriented regional IC.

We once said that if such regional IC approaches could be applied in Florence then they could be applied anywhere in the universe. We are still working on it. We do not yet have all the answers but are finding many interesting questions.

Conclusions and Perspectives

Within the Regional Competence project we have been able to both see the potential value in and practice the communication about competence over geographical and cultural borders.

This communication allowed the very down to earth Blekinge attitude of mapping competence to freely mingle and be enriched with the Slovenian pragmatic capacity to develop and adapt the original tools to a specific reality. Tuscany has in turn contributed with its sophisticated understanding of the relations between attitudes, skills, and knowledge as part of the region's human capital networks.

The project partners' ambition was (and still is) not only to contribute to the development of common tools that cater to the growing need to make pictures of competence at different levels and contexts, but also to systems and methods that allow us to talk about and gain better understanding for the intricacies of regional human and structural IC, in and between the kaleidoscopic diversity of European regions.

These endeavors are unfortunately still being slowed down by the fact (and serious obstacle) that any common European competence classification system and taxonomy, particularly in what refers to non-formal working life knowledge, skills-based knowledge, experience-based knowledge, and tacit/implicit knowledge and attitudes. But the project as such has at least been able to take some steps in the right direction.

At the European structural level, there are presently some interesting initiatives taking place as, e.g., replacing the old NACE and BIC codes with the much more flexible CPV code[29] in all EU member languages. But this merely helps the enterprises to relate in greater detail what they can offer in form of products and services and thus describes their competence in a circumspect way.

[29] Common procurement vocabulary. See more on http://simap.eu.int/EN/pub/src/welcome.htm.

We could very well need a complementary system that is directly dedicated to competence.

When widening the scope and quantity of potential subjects involved, moving from the organizational to the regional level, one raises exponentially the complexity of the possible interactions and possibly the time needed for a widespread cross-regional learning to occur.

Our experience tells us that there are some important ingredients to remember when preparing recipes for this proverbial fine-layered pastry.

One ingredient that makes that certain difference are pivotal persons, the neuronal links or synapses, who according to Buchanan (2003) have less degrees of separation and a fair ability to listen and communicate with their surroundings. In all of the three regions, we have had a Sterne, a Roberto, or an Erik.

The yeast for the processes are certainly the participatory methodologies that enhance the creativity, interaction, and sense of responsibility among local stakeholders thereby supporting bottom-up co-design, consensus building, action planning, and systemic cross-learning (Owen, 1997).

The blenders may well be specific software or other tools such as pen, markers, and paper. A good cook should be able to cook also with a wooden spoon but may reach much better results with the right tools.

But one important lesson is that ICT tools or databases cannot be seen as the panacea and that they have to be developed, if at all, after a long analysis of the functions and requirements they should respond to, not before. Otherwise one is preaching co-designed innovation on one hand and acting technology push solutions on the other.

The "tools" are as a matter of fact fairly useless left on their own.

Today it is quite easy to find ways to register data, but without proper systems for retrieval and contextual interpretation of this data we are only creating new data-tombs. Our mere definition of competence and IC makes this quite obvious.

Behind the tool design there must be a mature vision of the role of the human beings in society that guides what is being mapped, how this mapping is done, and the forms of retrieval and use of information.

It might not be so difficult to describe even what we up to a point have perceived as implicit knowledge and skills. The great difficulty stems from when we wish to combine this with individual and collective attitudes as part of a functional and applied competence.

Perhaps one of the most important experience for the regional competence partners has been the firm confirmation of the crucial significance of face-to-face communication. If we wish to properly solve problems as those previously mentioned and create a more complete basis when we plan the development of the competence and IC of individuals and organizations, we must learn how to discuss the different components of competence and attitudes.

In Sweden, the "development talks" between employee and employer is a viable alternative for using the information mapped in the ICDB. In Italy and Slovenia, the same function must be there, but it might look slightly different.

One general serious obstacle when transferring collaborative experiences has to do with the different traditions and cultural attitudes of openness and/or "trade secrets." It is necessary to break through this form of distrust barrier when you wish to build up an efficient regional IC management in a market context under continuous and accelerating change. It is important that the entrepreneurs accept that normally there is more to gain with an "open source" attitude, that for the most part general competence must be shared with others, and that the competitivity mainly lies in the original application of certain spearhead competence.

In Sweden, generally speaking, a consensual, open, horizontal, trustworthy approach to problem-solving and action planning and a strong participatory culture exists; in Italy and other countries in the South, depending on the contexts and people, this approach may be more closed, vertical, exclusive, individualistic, and consequently conflictive (more in terms of inertia, lack of initiative or sabotage, than in terms of direct confrontation).

Such differences in the approach clearly emerged during a very successful videoconference between 25 local entrepreneurs, trade unionists, and representatives from educational and research institutions from Blekinge and Mugello in the Tuscan mountains. It seemed very peculiar and strange for people on both sides to be able to openly ask any question as if they were all in the same room and speaking the same language.[30]

The topic was that of presenting the Employer's Ring[31] of Blekinge. Italians seemed amazed to imagine that an employer may allow one of the employees working in his factory to work for the neighboring business. The Italians were stating that "the local entrepreneur would find it very difficult to reach such an agreement with other entrepreneurs because they would be afraid of losing their best staff. There is much work to done in order to build trust and help regional players see the benefit of a regional IC growing through interaction, dialogue, analyses and syntheses. These are long-term processes, but such cultural shock can open the door to local learning and the launch of similar initiatives.

And last, but in no way least, when we discuss the balance and interdependence between human capital and structural capital, we might come close to the classic conflict about control over the means and tools of production.

But in the present knowledge-intensive and rapidly changing economy it is probably so that it is in the organizations' handling of this apparent contradiction between human and structural capital that we find some of the potential key elements behind their longer-term success or failure.

There are those who refer to knowledge management as mere attempts to pave the way for a knowledge society version of neo-Taylorism, while others recognize that the massive use of ICT not only opens doors for the transfers of many tasks from the human to the structural capital, but at the same time offers a wide spectrum of new possibilities in the development of human capital.

The individual employee might experience an incompletely unmotivated fear that his/her competence could be swallowed up and replaced by computer programs, databases, and other forms of structural capital.

We have met employers that cannot see much sense in investing too many resources into the competence development of employees that might not stay: "we have the costs to train them and then someone else comes an offers them a couple of Euro more and what was then the use of that?"

There are no simple solutions to this, as we neither can or should stop technical development, nor want to introduce feudal dependencies. There are jobs that will be taken over or eliminated by the new technology and the employees will profit upon

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[30] The videoconference had a professional facilitator working in Italian and English.

[31] The Employer's Ring, also described under Blekinge is a "coopetitive" model for sharing the workforce among a group of companies to balance out the ups and downs of the market. The Employer's Ring was a direct result of the involved companies use of the ICDB.

their human capital market value and take it to new buyers if attractive opportunities appear.

But particularly in the knowledge-intensives part of the economy, there is room for profitable alliances between the "owners" of the human and the managers of the structural capital. But this is only possible if both employers and employees understand and accept the legitimate dialectic process, where "old" human resources are being brought under the employers' control by being integrated into the structural IC of the organization, while traded for the opportunity for the employee to build upon her/his individual human resource-based IC value through continuous competence development.

Since we have been starting from the assumption that there exists both a regional competence and a common regional IC, then we must also assume that the region has a role to play in the strategic investments in the development of the said competence and IC.

The region and the regional stakeholders can in some fields have a subsidiary function, and in others, they can play a more decisive and leading role. In this text, we have indicated a few of these roles.[32]

A central function of the strategic competence and IC management of a region should be to guarantee the general favorable contextual conditions, supporting the investment, reproduction, regeneration, and development of the competence and IC of its individual actors. Here, we will need a truly holistic attitude towards IC management. But there will also be a need for continuous common investments in spearhead competence as well as in the broad competence among the general public.

There is obviously ample room for popular education initiatives, from public institutions and authorities as well as from the classic worklife-stakeholder organizations.

Central tasks are technology awareness together with mentality care. As we could see from Blekinge, the opening of the minds had a great importance in the development of the regions' ICT identity.

Throughout history there are examples on how technological innovations have not been possible to be properly used because of the lack of adequate social and organizational circumstances.

The resistance to the new is often reaching a degree of implicit destructiveness by isolating, ignoring, or resisting what perhaps is not under your direct control.

The positive relations to ICT among the general public in Blekinge is certainly the result of the early acceptance of the then-emerging new technology by the regional trade unions and their subsequent decisive initiatives to reach a high degree of computer literacy among their own membership.

Summing up the Regional Competence project, we can observe with satisfaction the strong regional IC cross-learning and the processes developing their own trajectory and positive feedbacks.

Our experience shows that there is much to gain when regions can compare and learn from each other.

We have thrown a stone in the pond and the waves are crossing over each other. It has taken time and will take even more but we know we are on the right path. We would like to exchange this experience with more people and help them to also build the cart now that we have some wheels.

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[32] It is important to stress that when we discuss the region we do not only refer to the public administration, but also other regional actors and networks such as trade unions, entrepreneurial associations, chambers of commerce, and so on.

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Part Four: Intellectual Capital for Cities and Local Communities

Chapter 18

Learning-by-Playing: Bridging the Knowing-Doing Gap in Urban Communities

Albert A. Angehrn, *INSEAD, The European Institute of Business Administration, Fontainebleau, France*

Abstract

It is not an easy task to change the way people think and act when it comes to sharing their knowledge, integrating and using that of others, as well as creating it collaboratively. It involves considering psychological factors, personal attitudes, and competencies as well as the history and dynamics of the social, emotional, and organizational context in which people operate. Nevertheless, over the last decade organizations worldwide have engaged in extensive 'knowledge management' (KM) projects, i.e., initiatives aimed at better leveraging latent, explicit as well as tacit knowledge sources, creating synergies and collaborations, increasing transparency, fostering innovation across different boundaries (geographical, functional, structural, cultural, and so on) and ultimately increasing the quality and performance of their value creation processes.

The context of an international project sponsored by the research division of the European Community provided the opportunity to capitalize on the insights gained from KM experiences in organizations to explore how a number of approaches, concepts, and systems could be applied in the social context of urban communities, in which the potential for creating value by achieving the objectives previously listed are also present, particularly given the 'intangible' knowledge exchange barriers existing between people living in the same town, in the same area, on the same street, or even on the same level in a large building.

The approach which emerged took up the challenge of removing these barriers using a 'Learning-by-Playing' philosophy, i.e., using game-like processes and systems to involve a very heterogeneous target population in gradually becoming more aware of

the existing barriers, then gaining interest in removing them, and finally become willing and able to explore collaboratively (and playfully) new forms of knowledge exchange and interactions bridging both online, 'virtual' (interactive web- and three-dimensional-based), and traditional, 'natural' spaces.

The belief underlying this chapter is that sharing a number of insights gained through our project, including the features of some of the processes and systems developed in that context, might be of value for people who, from a theoretical or practical perspective, are interested in the dynamics of KM—enabled change and innovation in social contexts such as urban communities as well as in organizations.

Overview

Why do organizations engage in KM initiatives and what are the reasons these projects have such a low success rate? In the next section, we begin by providing a critical analysis of experiences with KM/intellectual capital (IC), focusing on a critical barrier which often prevents such projects from generating value in organizations: the Knowing-Doing Gap. We then motivate the opportunity to extend KM/IC initiatives to domains such as urban, regional, national, or international communities, emphasizing a number of key similarities and differences between organizations and urban/social contexts (third section). As a next step, we introduce an approach, 'Learning-by-Playing', aimed at facilitating and accelerating the adoption process of KM initiatives through the injection of game-like learning experiences in the target population (fourth section). In the fifth section, we provide a detailed description and concrete example of how this approach has been successfully used in the context of a urban community. And finally in the sixth section, we present a number of insights and conclusions related to managing change and significant KM-related innovations in urban/social contexts.

The Starting Point: We Know It, But It Does Not Happen

Over the last decade, we have seen the blossoming of initiatives, labeled as KM, aimed at changing the way people create, share, store, transfer, and ultimately use knowledge within and across organizational boundaries.

The motivations for such initiatives range from highly strategic objectives (knowledge as a source of competitive advantage [Boisot, 1998; Murmann, 2004] and innovation [Von Krogh et al., 2000]) to performance improvement opportunities (e.g., resulting from introducing a higher level of transparency in terms of "who knows what," latent organizational knowledge assets and IC [Edvinsson and Malone, 1997]), to attempts to create new contexts and processes for collaborating and exchanging knowledge productively with partners and suppliers as well as with customers and other external constituencies (Malhotra, 2000).

The trend has been amplified through several books and articles on the subject (e.g., see www.brint.org for an extensive collection) and the emergence of software aimed at supporting different KM dimensions, providing tools to store, share, organize, access, and process explicit knowledge in different forms (from documents to process descriptions, cases, stories, and multimedia material), and at facilitating the exchange and emergence of new knowledge in so-called 'virtual communities' of geographically distributed contributors (Wenger et al., 2002).

