

# High Performance Multimedia

A Reader on the Technological, Cultural and Economic  
Dynamics of Multimedia

Edited by  
Peter A. Bruck  
Jak Boumans

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# HIGH PERFORMANCE MULTIMEDIA

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Economic Dynamics of Multimedia

Edited by

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*Chairman of the Board of EADiM,  
General Manager at Research Studios Austria*

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Selected proceedings of the ACTeN Scholars'  
Conferences 2002 and 2003



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## Preface

Content is king – often quoted and even more often neglected this slogan of the information age is impending over the European e-Content industry. The promising new markets of Information Society may legitimate such a statement, but how to serve this king? Economical circumstances and technological potentials determine the production, aggregation and distribution of e-Content. They are the starting points to any future development towards a flourishing industry sector of the third millennium.

To analyse the chances and challenges appearing at the horizon, the European Union set up a priority on “Information Society Technologies” within its 6th RTD Framework Programme. Following this focus eleven research institutions, think tanks and centres of excellence relating to IT and new media from all over Europe set up a project with the goal of **Anticipating Content Technology Needs (ACTeN)**. They aimed at providing a fair view of the European e-Content industry documenting its actual state and future possibilities with respect to practical as well as scientific needs. All key stakeholders of the branch were included into this process, fostering an exchange of knowledge in Europe. Therefore five of the eleven partners were based in central and Eastern European countries to boost the emergence of an **all European e-Content network**. A continuous market watch showing principles and developments served as the basis for numerous discussions between professionals representing every step of the e-Content value chain. Thus, in addition to the diffusion of knowledge throughout the industry, problems and potential in the process of the business could be analysed. Extending the perspective to the future, leading scientists contributed their latest findings. Furthermore, the presentation of best practice application fostered the spread of excellence.

Technology’s mastery is still in advance, whereas the implementation of new content services is lagging behind. **Digitalisation** has completely changed the structure of the content business through the dissociation of content and media channel. Highest technological demands in time and money are limiting the size of e-Content enterprises today – nevertheless cooperations to realise synergies in this areas are not in sight. This bears a chance for small companies as well as for the traditional media business like newspapers and film studios in aspects of content production. In contrast its distribution is still being dominated by broadcasters and telecom providers that skim the biggest part of the profits. But this situation will not necessarily persist due to changing consuming habits. Anyhow a fair solution has to be found especially in regards to digital rights management, respecting the needs of all parties involved.

The European e-Content market will be able to play a **major role in the future** by including all relevant players and their abilities. There are many fast evolving areas (mobile content, paid content, interactive digital TV) holding big potential in respect to technological development and economical profits. It is up to the EU to prepare a copious foundation to its exploitation by improving standardisation, knowledge transfer and networking. Thereby, a success depends on the coping with the imminent digital divide

that impends to damage the basis of a prosperous future of the European e-Content industry. The challenge during the next years will be to stop the concentration on high-end technology and to create new adequate e-Content services providing added value to everyone in Europe.

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# **1 Introduction: the Technological and Economic Dynamics of Multimedia Content Industry**

*Peter A. Bruck, Austria*

Multimedia content production is no easy business. The technological spiral of innovation is continuously changing the value chains and business models. While this might be true for many sectors of the ICT industry, it is particularly relevant for those who deal with creative contents and innovative applications.

Every new wave of innovation in technology has an immediate impact on the value chain by shortening all material production and distribution cycles and stretching the creative and design cycles. The effects can be clearly seen in the hardware industry when one looks at the success of Dell and the demise of IBM or Compaq. It can also be demonstrated for the software industry where the changes in the cycle of software development are fast paced.

The digital interactive content industry is, however, the main sector when it comes to the effects of the innovation spiral. Being on the top of the many layers of the technology, the content industry is the unasked recipient of innovation from the network layer, the hardware and the software layer. Technologies to assure the diffusion of content and content products are increasingly R&D-intensive. They include faster networks, new platforms, software-intensive products, virtual reality applications, data-base management, etc.

Nonetheless, there might be some hope on the horizon. The convergence of networks and rapid diffusion of high-speed broadband and the market advent of 3G mobile services will shift attention in all ICT sectors from provision of connectivity and the sale of devices towards content and applications that promise new business opportunities, growth and employment. A new era of demand has the potential to give a significant boost to the digital economy.