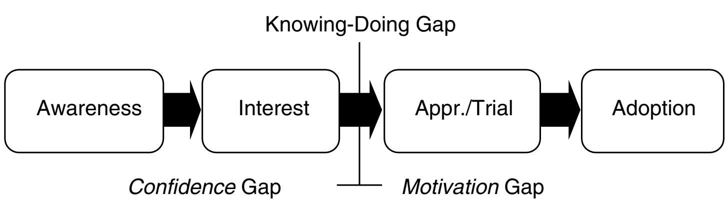
If the vast majority of KM initiatives in organizations have failed (in terms of not meeting expectations) it is mainly because trying to influence the attitude and the behavior of people when it comes to knowledge is more difficult to achieve than similar initiatives targeting a better organization/management of 'data' or 'information'. Knowledge implies a deeper involvement (in emotional, psychological, and social terms) of individuals, and initiatives aimed at altering existing patterns (particularly if they are anchored in years of experience/practice) turn out to be very challenging change management projects, rather than simple exercises of selecting and introducing a set of new processes and software tools.

Models of change, like the one proposed by Rogers (1983), indicate that the first two critical steps in such processes are the ones of raising *awareness* and *interest* in the individuals involved. In the case of KM initiatives, these two first steps are not particularly challenging. After succeeding in capturing people's attention by diverting them at least temporarily from their 'routines', it is relatively easy to make them aware of the inefficiencies created by widespread 'mis-management' of knowledge—for instance in large organizations where people operate in compartmentalized, 'silo'-type structures, or in companies which succeed in mobilizing only a fraction of the knowledge they could actually reach in their own employees, customers, partners, and suppliers networks. Stimulating interest for creating new conditions for knowledge to be valued and collected, shared, and organized better, as well as more efficiently reaching those who can effectively use it, is also not a particularly complex task, leading often to a "Yes, but" attitude, i.e., to acknowledging the relevance of the issue and showing willingness to at least talk about/discuss it (the "Yes" part), but signaling also (through the "but" part) that moving further beyond the interest phase, into commitment to try and finally adopt new ways of thinking and acting, will not be as easy as making people aware and interested in engaging in such an innovation.

It is in fact at this stage, between the 'interest' and the 'trial' phase in Roger's model, or between the 'Knowing' (that *something* should and could be done) and the 'Doing', in Pfeffer and Sutton's (2000) terms, that problems emerge. When it comes to KM projects, being aware and interested in potential change, and knowing that it would be feasible does not appear to be a sufficient condition to engage a person into action. Two further factors, confidence (I really 'can') and motivation (I really 'want'), come into play here. Action (compared to status quo) involves risks, which in turn triggers fear of failure (and its consequences), as well as a departure from 'comfort zones' in psychological, emotional, and cognitive terms. It is the resistance to change emerging at this phase of the process, and the difficulty of bridging this Knowing-Doing Gap which represent one of the key reasons for the low success rate of KM initiatives and projects, which ends up not even going much beyond the planning phase, or being put on low priority relatively early, and when initiated, do not succeed in mobilizing the

Figure 1

Knowing-doing, confidence, and motivation gap



energy and resources necessary to 'take off', heading often towards an early crash, or towards becoming seriously re-dimensioned (totally risk-free, but also totally meaningless in terms of impact), do not survive early pilot phases, or reach only 'cosmetic' changes, in which processes and systems are put in place, but not used, or in which people individually or collectively, claim publicly to operate differently (e.g., in order to get an award, bonus, or certification or to simply comply to directives), but actually do not.

Addressing the Knowing-Doing Gap is essential to the success of such transformational projects, and mainly corresponds to acknowledging explicitly (rather than ignoring) a number of basic needs people have in terms of:

- **Confidence and Competence**: people at this stage of a change process tend to feel under-confident in their actual capability to drive the change through and be able to redefine their role in the post-change scenario.
- **Distributive Justice/Fairness:** it is now that people realize the actual consequences of changing, and might start disliking or fearing the outcome, i.e., the departure from a perhaps 'suboptimal' but stable and predictable status, the need to develop new competencies, the impact on their social network and careers, the potential loss of a power position/status, and so on.
- **Procedural Justice/Fairness**: as observed in a variety of organizational contexts (Kim and Mauborgne, 1997), people might resist at this stage not because they dislike the outcome from a personal perspective ('what's in it for me?') but also because they dislike the process and the way it is managed, mistrusting the intentions of the initiators, disagreeing with the dynamics, or feeling not to have been involved (early) enough in determining the final objectives and how the overall change process is managed.

Applied to both urban and organizational contexts, the 'Learning-by-Playing' approach described in this chapter aims at providing an innovative way to help bridging the Knowing-Doing Gap, and move target communities to carry out pilot projects and adopt KM processes and systems with increased confidence (I/we really 'can') and motivation (I/we really 'want').

From Organizations to Social/Urban Contexts

Social contexts, and urban communities in particular, are interesting domains of inquiry aimed at better understanding the dynamics and diffusion of innovative ways of 'managing' knowledge, as they have much in common with organizations, while also differing on a number of relevant dimensions:

- **The Context**: In urban communities we typically face a very heterogeneous population (in terms of individual competencies, incentives, objectives, and so on), as well as a richer variety of relationship networks (such as families, neighborhoods, guild type of networks, and so on), and governing mechanisms (elected or appointed representatives, decision-making processes whose dynamics are determined locally, regionally, nationally, or even internationally depending on the form of democracy or other form of dominant government model).
- **Knowledge creation and exchange dynamics**: In urban communities, knowledge is often deeply anchored and affected by remote or recent history, reflected in the existing social and architectural spaces. Attempts to alter mechanisms

related to knowledge creation and exchange, and to move people from 'knowing' to 'doing' in such contexts, therefore, have a stronger 'cultural' dimension. For instance, as Zeldin (1994) tells us, "*... the peasants of the Bigouden in Brittany, in the year 1920, do not know that there is a sea only 10 kilometers away; the world is black beyond their own villages, filled with devils and danger...*" Did they really not 'know' it? And which invisible barriers in their minds, in their daily life, and in the way their community was led, prevented them from widening their horizons?

- **Change dynamics**: In urban communities, with the exception of 'revolutions', change is typically a slow, gradual process determined by power relationships between community members, their representatives and key stakeholders. Quoting again Zeldin (1994), "*... the Russians rioted in the 1840s when the government tried to persuade them to grow potatoes. Being used to living mainly on rye bread, they suspected a plot to turn them into slaves and force a new religion on them. But within 50 years they where in love with potatoes! The explanation is that they added the same sourness—kislotu—which had always given savor to their food, and which was what they were ultimately addicted to.*" We might agree or not with the 'addiction' explanation proposed by Zeldin, but the story reveals the time horizon to be taken into perspective when trying to drive change in fundamental domains such as food habits.

Also when it comes to objectives to be reached through KM initiatives in urban communities, similarities as well as differences with experiences in organizational contexts have to be kept in consideration. On the one side, urban communities are plagued by similar dysfunctional or suboptimal knowledge creation and exchange patterns, whose removal or redesign can potentially generate value for community members individually (e.g., better valuing and integrating the knowledge of marginalized members), for groups and sub-networks (e.g., new opportunities for local associations and interest groups to reach out and involve larger parts of the population), and the community as a whole (e.g., through identifying and mobilizing latent resources to increase the value distributed to the citizens, through increasing the efficiency of the centralized town council services, as well as through shaping collaboratively the development of the community).

On the other side, financial incentives and market success, which play a critical role in commercial organizations, are much less relevant in motivating members of urban communities, for whom other critical factors and objectives prevail, such as:

- quality of life
- level of participation/involvement (in the decision-making and change processes within the community)
- level of integration (of marginal groups, of newcomers, and so on)
- identity and vision (of the community, in terms of acknowledging its roots, its unique characteristics, as well as envisaging future development opportunities and trajectories)

It is with these key similarities and differences in mind that we embarked, in the context of a research project sponsored by the European Commission (2000), on the project of injecting in an urban community (a small French town of 2,500 inhabitants near Fontainebleau, 60 kilometers south of Paris) a set of models and tools aimed at creating new spaces for the community members to exchange knowledge, interact and socialize, discover appropriate new forms of collaboration and value creation. Besides the main objective to explore KM in an urban community and to experiment with approaches to bridge the Knowing-Doing Gap in such a context, the project presented an opportunity to:

- address a diverse and heterogeneous target group (as KM initiatives in organizations also increasingly span geographical and functional boundaries [Doz et al., 2001])
- explore the impact of social networks on the diffusion of innovation (which is very relevant and a fast growing research area [Wasseman and Faust, 1994])
- investigate the design and adoption of 'third places' (Oldenburg, 1991; Rheingold, 1993) and interactive experiences aimed at engaging citizens in new forms of collaborative learning, knowledge exchange, and social interaction.

The Learning-by-Playing Approach: Games for Change and Collaboration

The key role of games in triggering learning, knowledge structuring, and cognitive change in children has been extensively analyzed in the work of Piaget and Vygotsky (Moll, 1990; Wadsworth, 1979). In adult education and particularly management development, computer simulation games have been employed successfully over several decades, and studied extensively in terms of their impact on variables such as the development of various competencies and skills, motivation, willingness to experiment, development of appropriate mental models, and critical thinking (DeJong, 1991; Malone, 1981; Wild, 1996).

Although used extensively to drive cognitive and behavioral change in individuals and teams (typically in educational environments), games, and the act of 'playing', has not been explored yet as a way of enabling learning and change in contexts such as urban or regional communities. Recent advances in three technologies support the design of (1) effective 'social simulations' reflecting the dynamics of organizational contexts (Angehrn, 2004; Manzoni and Angehrn, 1997), (2) real-time three-dimensional spaces in which users can easily navigate, meet, interact, and build progressively their own 'virtual worlds' (Angehrn and Nabeth, 1997; Qvortrup, 2001), and (3) believable intelligent agents technology (Balzer, 1997; Carbonell, 1980; Roda et al., 2003), together with the need to address the Knowing-Doing Gap in our target urban community, motivated the development of a Learning-by-Playing approach. This consists in the design of game-like experiences to be deployed with community members to help them progress towards the adoption stage, in terms of gradually developing their confidence and motivation to experiment with, participate in the design of, and finally adopt new forms of knowledge management processes and systems.

The game-like experiences that we developed and deployed in our project consisted in:

(1) a 'social simulation'—an interactive role-playing game in which players interact with realistically modeled 'virtual' characters whose attitude and behavior is simulated in a computer application and can change over time as a function of how the players interact with them? enabling the citizens to experience first-hand the challenge (and frustration) of trying to introduce significant innovations in an urban community,
(2) a 'virtual town'—a real-time, three-dimensional, and avatar-based experience of collaborative learning and knowledge exchange aimed at making citizens

familiar and confident with the creation of shared online spaces and with the concept of peer-to-peer knowledge creation and sharing online,

(3) a set of 'virtual community agents'—software characters representing 'virtual community members' interacting dynamically with citizens to help and stimulate them through personalized suggestions to derive personal value as well as increase their active participation in the creation of shared knowledge assets and initiatives both online and off-line.

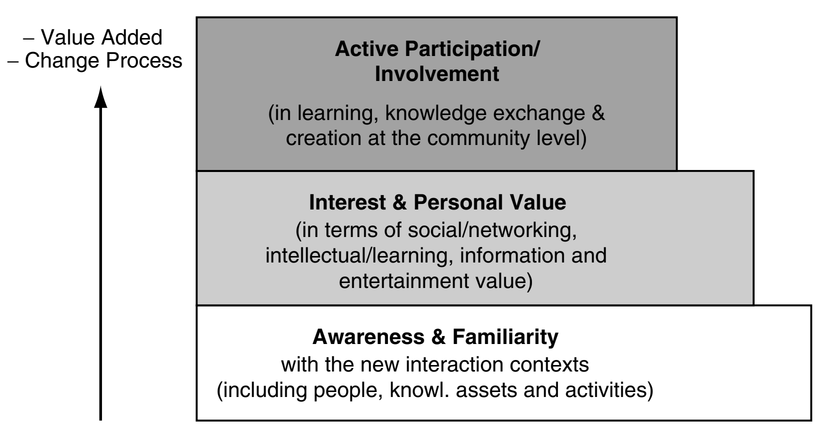
The following section illustrate in more detail the first of the three game-like experiences, called *Ed Challenge*, as this is the one which has reached the highest development level and usage frequency (to date, in fact, it has started to be employed by other urban communities as well) and has had the most important impact in addressing the Knowing-Doing Gap introduced in the previous sections. The main impact of this game has been to help citizens of the pilot town move beyond the 'interest' phase and became actively involved in the successive phase, which consists in introducing a web-based knowledge exchange platform (a KM-oriented town Intranet open exclusively to community members). The other two 'games' we developed according to the Learning-by-Playing approach are currently being used to support the gradual transition from the 'trial' phase to the 'adoption' phase, helping an increasingly large number of citizens to productively integrate the new knowledge exchange processes and systems introduced in their community (Figure 2).

The 'Ed Challenge': Towards Social Simulations for Urban Contexts

Since resistance to change is the most important factor determining the success or failure of KM initiatives (in organizations as well as in urban, regional, and similar community contexts), the first playing/learning experience we developed was a 'social simulation', a computer-supported, interactive role-playing game in which citizens, playing in small teams of 3 to 5 participants, are invited to play the role of 'change agents' sent into a fictitious town, an urban community similar to their own, with the

Figure 2

Objectives of learning-by-playing experiences (*Ed Challenge*, *Virtual Town*, and the *Virtual Community Agents*)



mission of convincing the key members of that community (virtual characters representing the Mayor, their main collaborators, as well as other important stakeholders) to adopt a significant innovation (the introduction of KM processes and systems in their town). Working in parallel over a period of two hours, during which they are supposed to accomplish their mission, the players' teams consisting of mixed citizen groups (including young people and seniors, elected representatives, association representatives, and simple citizens) first simulate their intervention in the simulated town and then meet all together to compare their experiences and achievements.

A Challenging Town Change Management Scenario

In order to be able to appreciate the simulation from a user perspective, we will first illustrate the type of mission the users are faced with when playing the game:

> "Imagine being asked by an important body, such as the European Commission, to join a team of change agents for a very delicate mission. You'll be sent to *Edcomville*, a French town, to convince the members of its very independent-minded community that it is high time to innovate and adopt a new online system for urban communities called *EuroNet*, which is basically a website designed to facilitate the exchange of knowledge between citizens of a town ('intranet' dimension) as well as between European towns ('networked communities' dimension).
>
> During the last two years, EuroNet has been successfully adopted throughout Europe apart from France, where the reticence of the pilot town, Edcomville, has hindered the progress of the project. In fact, the original implementation plan envisaged the introduction and evaluation of EuroNet in one pilot town per country. Edcomville was chosen as the pilot site in France because of its dynamism towards the new technologies. Two years ago, Edcomville's website indicated quite a lot of enthusiasm for the communication tools offered by the Internet, which showed the collaborative and entrepreneurial spirit of this community.
>
> Although they were initially very proud of being chosen for this European project, the town representatives of Edcomville have not, to this day, taken any initiative to introduce EuroNet to the citizens of the town. The "excuses" presented by the town council (lack of time and resources, other priorities, and so on) have thus slowed down the implantation of the project in France and delayed the whole project on a European scale. This has become particularly disturbing, because the European Commission (EC) truly believes that this new KM system for urban communities, once fully deployed, can generate high value by empowering/enabling citizens to acquire useful knowledge for their everyday life as well as to share their personal knowledge initially with fellow citizens, and then later, with citizens of other towns, supporting best practice exchange and the emergence of new innovation and collaboration initiatives across Europe. That is why delays are no longer acceptable and given the critical situation the EC has decided to appoint a team of change agents to move to Edcomville and 'fix' the problem."

Developing a realistic scenario such as the one described in the previous paragraphs was the first important step in designing a simulation to help citizens of the target pilot town gradually come in touch with the challenge and understand the implications of introducing KM initiatives in their own community, providing them (in a playful way) with the confidence and motivation necessary to bridge the Knowing-Doing Gap.

The two key characteristics of such a scenario are that players are 'projected' into a realistic situation bearing lots of similarities with the one they are actually experiencing in their own community. Within this situation they are required to play a new role, the one of 'change agents', which is different from their natural 'change recipients' role, and are stimulated and enabled to develop a significantly different perspective.

As we could observe and validate with a variety of citizens who took part in the simulation, both factors contributed in helping individuals to develop a more informed attitude towards the innovation process occurring in their community, combined with an increased willingness to move from the 'interest' to the 'trial' phase.

The Simulated Social Context: Modeling People, Networks, and Cultural Factors

Beyond the realism and relevance of the scenario, the effectiveness of social simulations is a function of how well they reflect the dynamics of the context in which the users (teams) are supposed to operate. Within the *Ed Challenge*, this task consisted in modeling:

- a set of credible virtual characters ('stereotypes') populating the simulated town of Edcomville, that the players can come in touch with, gather information about, meet and involve, trying to gradually convince them to adopt the proposed innovation
- formal and informal relationship networks linking the different characters (family links, influence patterns, and so on) and influencing their behavior
- specific 'cultural' factors characterizing the community as a whole
- A set of relevant actions (tactics/initiatives) that the players can apply during the simulation in order to influence the willingness of the virtual characters to become aware of, get interested in, try out, and finally adopt the proposed innovation.

These Characters Behave Like Us!

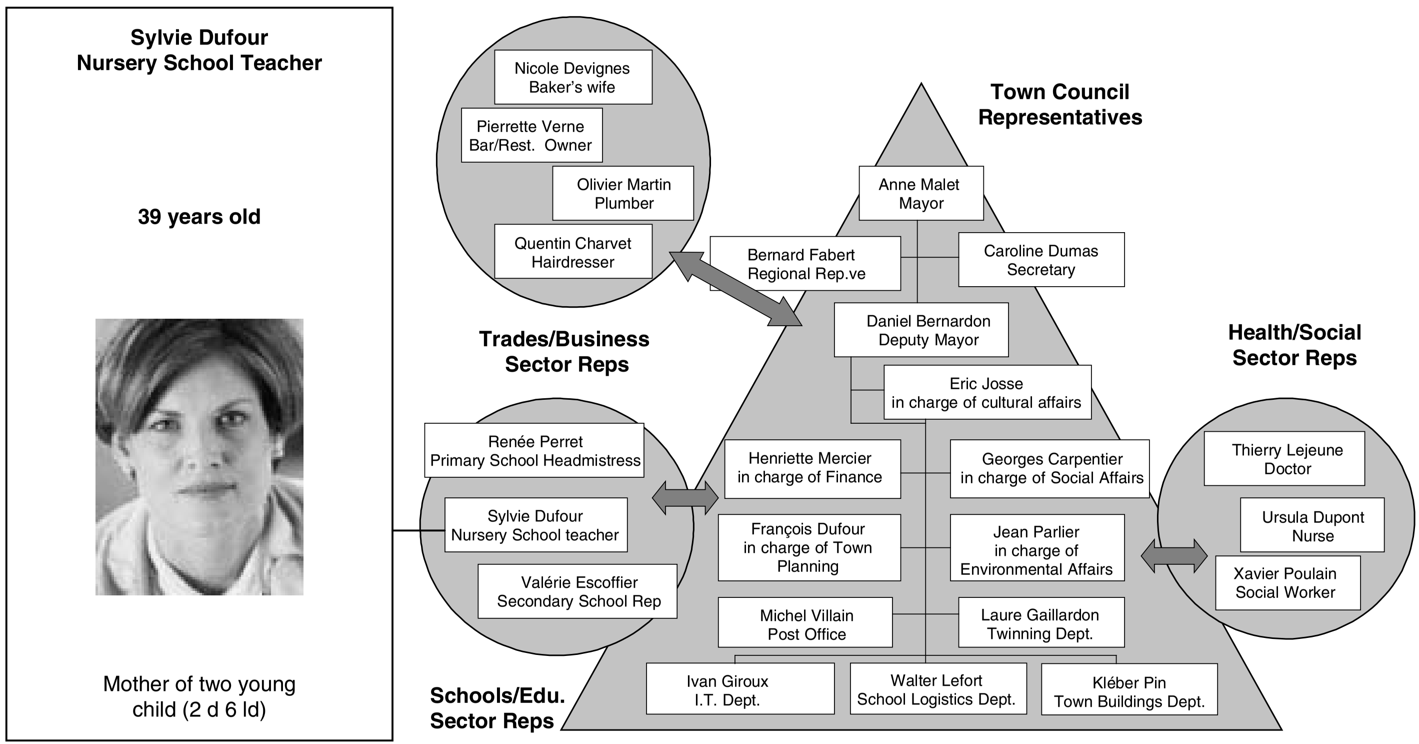
To help the players easily identify themselves and the people in their environment with the characters populating the simulation, particular care was dedicated to identify and finetune the profiles, personalities, and dynamic behavior of a set of stereotypical community representatives (Figure 3). Characters were given specific roles in the community, realistic profiles reflecting their personal backgrounds, as well as unique personalities emerging during the simulation to reflect the variety of reactions people display when confronted with significant change (especially when this change comes from 'outside').

In particular, the virtual characters have been assigned a variety of typical 'attitudes towards change' represented by the five categories: Innovators, Early Adopters, Early Majority, Late Majority, and Resisters (Figure 4A [Rogers, 1983]).

Belonging to one of these categories determines the initial attitude of a character towards the innovation (some, given their position/role in the community as well as their personal profile might feel naturally threatened, while others may rather tend to welcome the introduction of new knowledge-sharing processes and systems within the community), and the types and strength of arguments they put forward to motivate their resistance to move through the awareness, interest, trial, and adoption stages. The underlying model takes into consideration that this progression occurs through the gradual development of knowledge and understanding of the proposed innovation, followed by the desire of seeing it happen (alignment with own goals) and leads finally to the intention and willingness to commit to and actively participate in the change process. As illustrated in Figure 4B, each character was also modeled to reflect different degrees of difficulty in terms of capturing his/her attention (to increase awareness), trust (to reassure that the change proposed was in his/her interest), and collaboration

Figure 3

Overview of virtual characters in the *Ed Challenge* simulation



(to achieve the person's commitment to enter the risky phase of trying to operate in a new way, gradually adopting the proposed innovation, and integrating it into his/her habits).

The Impact of Social Network and Cultural Factors

Beyond personality, role in the community, 'change attitudes', as well as other factors modeled at the individual level (such as preferences in terms of communication/

Figure 4A

Adoption/innovation distribution

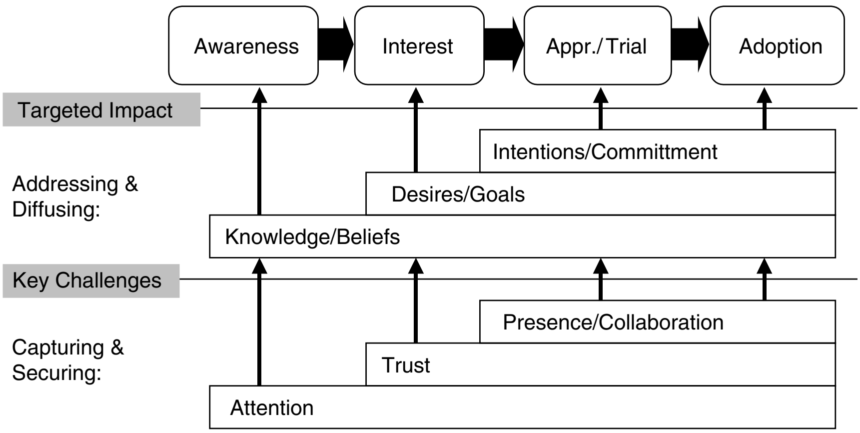
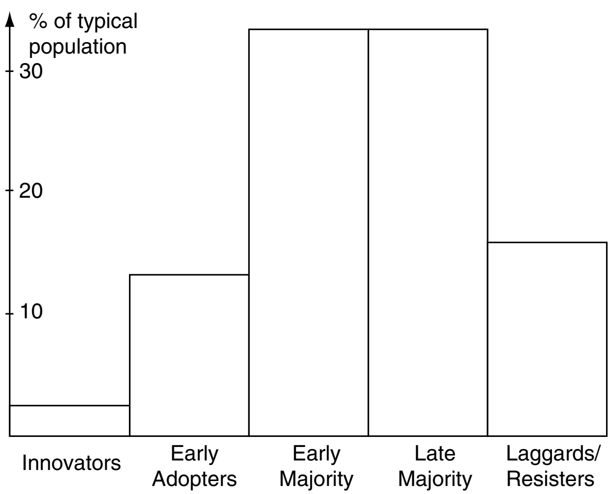


Figure 4B

Factors affecting transition between change phases.



interaction style and degree of individualism/ego-centeredness—determining how open the character is to external stimuli/arguments) and the behavior of the virtual characters in the simulation had to be modeled to reflect their relationship to their social context, and particularly their belonging to specific subgroups such as associations, neighborhoods, professional groups, or sports clubs. Modeling these 'subcultures' revealed to be extremely relevant as it contributed in reinforcing the realism of the characters' identity and behavior, as well as in determining influence patterns within the target community of Edcomville.

Within the *Ed Challenge* simulation, each social network is modeled according to a set of parameters including level of formality (from family or informal friendship links to hierarchical professional ties), visibility (requiring players to perform an in-depth analysis of the social context to understand effective influence patterns), and intensity and value (reflecting positive or negative influence). Specific roles (leaders, speaker, and so on) and power relationships within each network represent an additional parameter influencing the diffusion of attitudes within the community.

Modeling social and influence networks also played a very important role in the design of the simulation because it enabled us to integrate dynamics reflecting, for instance, the fact that community members with well-sounding formal titles (e.g., members of the town council) are not necessarily the most influential, and that diffusion of positive as well as negative attitudes towards change follow a number of not always straightforward patterns.

Finally, to complement formal and informal networks, we included in the *Ed Challenge* simulation a dynamic model reflecting a set of cultural biases/specificities characterizing the underlying social context. These cultural specificities are expressed in the simulation through a set of 'do-do not' statements which can influence the success or failure of initiatives undertaken by the players. Throughout the simulation, players come in touch with and become aware of these cultural specificities in different ways:

(1) through the reactions they receive interactively to the initiatives they implement (which might be favorably or unfavorably affected by the context—e.g., receiving a negative reaction when trying to use compulsion in a context in which 'consensus' represents an important cultural value)
(2) through careful observation of events triggered by the virtual characters during the simulation. For instance, players are able to observe that community members prefer certain communication channels (e.g., publishing articles in the community magazine) to others (e.g., bulletin boards) when communicating among each other, and hence be able to imitate them
(3) through 'stories' that individual characters tell them in different contexts (for instance, when they meet them). These 'stories' reflect specificities of the cultural context modeled ("You know, involvement in associations is extremely important here, because . . . ", or "People don't easily trust 'outsiders' here, because . . . ") as well as concrete examples of successes and failures of implementing change in the community ("I remember that five years ago somebody tried to involve the town council in the development of a similar system, but the Mayor . . . ").

Accordingly, the success of the players in the simulated community does not only depend on their capability to address the different characters appropriately and to take into consideration formal and informal networks, but also on the extent to which they are able to identify early enough cultural specificities and take such factors into consideration throughout the process.

To enhance the realism of the simulation, extensive research has been performed within our pilot town in order to fine-tune the virtual characters, the formal and informal influence networks, as well as to collect stories and anecdotes to be inserted in the appropriate place within the simulation, contributing also indirectly to convey, through the game, a first experience of knowledge exchange within the community. When used in other contexts/towns, these elements can be flexibly modified to reflect the specificity of the new context (e.g., a whole region, a larger town, or a neighborhood within such a town) in order to augment even more the 'mirroring' effect, increasing the citizens' perception that the simulation is particularly relevant to their own situation.

Feasible Actions and Simulation Session Dynamics

Within each simulation session, teams are typically given approximately two hours to play the simulation and then meet for a debriefing session to compare and discuss their experiences. During the time they spend with the computer-based game, the players are first asked to develop a joint strategy, and then invited to put it into practice, selecting and launching a large number of change management and communication tactics, realizing that the virtual characters they are trying to influence can react very differently (collaboratively, defensively, apathetically, and so on) depending on when, how, and with whom such tactics are initiated.

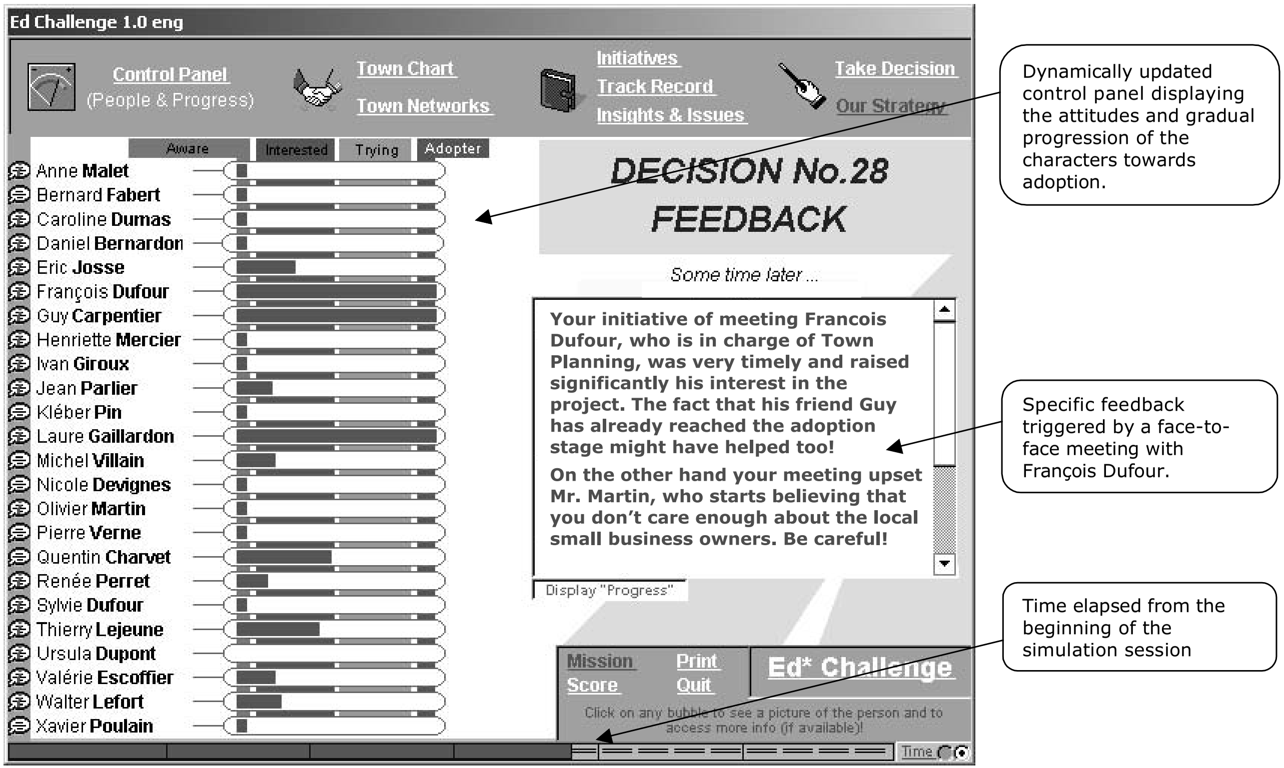
Tactics/initiatives that players can apply and experiment with during a session were derived from actions typically adopted by change agents in organizational contexts, validated in the context of business simulations (Angehrn, 2004; Jick, 1992), and specialized to reflect the specificity of an urban context. They include the possibility to schedule individual meetings with community representatives (who might find excuses to miss or postpone them), the organization of workshops (whose attendance and success depends on whom the players appoint as a workshop leader), pilot projects or town meetings, the publication of project-related information in the community magazine or on bulletin boards, the participation in town council meetings, observing which characters frequently play tennis together or meet in the local café, inviting speakers or trying to convince the Mayor to send out directives, and many others. Once triggered, these initiatives are evaluated dynamically by each virtual character as either a potential threat, a stimulus to progress along the four adoption phases, or as an irrelevant event falling in his/her indifference domain.

After each initiative, users are provided with feedback on the specific consequences of their action, together with an updated status of the current attitude of the virtual characters, as illustrated in Figure 5.

As we could observe in several sessions, the presence of a large number of feasible actions contributes to generate discussions in the team ("Who should we target now?," "Which tactic would be most effective now to help them move beyond the interest phase?," "How can we break the resistance of X, who told us that KM initiatives do not belong in places like his town?," and so on), stimulating players to express and explain their beliefs explicitly and compare/confront them with the ones of their fellow team members in order to try to impose/propose their views on what should be done to complete the mission and succeed in convincing all of the virtual characters, or at least the most influential ones, to adopt the KM innovation in their town, or to help the

Figure 5

Example of dynamic feedback and progress tracking in the *Ed Challenge* simulation



team interpret the feedback provided by the simulation and reach a consensus on the strategy to be followed.

In fact, as we have designed the simulation on purpose to be particularly 'hard' (by injecting all of the different forms of resistance to change we gathered during the research phase, and by giving a particularly un-collaborative personality to some of the most influential characters in the game), team discussions tend to be particularly lively and involve the players both mentally and emotionally—in particular once they start 'hating' some of the characters, or in case they start losing faith in their capability to convince key characters such as the Mayor of the simulated town.

Insights: Success Factors and Further Research

The objective of this chapter was to discuss the role of game-like experiences in the process of introducing significant innovations in urban communities, and illustrate with a concrete example how appropriately designed games (such as the *Ed Challenge*) can contribute in addressing the Knowing-Doing Gap, a major barrier to the success of KM/IC projects, by efficiently increasing the confidence and motivation of citizens to adopt new KM-related processes and systems within their communities.

Although games are typically associated with entertainment, the Learning-by-Playing example described in this chapter targeted an area critical to both individual and community development. Its objective was to give citizens the perspective of a change agent (rather than the more natural one of a 'change recipient') facing different patterns of resistance (reflecting realistically the ones they would face in their own community, as well as mirroring their own), enabling them to develop an appreciation of the different factors (individual attitudes, social and influence networks, cultural aspects) affecting change and innovation diffusion, and increase their capability to diagnose such factors efficiently in order to succeed in accomplishing a realistic mission. Ultimately, the simulation game described in the previous section aimed at providing players with a common 'language' allowing them to address in a non-threatening way the challenges associated with introducing change in urban communities like their own and face different resistance patterns (including their own). In order to successfully address the Knowing-Doing Gap, the simulation also had to provide the players with increased confidence in their capability to drive change, and a first level of appreciation of the value of introducing KM initiatives in an urban community.

In terms of immediate impact, observation of players' teams combined with focus groups and direct feedback have confirmed that the simulation succeeds in achieving its target of introducing in a playful and memorable way a deep understanding of the different factors involved in introducing major innovations in urban communities, and in particular:

- the key role of individuals, their natural attitudes towards innovation, the phases necessary to gradually make them confident and motivated to adopt innovations, the different resistance patterns and defensive arguments which are likely to emerge during the process, as well as the underlying reasons, whose understanding is critical in order to be able to diagnose and face them adequately
- the importance of diagnosing and addressing the impact of formal and informal networks (including the town council, local associations, but also cultural subgroups and family ties) in order to efficiently manage the innovation diffusion process

- the necessity to understand and include cultural factors rooted in urban communities to develop a successful strategy and guide the selection of appropriate tactics when introducing major innovations (such as KM initiatives) in such contexts
- the relevance of taking into consideration the non-linear dynamics of change processes in social contexts, in order to manage expectations in a realistic way.

It is significant to note that the adopted Learning-by-Playing approach succeeded (at least in our case) in enabling a very heterogeneous target population to efficiently understand and internalize these relatively complex concepts in a vivid way, enabling them to use the acquired insights to explain their own behavior, that of their fellow citizens, as well as to revisit and discuss previous (successful or unsuccessful) experiences of change initiatives in their community in the light of the concepts conveyed and the behavioral patterns experienced during the simulation.

Next Steps: Games for Online Advanced Competencies Development

In order to allow for a wide application of the *Ed Challenge* simulation as a means to introduce citizens to the challenge of introducing KM systems and to bridge the Knowing-Doing Gap in their adoption process, the tool has been designed to be used in traditional sessions (in which groups of users come together to first play and then discuss their experience) as well as online. The online version of the simulation enables players to make a further step in understanding the implication of extending knowledge exchange to online domains, experiencing how a team of distributed players can interact and coordinate during the strategy-building, implementation, and debriefing phase of the simulation through a set of real-time communication tools including chatrooms, whiteboards, as well as audio/video computer conferencing (an option which has not been used extensively yet given that not many users are equipped with microphones and cameras). The design of community games aimed at enabling citizens to efficiently develop relevant online teamwork, collaboration, and knowledge exchange competencies is a first promising research direction resulting from the experiences reported in this chapter.

Key Barriers in Re-Establishing the Learning-Playing Connection

A second important research direction we are currently investigating using the two other Learning-by-Playing experiences mentioned in a previous section (*Virtual Town* and *Virtual Community Agents*) are directly related to two barriers we have encountered in implementing our approach:

(1) The "*Games are not for Me*" Barrier
As discussed at the beginning of a previous section, psychological and pedagogical research confirms what is evident to everybody through simple observation, namely that games play a critical role in the development of competencies as well as cognitive and behavioral change in children. Nevertheless, adults, especially when influenced by non-experiential educational experiences (learning as absorbing knowledge from experts), as well as by social conventions confining games to the realm of entertainment (learning is a serious issue, playing is not), can have serious difficulties associating 'playing' with learning and change. Our experience shows that this form of initial resistance typically disappears once individuals accept (ideally thanks to

peer pressure) to get involved in Learning-by-Playing experiences such as the *Ed Challenge* or the *Virtual Town* (in which citizens operating avatars navigate and interact in real-time, three-dimensional environments). Nevertheless, recreating the link between playing and learning in individuals and communities is a task which should not be underestimated.

(2) The "*Failing in Teamwork Contexts*" Barrier
Experiential learning requires individuals to be ready to fail. Learning-by-Playing experiences for communities, like the one previously described, provide risk-free environments in which making mistakes becomes possible without significant consequences (except for the actually desirable confidence of generating awareness of one's own cognitive and behavioral limitations and insights which might emerge from the experience). Nevertheless, failing in teamwork situations (by suggesting, for instance, actions which turn out to be unproductive), although potentially conducive to enhanced learning, can represent a serious threat for individuals for whom failing—even in a risk-free learning and playing context—is individually (face-losing) as well as socially (status-losing) unacceptable. Emphasizing from the very beginning the fact that making mistakes is an essential component, and even a necessary condition for learning (in terms of generating dissatisfaction with the status quo [Argyis, 1990; 1991]) as well as that Learning-by-Playing is not an approach to assess individuals, but rather an opportunity for an insightful role-playing situation ('you are just playing a role'), is the only way we have found until now to mitigate the negative consequences of this second learning barrier, which also typically disappears as soon as individuals realize that they are not the only ones making mistakes.

In summary, this chapter aimed at sharing experiences gained in trying to design and apply game-like experiences to address the factors threatening the adoption of innovation in social contexts such as urban communities, and in particular the introduction of KM/IC-related processes and systems. The evidence we have been able to collect in a first pilot project, together with the high interest expressed by other communities to engage in Learning-by-Playing experiences such as the simulation we have described, are encouraging signals indicating that reconnecting learning with playing in community contexts might provide an effective new way to foster innovation and collaborative change in social contexts.

Acknowledgments

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Chapter 19

Cities' Intellectual Capital Benchmarking System (CICBS): A Methodology and a Framework for Measuring and Managing Intellectual Capital of Cities: A Practical Application in the City of Mataró[1]

José María Viedma Marti, *Polytechnic University of Catalonia and President of Intellectual Capital Management Systems, Barcelona, Spain*

Abstract

City governments have to make important decisions on the future of their communities. In the past, the vision, objectives, and goals of cities have been determined mainly by considering tangible assets as the main factors of a city's prosperity. However, in the knowledge economy, the role of intangible assets in wealth creation has become fundamental. As a result, an intangible framework of assets that allows navigation from the present reality to the future vision has become an urgent need for all cities. This chapter has two well-defined parts. The first part develops a specific methodology and framework for measuring and managing the intellectual capital (IC) of cities. And the second part deals with the practical application of this model of IC in cities in the specific case of the city of Mataró, providing some details of the first cities' IC report.

[1] This chapter was reprinted with permission from Palgrave MacMillan Ltd. and appeared previously as: Viedma, J. M. (2004). CICBS: A methodology and a framework for measuring and managing intellectual capital of cities. A practical application in the city of Mataró. *Journal of Knowledge Management Research and Practice*. pp. 13–23, Palgrave Macmillan Ltd.

The Government of Cities in the Information Society

Progress in new technology, especially in information and telecommunications technology (ICT), has radically transformed the way people live and work in the information society. In this respect, Edvinsson and Malone (1997, p. 190) have asserted:

> In particular, the combination of powerful communications technologies with equally powerful information technologies will make it possible for people to live and work nearly anywhere and still enjoy most of the fruits of life in a big city or suburbia or the country-side–from culture and arts to role-playing and simulated participation in distant world events . . . These same technologies will also make work more and more portable, shifting jobs from centralized work sites (office buildings and factories) to virtual offices located at home or on the road or in neighborhood centers.

Such changes in the way that people live and work, facilitated by the aforementioned technologies, inevitably prompt the question: "If we can live and work anywhere, where shall we live and work?" Moreover, these same changes pose important questions for city governments, including the following:

- Which facilities must be offered by city governments if the city is to be the most attractive place in which to live?
- How can innovative companies be attracted to the city?
- How to foster entrepreneurship?
- Which organizational structures are required?
- How can the city be transformed to face new technological changes successfully?

These questions and many others of a similar nature transform the dynamic of municipalities, create new challenges, and increase competition. City governments have to make important decisions regarding the future of their communities.

Similar changes have occurred in the past. In the years before the American Civil War of 1861–1865, the factory towns of the northeastern U.S. (such as Elisabeth, Lowell, Paterson, and Manchester) had established a successful combination of physical capital and IC in technology (looms), power (water wheels), employees (northern European immigrants), infrastructure (interchangeable parts), and transportation (canals). But the wealth and power brought by this successful formula did not last. By the beginning of the 1890s, IC and financial capital in the form of talent and money had moved to other towns (such as Chicago, St Louis, Pittsburgh, and Detroit) where a new recipe for success was developed. This consisted of new technologies (steam and electricity), new forms of transportation (railroads and, later, trucking), new sources of labor (eastern European immigrants), and a different infrastructure (mass production and bureaucracies) (Edvinsson and Malone, 1997).

This historical example demonstrates that the recipe for success changes when there are substantial technological breakthroughs. It is apparent that we are now in that situation again. The equation is again being recast and the balance of forces are again being reset. The new formula will combine new technologies (microprocessor-based products), transportation (the Internet and broadband telecommunications), labor (the mix of office-goers, telecommuters, 'road warriors', and 'corporate gypsies'), and infrastructure (virtual organizations) (Edvinsson and Malone, 1997).

City governments have the difficult task of guiding the transition from the existing formula to the requirements of the new equation. The purpose of this chapter is to help these governments in their planning for such a transition by providing them with a new model. This new framework must be especially focused on the management of intangible assets because IC is now the main source of future wealth, prosperity, and growth.

Measurement and Management of Cities' IC: The State of the Art

Having established the case for a model to measure and manage the IC of cities, the question that arises is whether there any proven models for the purpose. The present author is not aware of any. In *Intellectual Capital* (1997, pp. 192–193), specifically in the section entitled "The Intellectual Capital of Municipalities," Edvinsson and Malone hinted at the possibility of adapting the IC Navigator model for application in municipalities. The authors note the nature of the IC Navigator:

> "... with its mix of the human factor (citizens), customers (the business that support or employ these citizens, as well as those being recruited to come to town), and process (the municipality's mix of city government, schools, police, fire department, and so forth). There is also, of course, the financial factor, which combines the city's budget (including debt or surplus), tax base, and the combined local investment of the area's businesses. Tellingly, what is all but missing in most municipalities is the renewal and development factor. This is due less to the fact that cities and towns don't fit the IC Navigator than that, complacent after a century of predictable change, they have allowed programs to develop these indirect assets to atrophy.

The authors then go on to present a set of "process focus" indicators as a guide to how the general IC Navigator model might be adapted to the specific case of cities.

Apart from this reference in Edvinsson and Malone (1997), the present author is not aware of any significant contributions to the question of the management of the IC of cities. In contrast, the similar subject of the management of the IC of *nations* is in a *somewhat* more advanced stage of development. Bontis (2002), in his work entitled "National Intellectual Capital Index: Intellectual Capital Development in the Arab Region," asserts:

> Although much of the history of intellectual capital literature spans only a decade, the national view of this phenomenon is in its infancy. There have been only two countries that have examined their intellectual capital development: Sweden (Rembe, 1999) and Israel (Pasher, 1999).

The Bontis (2002) study of the Arab region can be added to this meager list, and thus represents the third attempt to make a meaningful examination of the IC development of nations.

These three studies of nations (Rembe, 1999; Pasher, 1999; Bontis, 2002) justify the need to measure and manage the IC of cities in a similar way. Rembe (1999, p. 4) reported that Sweden offers highly attractive and competitive IC assets of superior value in the following way:

> Just as corporate investment flows are increasingly determined by the potential of the intellectual capital of companies, international investments will be increasingly determined by the intellectual capital of nations. Traditional statistics are valid in themselves for comparing nations. But today they are hardly enough. Investors must also analyze country-specific "soft" investment data—the data that gives a clear

> picture of a nation's combined intellectual capital and how it can be utilized for future growth and profits.

Similarly, Pasher (1999, p. 4), in "The Intellectual Capital of State of Israel," made the following observation:

> The assets that have given Israel an advantage over other countries are the hidden intellectual assets. Though Israel is a young country, it is blessed with many intellectual assets. And despite the many political storms it continues to weather, Israel has become a hothouse for some of the most profitable technological ideas. It is well integrated into the international community of technological industries, and is regarded as one of the most important and prominent countries in this field. The country is an important R&D center for international hi-tech companies and has more start-up companies than any other location with the exception of California's Silicon Valley. Since 1982, the number of hi-tech start-up companies in Israel has grown from approximately 50 to over 2000!
>
> So far no one has formulated a document presenting Israel's core competencies, key success factors and hidden assets which provide it with comparative advantages and high growth potential.

Similar arguments can be found in the Bontis (2002) report on the Arab countries.

Furthermore, the three reports aforementioned all used the Skandia Navigator model (IC Navigator model) that was initially conceived and applied by Edvinsson and Malone (1997) in the Swedish insurance company Skandia. All three reports translated the company IC model into a country IC model—but the main features of the framework still remained after the translation.

Given that the measurement and management of the IC of cities has great similarities to that of countries, and given that all three studies previously mentioned used the IC Navigator adapted to countries, this model is discussed in the following text.

The IC Navigator model (or Skandia model) provides a balanced and holistic picture of both financial capital and IC. According to the model, there are four areas of focus with regard to IC: 1) customer and market capital (in the original model designated for measuring IC of an organization, customer capital was exchanged for market capital which is used for measuring the IC of a nation); 2) process capital; 3) human capital; and 4) renewal and development capital. These areas of focus are used as the basis for assessing the IC within a competitive environment and the IC Navigator model uses the house as a metaphor for the organization or nation, as is shown in Figure 1.

CICBS: A Methodology and a Framework

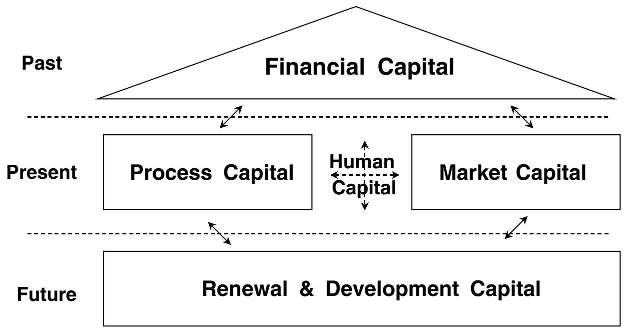
Despite the absence of any specific precedent for these matters, the advances made in the management of the UC of nations can be extrapolated to the case of cities. The design of the new Cities' Intellectual Capital Benchmarking System (CICBS) model that we now describe is heavily dependent on the IC Navigator model for nations, as previously described.

The CICBS is a new methodology and a new framework for measuring and managing the IC of cities. Essentially, two approaches can be taken to such a model.

The first approach, which we call 'Cities' General Intellectual Capital Model' (CGICM) is a transversal approach that covers all of the economic activities of the city or all of the economic micro-clusters by which the economic activities are assembled. The CGICM is essentially based on the models for nations developed by Edvinsson and Malone (1997) and Bontis (2002) using the IC Navigator model as previously

Figure 1

IC Navigator house metaphor



described. This takes in the following phases: vision, core activities, core competencies, indicators, and IC IC categories. These IC categories cover the following: financial capital, human capital, process capital, market capital, and renewal and development capital.

The second approach, which we call 'Cities Specific Intellectual Capital Model' (CSICM) is a longitudinal approach that deals specifically with each city's relevant economic activity or relevant economic micro-cluster, in a particular and distinctive manner. This model is mainly based on Viedma's ICBS Model (2001a; 2001b) and includes the following phases: vision, segment demand, output, products and services, processes, core competencies, and professional core competencies. Figure 2 gives a general overview of the CICBS model.

These two approaches to the CICBS model are discussed in the following text.

Cities' General Intellectual Capital Model (CGICM)

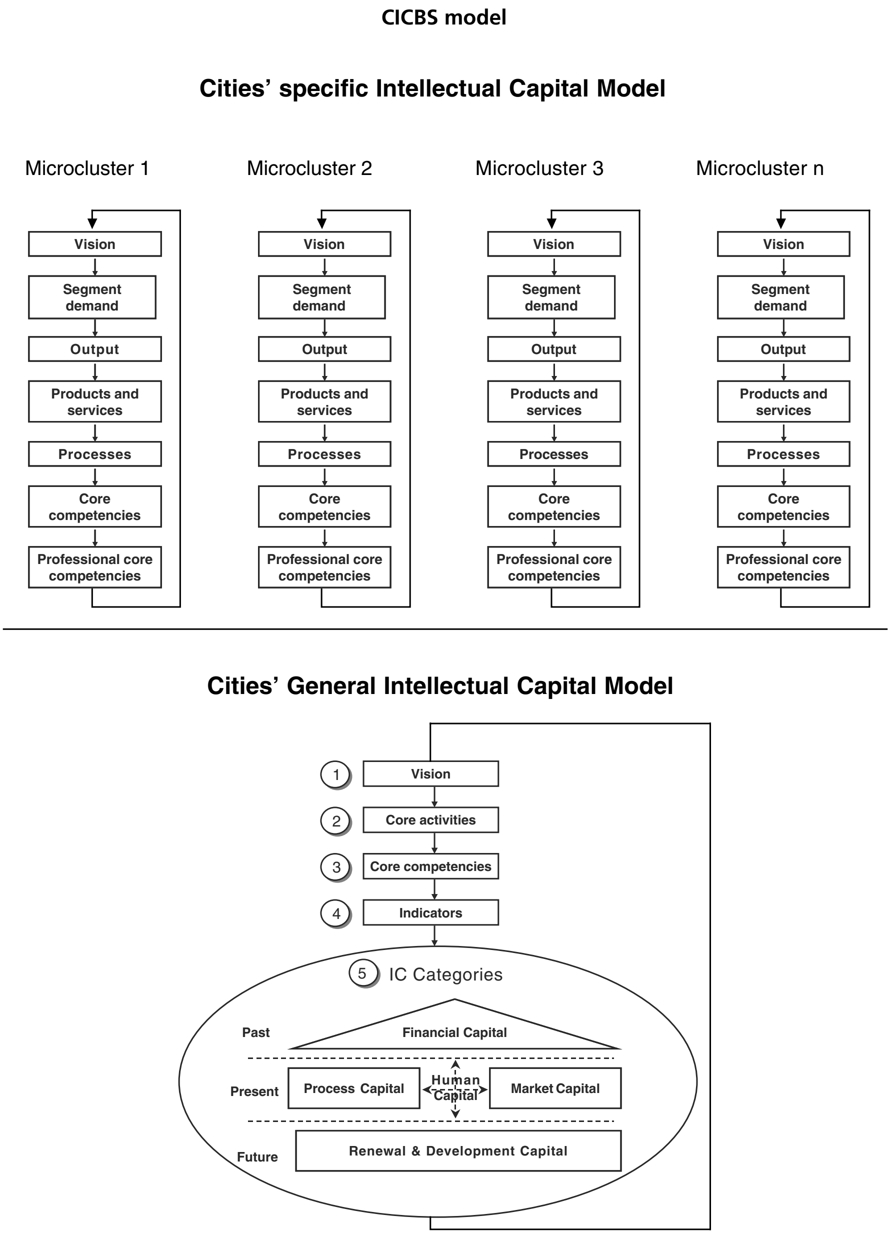
The CGICM is a general model for measuring and managing the IC of cities that is essentially based on the measurement and management of the intangible assets a city possesses. To develop a set of different economic activities these assets are assembled into what are called *micro-clusters* according to certain criteria of homogeneity. It is basically about managing the creation and development of a common and general knowledge—an IC platform—that strengthens the existing micro-clusters of a city and nurtures the building of new ones.

The process of managing a city's general IC is based on five phases (Rembe, 1999; Roos et al., 1997):

- Phase 1: Creating the vision
- Phase 2: Identifying the core activities needed to realize the vision
- Phase 3: Identifying the core competencies needed to realize the core activities
- Phase 4: Identifying the indicators for each core activity and each core competence
- Phase 5: Assembling the indicators into different IC categories

Each phase can be considered as a constituent factor of the CGICM. A summary description of the different phases is given in the following text.

Figure 2



Phase 1: Creating the Vision

The vision of a particular city, which we used as the starting point of the process, usually crystallizes through brainstorming and interviews with leading figures in various fields in the city—such as life sciences, social sciences, urban planning, accounting, business management, and so on. It is also important to involve young people in the discussions and ask them what they would like their city to look like in the future, and what would make the city attractive for them. The first step in the process, therefore, is to understand what the city is and what the city wants to be. Clear objectives usually make the vision more specific.

Phase 2: Identifying the Core Activities Needed to Realize the Vision

Once the vision is established, the next step is to identify the actions, projects, and activities that need to be put into practice to reach the vision and objectives previously defined.

Phase 3: Identifying the Core Competencies Needed to Realize the Core Activities

The core activities defined in Phase 2 give way to the core competencies needed to realize the core activities. We assume that core competencies are equivalent to core knowledge and IC. Such core competencies can be understood as a bundle of intangible assets (Andriessen, 2001).

Phase 4: Identifying the Indicators for Each Core Activity and Each Core Competence

Core activities and core competencies are identified in strategic theory as key success factors. As the term implies, key success factors indicate the vital criteria that the particular strategy must meet if it is to succeed. The next logical step is to take the key success factors identified in the previous steps, and identify the indicators that best reflect these key success factors.

Phase 5: Assembling the Indicators Into Different IC Categories

In this phase, we assemble the indicators that have been identified in Phase 4 into the different IC categories of the IC Navigator model previously discussed.

The model for measuring IC uses the idea of a house as a metaphor for the organization of a city. Financial capital constitutes the roof of the house and reflects the city's history and past achievements. However, it must be noted that these do not necessarily enlighten us in terms of future achievements.

The supporting columns are process capital and market capital—the supports upon which the present operations of the city are based. Renewal and development capital, which is situated in the foundation of the house, measures how the city prepares for the future. Human capital, which is found in the center of the house, interacts with all the different focal points. Human capital is the heart of the city—that is, the capabilities, expertise, and wisdom of the people. It is the role of the city to assist, guide, and support its people towards the realization of their strategic goals.

The city can also be described as a tree. The various means by which the tangible assets are expressed—the annual reports, catalogues, protocols, and others—are represented by the leaves and branches of the tree. The wise investor who desires the fruit of the tree will examine its roots to learn about its future. The roots of the tree (or the foundation of the house, to mix the metaphor) reflect the renewal and development capital of the city—the source of future growth and affluence.

Based on this essential structure, the diverse focal areas of capital from which the indicators will be assembled, are as follows.

Human Capital

Human capital includes knowledge, wisdom, expertise, intuition, and the ability of individuals to realize city tasks and goals. This focus also includes the values of the culture and the philosophy of the city. Human capital is the property of individuals, not the city.

Process Capital

Cooperation and the flow of knowledge require structural intellectual assets—that is, information systems, hardware, software, databases, laboratories, an organizational structure, and a management focus—which sustain and amplify the output of human capital. Such structural capital is the capital that remains in the city after the employees go home.

Market Capital

The initial model, which was designed to measure the intellectual assets of the organization, relates market capital to customer capital—that is to say, the same assets that are embedded in the relationships with the organization's customers. When we discuss the measurement of a city's intellectual assets, the customers consist of those markets with which the city maintains national and international contacts. Market assets reflect the general assets embedded in a city's relationship with the international market. The assets in this focal point include customer-city loyalty, the satisfaction expressed by strategic customers, the value of brands, and so on.

Renewal and Development Capital

This reflects the city's capabilities and actual investment in its future development and renewal through the exploitation of its competitive strength in future markets. Renewal and development assets include investments in research and development, patents, trademarks, start-up companies, and the like.

After setting up the process of the Cities' CGICM, there must be an ongoing follow-up process with constant feedback from the latest phases to the earlier ones, and vice versa. In addition, the CGICM methodology facilitates the systematic and repetitive benchmarking of the different items of the whole process with the corresponding items of the world's best city previously chosen as a reference model. Figure 3 shows this process of benchmarking.

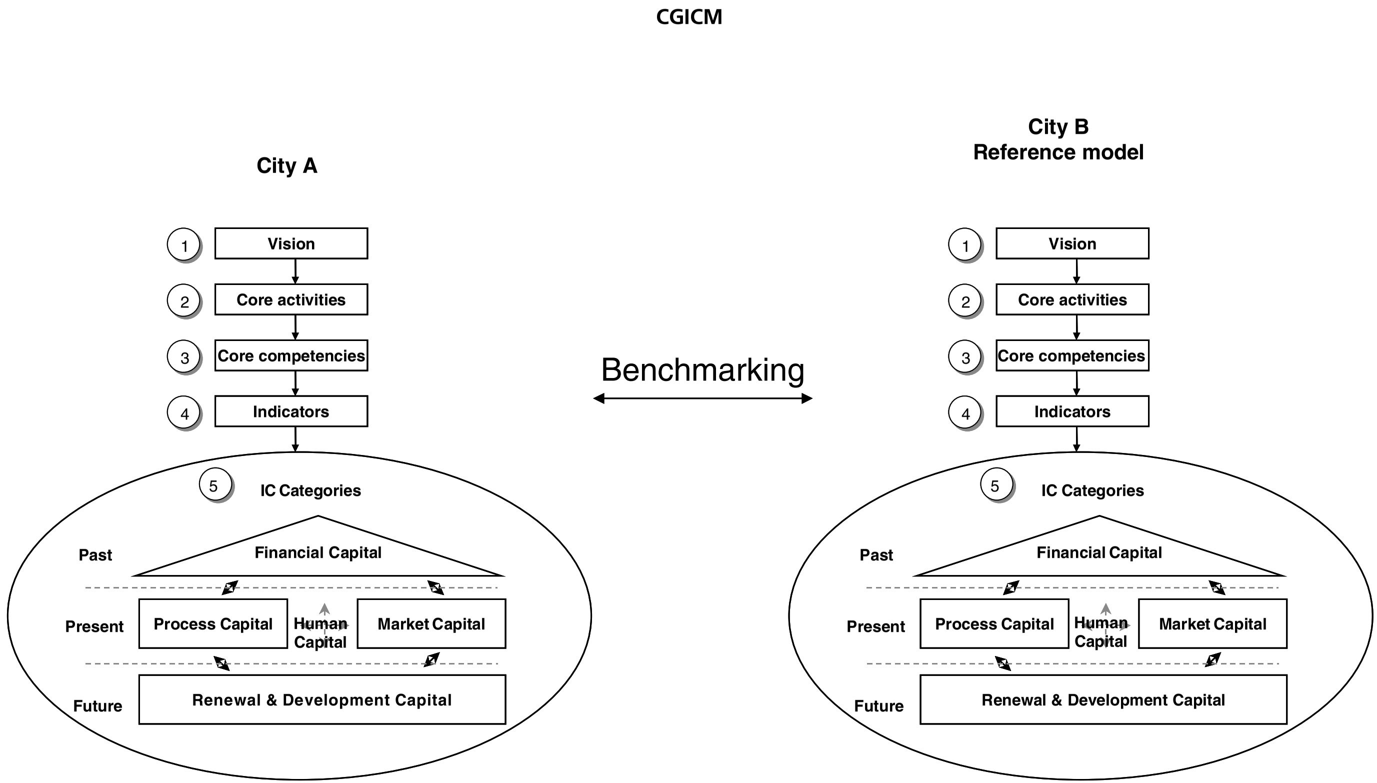
Cities' Specific Intellectual Capital Model (CSICM)

The purpose of the CSICM is to measure and manage the IC of each of the relevant industry micro-clusters that exist in the geographical area of the municipality. The model is mainly based on the intellectual capital benchmarking system (ICBS) enterprise methodology (Viedma, 2001a; 2001b), which is summarized below.

A brief description of each flowchart step follows:

- *customer needs:* customer segment needs that the company expects to cover through its business unit activities;

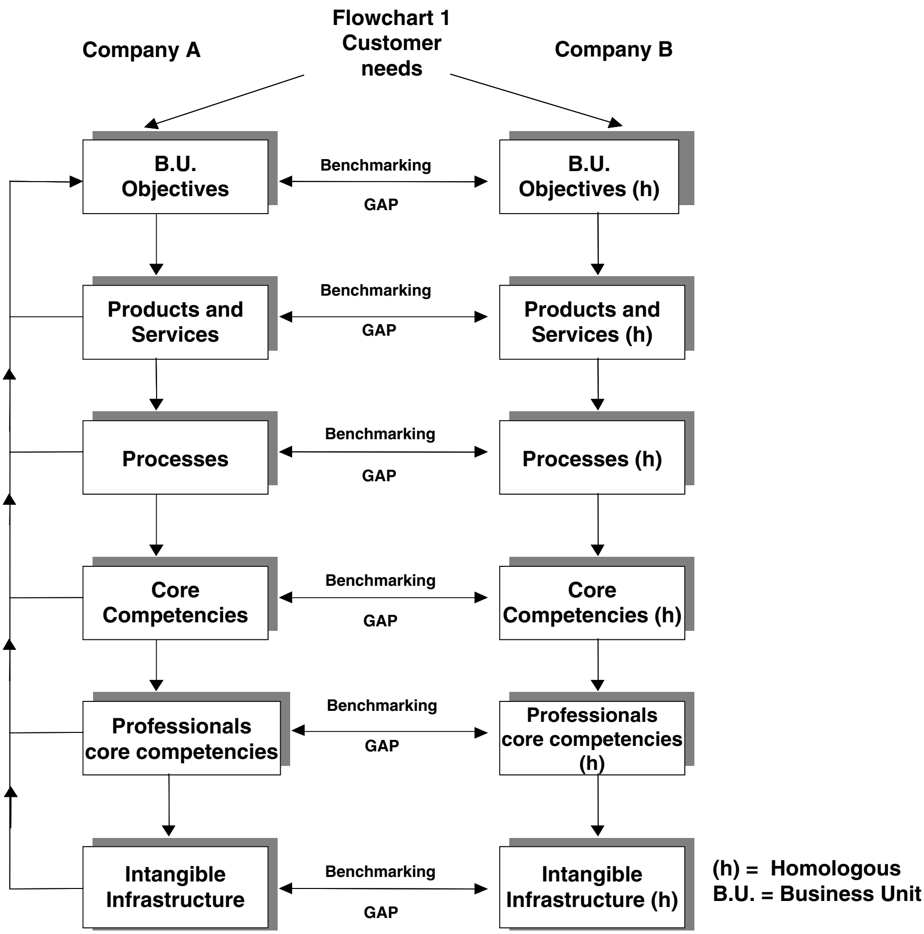
Figure 3



CGICM
City A
City B
Reference model
1
Vision
2
Core activities
3
Core competencies
4
Indicators
5
IC Categories
Past
Financial Capital
Present
Process Capital
Human Capital
Market Capital
Future
Renewal & Development Capital
Benchmarking

Figure 4

IC benchmarking system



- *business unit objectives:* the ultimate financial and non-financial objectives of the business;
- *products and services:* products and services with their attributes, characteristics, functions, and embedded knowledge and technologies;
- *processes:* innovation and operations value-chain activities that produce products and services—made up of core business activities, outsourcing activities, strategic alliances, and cooperation agreement activities; competitive advantages are generated mainly in the different value-chain core business activities; core competencies are mainly embodied in the core business activities of the value chain;
- *company core competencies:* essential knowledge or core competencies that enable competitive advantages, unique processes, and competitive products and services within the business unit;

- *professional competencies:* professionals, managers, and support staff competencies and capabilities that will generate and perfect core competencies;
- *company intangible infrastructure:* infrastructure that the company has for the use of its different business units.

All of the aforementioned steps have the ultimate purpose of identifying the core knowledge and core technologies that are the prime reasons for sustainable competitive advantages.

The methodology also makes it possible to compare each specific business unit with the corresponding business unit of the best of the competition—thus, facilitating the benchmarking of products and services, processes, core competencies and professional core competencies, and intangible infrastructure.

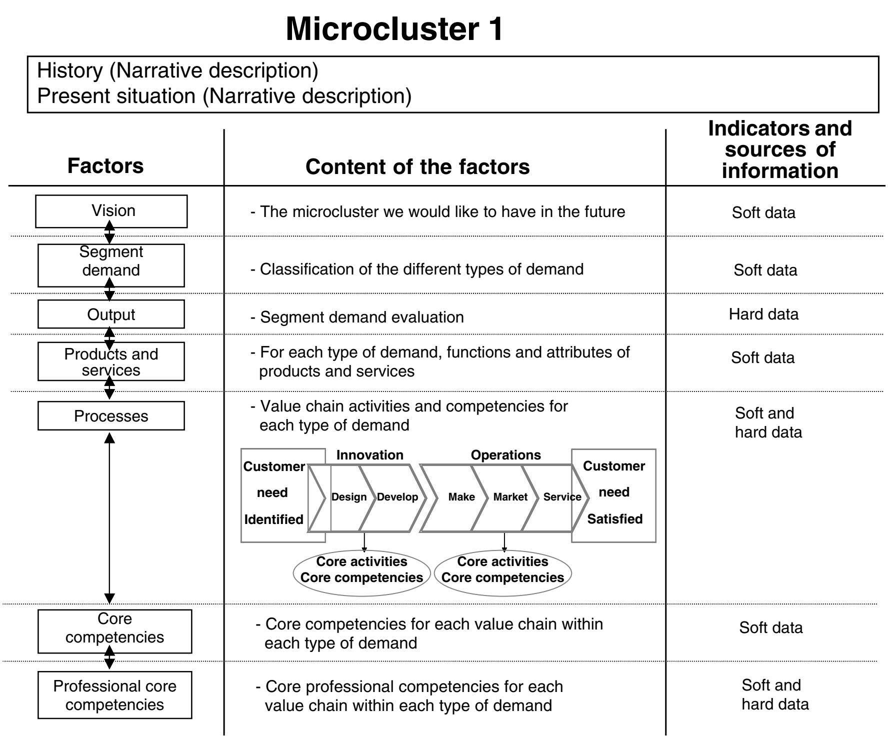
In a similar way to the ICBS enterprise methodology, the CSICM has been designed as illustrated in Figure 5.

The discussion now turns to a detailed description of the structure and operation of the CSICM.

First, we must determine the relevant micro-clusters in a given city and, once they have been identified, apply the CSICM to each of them. For the purposes of the discussion, assume that microcluster No. 1 of Figure 5 is a relevant microcluster of

Figure 5

CSICM



Mataró city. In applying the CSICM to this, the factors that make up that microcluster, and its corresponding contents, are as follows:

- *vision:* future vision about how the city's government wants microcluster No. 1 to be—which is made up of the set of city's companies that are in a similar economic activity;
- *demand segment:* classification of the various demand segments for the products and services of microcluster No. 1;
- *output:* appraisal of the different demand segments of the above factor;
- *products and services:* functions and attributes of products and services evaluated for each corresponding demand segment;
- *processes:* operation and innovation value chains analyzed for each demand segment to identify and value each of the value chains, the core activities, and the competencies that support them;
- *core competencies:* consideration of the competencies that support the core activities of both value chains—core competencies thus being determined for each demand type and value chain through a process of synthesis;
- *professional core competencies:* identification and evaluation of each value chain and demand type, including which professionals are required, and to what extent they make the existence and development of the firm core competencies possible.

The identification of the factors in a specific microcluster is made through primary and secondary information sources. Among the primary sources, questionnaires to the microcluster's firms and experts are especially relevant.

The indicators used to measure and manage the factors are obtained by choosing, from the primary and secondary information sources, the ones that best describe the factors content.

As was the case in the ICBS methodology, if the model is considered as a process, all of the aforementioned factors or steps also have the ultimate purpose of identifying the core knowledge and core technologies that are the prime reason for the sustainable competitive advantages of the microcluster.

In a similar fashion to that of the ICBS methodology, the model makes it possible to compare each specific microcluster with the corresponding microcluster of the best of competing cities—thus, facilitating the benchmarking of vision, segment demand, output, products and services, processes, core competencies, and professional core competencies.

Figure 6 depicts the benchmarking process of the specific IC of cities' microclusters.

Furthermore, given that a large part of the information is based on soft data (especially that of the corresponding microcluster of the benchmarked world's best city), all of the questions in the CSICM questionnaires have a specific response box. By integrating these responses, the CSICM also permits an evaluation of the degree of reliability of the benchmarking and its constituent parts, the establishment of plans for systematically improving information acquisition, and the setting up of a competitive intelligence team in the city. Figure 7 represents the reliability indexes of the questionnaires.

A Practical Application in the City of Mataró

The city of Mataró is located in the northeast of Spain or, more precisely, in the autonomous community of Catalonia. It has 104,880 inhabitants in a territory of 22.6 square kilometers, and is situated on the coast, in the center of the so-called 'Mediterranean arch'. Only 28 kilometers north of Barcelona, Mataró is part of the metropolitan region of Barcelona, and is the capital of the Maresme region with a

Figure 6

Benchmarking the specific IC of cities' microclusters

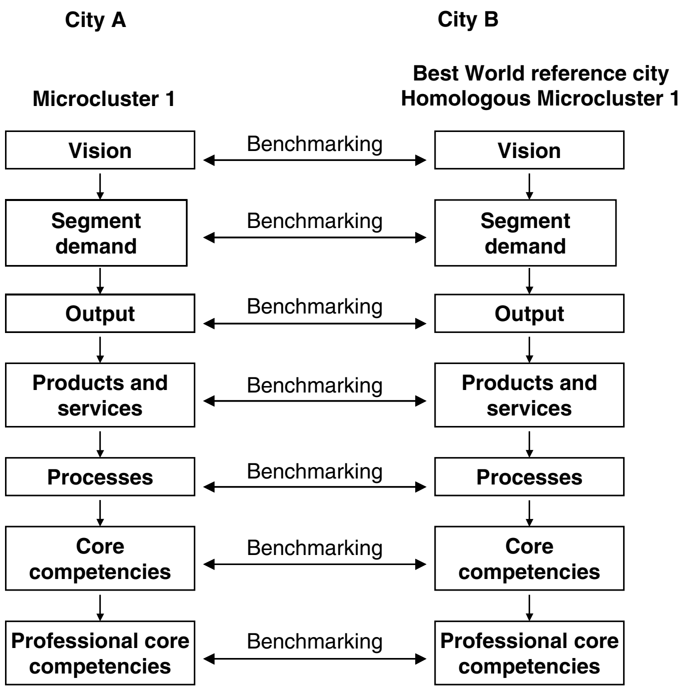
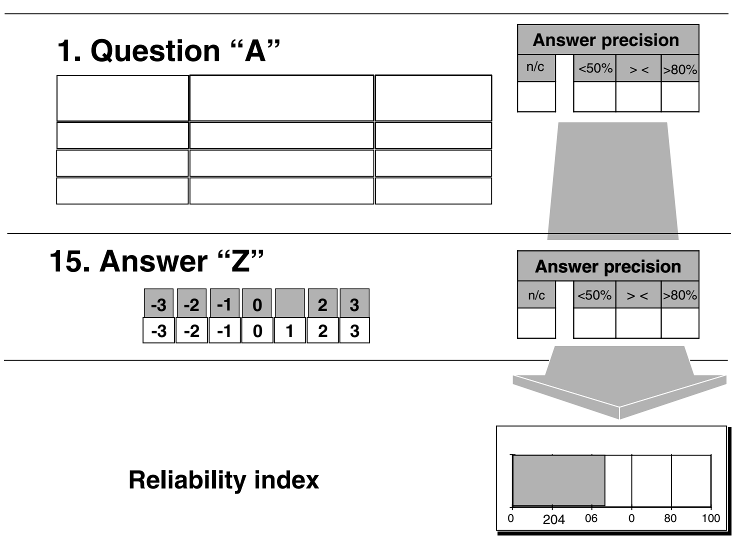


Figure 7

Reliability index



population close to 300,000 and a territory of 397 square kilometers. Maresme is an area of high economic and tourist development.

In recent years. the government of Mataró has pioneered the development and implementation of several initiatives to foster information and telecommunications technologies in the city and to develop and share the most advanced knowledge in technology and management. These initiatives are rooted in two macro-projects:

- "Master plan for the Information Society in Mataró 1999" (Ajuntament de Mataró, 1999)
- "Mataró, Knowledge City, January 2002" (Tecnocampus Mataró, 2002).

To put these macro-projects into practice, new institutions have been created (Tecnocampus Mataró), and others already in existence have been strengthened. The latter have included the Institut Municipal de Promoció Económica de Mataró (IMPEM), Promoció Urbanistica de Mataró S.A. (PUMSA), Escola Universitaria Politécnica de Mataró (EUPM), and Centre de Tecnologia Empresarial de Mataró-Maresme (CETEMMSA).

These macro-projects are the nearest antecedents of the ICMM project (Intellectual Capital Management of the City of Mataró) that is described in this section.

Therefore, the primary objective of the ICMM project is to finalize and coordinate the different initiatives of Mataró in orientating the city towards the information and knowledge society. The intention is to achieve this through the conception, design, and implementation of a methodology on the measurement and management of the city's IC. The ICMM project has two clear stages:

- the conception and design of the cities' IC management model (as described earlier in this chapter); and
- adaptation and implementation of that model to the specific characteristics of the city of Mataró.

This second phase is described in the following text. Before doing so, the present paper describes the CGICM, and follows this with the CSICM.

Cities' General Intellectual Capital Model (CGICM)

For the initiation of the IC Platform, which is common to all the relevant economic activities of Mataró city, the available information from the two previously mentioned macro-projects was used, as well as data provided by:

- the observatory of Mataró's information society;
- the Municipal Institute for Economic Promotion.

Taken together, these sources of information have allowed the determination of the content of Phases 1 to 5 of the model. That is, the future vision of the city, the necessary activities and projects to accomplish the vision, the necessary core competencies to carry out the core activities, and the indicators to appraise the activities and competencies have been determined. Then, the excellence of the IC general platform constructed from the indicators of the city of Mataró are compared with those of cities considered to be more advanced in terms of information and telecommunications technologies and of shared knowledge management. In this specific case, Treviso was chosen as the reference city for benchmarking.

The first abridged balance sheet obtained from "Mataró General IC" is depicted in Figures 8 and 9. The balance sheet shown in Figures 8 and 9 are the first ones ever

Figure 8

Mataró general IC balance sheet

DIVISIONS	PREVIOUS PERIOD	PREVIOUS VALUE	PERIOD	VALUE	MEASURE UNIT
FINANCIAL CAPITAL					
GDP (market prices)	1991	817.81	1996	1064.06	Millions of euros
Household's disposable income	1991	6.022,7	1996	8.550,6	euros per capita
GDP per capita	1991	8058	1996	10430	euros
HUMAN CAPITAL					
University/college + secondary studies	1991	17.14%	1996	22.1%	Percentage
Habitual internet users	October-1998	11%	September 2001	27.9%	Percentage
Percentage of qualified workers			1991	26.50%	Percentage
Activity rate	1991	56.98%	1996	55.67%	Percentage
Gini index	1989	0.387	1994	0.368	Index
PROCESS CAPITAL					
Service sector development					Percentage
Salaried workers in the high knowledge sector (%)			1st quarter 2002	37.7%	Percentage
Percentage of firms with Internet connection	October-1998	24.1%	September 2001	66.7%	Percentage
MARKET CAPITAL					
Self-containment	1991	79.53%	1996	72.28%	Percentage
Self-sufficiency	1991	81.91%	1996	75.93%	Percentage
Exports/imports ratio			2000	0.68	Ratio
RENOVATION CAPITAL					
Youth rate	1996	16.99%	1 January 2002	14.21%	Percentage
Newfirms registered for taxation	1997		1st quarter 2002	3.382	Firms

Figure 9

Mataró general IC balance sheet (human capital detail)

DIVISIONS	PREVIOUS PERIOD	PREVIOUS VALUE	PERIOD	VALUE	MEASURE UNIT
HUMAN CAPITAL					
University/college + secondary studies	1991	17.14%	1996	22.1%	Percentage
Continous education (adult participation rate)					
Illiteracy rate	1991	6.34%	1996	4.73%	Percentage
Habitual computer users	October 1998	nd	September 2001	43.7%	Percentage
Habitual Internet users	October 1998	11%	September 2001	27.9%	Percentage
Life expectancy	1999-1995	79.65	2001-1997	80.12	Years
Percentage of qualified workers			1991	26.50%	Percentage
Activity rate	1991	56.98%	1996	55.67%	Percentage
Activity rate, Men	1991	71.71%	1996	68.87%	Percentage
Activity rate, Women	1991	43.11%	1996	43.14%	Percentage
Activity rate, Young 15-24 years	1991	61.17%	1996	53.82%	Percentage
Activity rate, Adults 25-54 years	1991		1996		Percentage
Activity rate, Adults 55-64 years	1991		1996		Percentage
Library visits			2000	280.040	People
Cultural entities and organizations	1999	189	2000	203	Number of entities
Cinema capacity/1000 Inhabitants	1999	36.82	2001	32.91	Seats /1000 inhab.
Theatre capacity/1000 Inhabitants	1999	7.78	2001	7.52	Seats /1000 inhab.
Cultural entities/1000 Inhabitants	1999	1.80	2000	1.92	Entities/1000 inhab.
Abstentions rate over the total electoral roll	1996	21.16%	March 2000	33.7%	Percentage
Gini Index	1989	0.387	1994	0.368	Index
People receiving poverty subsidy	1999	296	2002	236	People
Registered unemployment rate					Percentage
Female unemployment rate					Percentage

obtained on "Mataró General Intellectual Capital." As can be seen, they don't include data corresponding to the reference city, because at that stage of the project they were not accessible. Full details on the strategic vision of the city, the activities and projects to accomplish the vision, and the indicators to appraise the activities and competencies are available in http://www.ajmataro.es/ajuntament/publidoc/conjuntura/conjuntura13.pdf. This report entitled, "Intellectual Capital Management in the city of Mataró," also includes an extensive definition of all the variables, indicators and formulas the have been used in the research.

Cities' Specific Intellectual Capital Model

For the initiation of the Mataró IC management specific model, the relevant "industry macro-clusters" were first determined, as follows:

- textile (knitwear)
- construction
- retail trade
- education and training

The identification of the relevant microclusters took into account a large number of indicators. However, special consideration was given to the extent of employment in each case. Given that the textile microcluster turned out to be the most important (with 23% of the working population), the balance of this chapter refers exclusively to it.

Evaluation of the CSICM factors was thus made through *ad hoc* questionnaires to experts and companies from the textile micro-cluster of Mataró city. These questionnaires allowed an identification and evaluation of the factors content. The first results from the questionnaires allowed a diagnosis of the present state of the CSICM factors—that is, the "demand segment," the "output," the "products and services," the "processes," the "core competencies," and the "professional core competencies." These first results from the questionnaires were then compared with corresponding results for the city of Treviso (Italy)—as it is considered to be the key center of one of the world's most important textile knitwear microclusters.

The first abridged balance sheet obtained from "Mataró Specific IC" is depicted in Figure 10.

Conclusions

City governments have to make important decisions on the future of their communities. In the past, the vision, objectives, and goals of cities have been determined mainly by considering tangible assets as the main factors in determining prosperity. However, in the knowledge economy, the role of intangible assets in wealth creation has become fundamental. As a result, some local communities have initiated strategic plans to develop new information technologies and collective knowledge.

However, these plans all lack coordination and continuity. More significantly, they lack an intangible assets framework that allows navigation from the present situation to the future vision of the city.

To fill this gap this chapter has presented a model and a framework especially developed for measuring and managing the IC of cities. The theoretical background and foundations of the model have been carefully explained. Essentially, the City's IC Model has two different approaches. The first approach—CGICM—is a transversal approach that covers all economic activities of the city and is mainly based on the

Figure 10

Mataró specific IC balance sheet

Factors	Mataró	Treviso	Mataró										Treviso									
Employees per firm			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
1 a 5	2	1																				
5 a 10	2	1																				
10 a 25	3	3																				
25 a 50	2	4																				
50 a 100	1	1																				
100 o >	1	1																				
Accuracy level	**82%**	**50%**																				
Demand type			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Final consumer	1	2																				
Distributors	2	4																				
Departmental Stores	2	1																				
Other textile producers	2	1																				
Own stores	1	2																				
Multibrand stores	3	2																				
Accuracy level	**80%**	**50%**																				
Products and services			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Quality	7	8																				
Price	6	9																				
Fashion	6	9																				
Accuracy level	**70%**	**50%**																				
Innovation			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
In the product	7	9																				
In the process	6	8																				
Accuracy level	**80%**	**50%**																				
Processes			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Spinning	2	0																				
Finishing	1	0																				
Design	5	8																				
Wearing	5	2																				
Marketing and distribution	4	8																				
Accuracy level	**80%**	**50%**																				
Product type			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Men's underwear	1	0																				
Women's underwear	1	0																				
Men's outwear	2	8																				
Women's outwear	3	9																				
Children	2	2																				
Sport	1	1																				
Accuracy level	**76%**	**50%**																				
Distribution channels			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Own stores	1	2																				
Franchises	1	2																				
Salesmen	2	8																				
Representatives	6	9																				
Accuracy level	**76%**	**50%**																				
Core competencies			10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10
Own brand development	5	8																				
Outsourcing degree	5	7																				
Local outsourcing degree	8	4																				
Labour force qualification	5	7																				
Export potential	4	7																				
IT use	5	7																				
Technological development	4	6																				
Institutional frame	7	8																				
Accuracy level	**81%**	**50%**																				
Total accuracy level	**78%**	**50%**																				

nations' IC Navigator model of Edvinsson and Malone (1997) and Bontis (2002). The second approach—CSICM—is a longitudinal approach that deals specifically with each city's relevant economic activity or relevant economic microcluster. The CSICM is mainly based on Viedma's (2001a; 2001b) ICBS Model. Both approaches use benchmarking techniques when building the future vision of the city, and the process of benchmarking is carried out using the world's best cities as reference models.

After the presentation of the models, the chapter has dealt with the practical application of the Cities' IC Model to the city of Mataró, and has given the broad lines of the main steps of the implementation process, together with details of the first cities' IC report.

In presenting this pioneering effort, it is hoped that new productive research on managing intangibles in municipalities will be encouraged.

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Chapter 20

Intellectual Capital for Communities: Research and Policy Agenda

Ahmed Bounfour, *University of Marne La Valle, France*

This chapter, while concluding the present volume, attempts to derive some problematic issues for research and action in the field of intangibles, taken from a more global perspective. Indeed, the main focus of the academic research over the last eight years in the intangible area has been devoted to the question of "How"—how to improve the reporting system and how to measure performance of companies by a better assessment of their hidden values? This effort is naturally of high importance, but there is a risk that after new rules of reporting are adopted, nothing really happens, or more importantly, that the "new" accounting rules are being "built on the sand." For instance, a huge effort has been devoted recently to the recognition (e.g., capitalization) of intangible items in corporate balance sheets. But in a mid-term perspective and taking into account the evolution of socio-economic systems, it might happen that the notion of a balance sheet, which is basically an instrument for photographing resources and outcomes of individual companies, will be of less relevance. Even under the "transaction regime," networking becomes a dominant principle of organizing activities and, therefore, it is the networks that innovations in accounting should be mainly directed. Moreover, due to the instability of individual enterprise links, as well as the volatility of competitive advantages, the focus should be centered more on reducing the asymmetry of information by disclosing information on intangibles (for instance, through restructuring of the expenditure part of "profits and losses" accounts, rather than on forcing companies to capitalize items, immediately submitted to "impairment tests").

However, the problem is deeper, and in Chapter 1, I have tried to provide some analytical instruments, especially by bringing to the fore the "community regimes" as complement/substitutes to the dominant "transaction regime" and how this perspective impacts the way we can problematize intangibles. For instance, we should consider the impact of the distinguished community regimes on intellectual and property rights

(IPRs) as a serious perspective. Depending upon the type of regime considered, the dominant IPR principles should be specific. This naturally needs further refinements.[1]

The community perspective led us to also introduce an emerging and somewhat important category of intangible resources: **recognition resources**. Recognition resources are intangibles shared within and around ad hoc communities with an open source perspective for IPRs. These resources are the levers of establishing socio-links and, therefore, for recognizing others, and by so doing for recognizing itself.

In this volume, several stimulating perspectives have been developed for the IC for nations, regions, and other communities. These have been, and still are, the main social "instrument" for recognition among human beings. In the so-called knowledge economy (KE), they are also under pressure from optimizing their "transactions." Contributors to this volume tried to propose another perspective, by bringing to the fore how intangible resources can be used as a stimulating perspective for policy-making. However, as it is the case for companies, these communities might also evolve, especially with regards to the relevance of the decision-making process. For instance, taken from a worldwide perspective, it is clear that the power of individual states (state-nations) reduced substantially over the last 30 years, in comparison to that of large corporations. But nations are still there and we cannot forsee their disappearance but can predict weakening of their states.

However, in a mid-term perspective, we can foresee different intermediate organizational modes, aiming at satisfying individual transactions or recognition aims (constraints). In that case, one can imagine different arenas (communities) where intangible resources can be exchanged via transactional or gift-countergift procedures. I cannot further develop this point at this stage, but this should certainly be one of the stimulating issues for research in the near future.

The Research and Policy Agenda

In this chapter, several issues from a community perspective are worth noting:

- **Assessing new organizational forms–networks, communities, and groups under different socio-economic regimes.** This seems to be an important issue, insufficiently considered in the managerial literature on intangibles. The organizational capital is now considered as an issue for corporate performance, but this topic is still addressed from a narrow perspective: the transaction perspective, e.g., how organizational capital helps companies improve their value, especially in financial markets. I would recommend delving deeper, by further assessing to what extent new organizational forms can be designed under different regimes (community versus transaction) and what kind of relationships can be established among such regimes. Under the transaction regime itself, new instruments still have to be defined, for instance, for reporting on intangibles in networks. In another area, understanding how ad hoc communities (such as diasporas) leverage their intangible resources can also be a stimulating theme for research.
- **Defining a status for recognition resources.** I have underlined in Chapter 2 the importance of recognition resources with the emergence of communities as a social space for recognition. Using this as starting perspective, we need then to go further and develop ad hoc taxonomies, assess emerging approaches, and

[1] This issue and others will be developed in my forthcoming book entitled *Scenarios for the New Capitalism*.

derive further conclusions on the relevance of these items. This may be done, for instance, by revisiting existing practices, for regions, cities, or specific communities (whether they are local or global).

- **Reevaluating IPRs.** The ongoing transformation in organizational forms of activities naturally have an impact on the important issue of IPRs. Under the transaction regime, these are basically instruments designed towards generating exclusive rents. But what should be their status under the community regime? This issue needs to be further refined in order to test its relevance under specific circumstances and for specific activities. We all have this Linux perspective. But what types of principles should be applied for other activities: under the "constrained community" regime, for instance. Should patenting procedures be implemented on a community basis rather than on an organization/individual basis? Should there be a patent? What is the impact of different patenting options on innovation? Finally, what should be the most adapted IPRs regime for recognition intangibles?
- **Intangibles and demography.** This is an important issue at least for developed countries, for three reasons: First, with age, people position themselves less linearly in time (and space). There are no clear limits between the different stages of life; second, because of the importance of continuous learning and, therefore, the development of human capital; and third, because we still need to understand the impact of the aging population on innovations capabilities.
- **Defining instruments for managing IC of established communities (nations, regions, cities, and universities).** In this volume, we tried to show the growing interest of researchers and policymakers for IC management at national, regional, and local levels. However, instruments for such management are still to be refined and academic research can contribute substantially to such an advance.
- **RTD policies.** RTD instruments are generally defined with the aim of increasing innovation capabilities of nations, regions, and naturally of companies. They are mainly input-oriented (the 3% of gross domestic product [GDP] in Europe as a target for 2010). But RTD policy is also challenged by the necessity of defining ad hoc framework conditions, for new organizational forms. For instance, how to assess performance of networks and how to support them? What kind of instruments can be implemented for developing IC of regions and cities? What kind of cross-learning can be implemented? What are the most adapted socio-economic systems to the KE (for instance, should the European Nordic Model be considered as a "benchmark" for other European countries?)?
- **Competition policy.** Competition policy is based on competition! But what should be the impact of community behaviors on such a policy. For instance, to what extent does the emergence of recognition as a principle of action challenge such a policy?
- **Cross-learning in a global perspective.** By considering knowledge from a global perspective, we also have to consider the cross-learning process that might be designed and implemented globally. For instance, what kind of learning can be organized between communities belonging to different socioeconomic contexts: can Japanese learn from European or American communities and vice versa? What kind of learning can be designed with other parts of the world (Africa, Asia, and South America)?

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