The potential for digital content growth is thus very high and growth might only just beginning. Demand for content from consumers and intermediaries exploiting the potential of multiple content delivery channels is extending and supplanting infrastructure push as a major driver.

Wireline broadband and mobile high speed connections have to be considered disruptive technologies. They are challenging established business models while creating important development opportunities in many sectors. Mobile content and applications will be major drivers of mobile telecommunication services and content industry revenues in developed countries. Games will be a key application sector for wireline and wireless, other e-content areas will follow.

The relationships between content originators and final users are changing, intermediaries are being created or replaced, and attitudes to content ownership and acquisition are changing. However complete disintermediation and direct

contact between content creators and content users has not so far developed to a significant extent. Rather, experience of the last three to five years show that the major brands from media (in Austria: ORF, Standard), telecom industries (in Europe: Vodafone live, T-zones) or IT (Apple music) systematically increase their market share in paid, legal contents while university, cultural and government institutions dominate the free access market.

The digital content industry is facing a number of new changes and issues which are worth recounting at the beginning of this book:

- **The Wiki Movement:** Users are challenging established ownership and distribution arrangements, whether through P2P networks or open access/open archive publishing conventions, or through new mass distribution and inter-community trading. Network availability and broadband applications create possibilities for new forms of expression by users. See the success of Wikipedia where users are content creators for an entire encyclopaedia.
- **Different sectors react differently:** Scientific, technical and medical publishing has gone towards full digitisation and digital delivery. In the games sector a new on-line segment has developed. Intellectual property and copying issues remain crucial.
- **Three modes of pay:** subscription, pay per use/view and access charges remain the key ways for generating revenues. Companies survive if they are able to generate positive revenue feedback cycles when growing numbers of paying users foster the marketing, development, and distribution of online content and services, which in turn might draw more paying users.
- **Content Gap and Economic Issues:** The creative ICT and digital content industries are challenged to develop innovative contents adapted to broadband, mobile or fixed; to co-operate and change roles among value chain players (in particular between content owners, network operators, Internet service providers, hardware and consumer electronics suppliers); to fight digital piracy and deal with the role of file-sharing; Major concerns are the role of intellectual property in protecting ownership in both products and services, the enforcement of copyright in a digital world, defining and monitoring fair use and the boundaries of legitimate use, and the interaction between competition law and copyright; to create a regime for digital rights management and customer authentication; to put into place efficient payment methods (especially for micro-payments).
- **Content Gap and SMEs:** Operating in the new digital content industries is highly complex and challenging: legal issues are critical, the definition of software and application products complex and licensing negotiations often more lengthy and complicated due to intricate technical issues and

differing legal regimes across platforms and countries. In addition, oligopolistic content markets with a strong role of market leaders, exclusive access to content or networks (network access gatekeepers) make it very difficult if not impossible for SMEs to stay in the market in the longer run and deploy broadband applications and content.

- **Financing Cycles:** The climate for private investment in the creative ICTs is a-cyclical to the technological advance: Three to five years ago money was readily available, but the technology mostly narrowband; today rich media (DVD-Offline) and broadband (Online and Mobile) could deliver new contents and innovative services, but the investors have been burnt away. Often, investment in digital content and digital delivery has to be sustained by margins derived from traditional market activity. Very few successful new ways of generating revenue have emerged.
- **Moore's Law is working to increase Content Gap:** Performance increases and productivity gains increase functionalities and reduce prices for users. Often, these gains require structural changes in content creation and delivery industries. On the supply side the new generations of ICTs are leading to changes in the market structure of telecommunications, information services and content firms. Essentially, all the players must reinvent themselves. Network operators need to generate revenue to support investment in next-generation networks and replace loss of traditional business (see: Telekom Austria plans to start TV via ADSL later this year -> Triple Play). For intermediaries, the market churn is very high and there are few winners.
- **Market complexities increase:** New sets of business activities and new roles emerge in the creative ICT and content industry: content design and aggregation, marketing of publishing offers, rights acquisition / management, packaging and distributing content, content protection, management of emerging publishing services, design and sale of interactive advertisement spaces, profiling users, integrated billing management, payment management, customer relation management, security/control services, access management.

In order to successfully manage these multiple roles and these often joint but then also separate activities a critical size is required. They involve a high degree of co-ordination as well as competition along value chains.

**Politics is simple:** Public policies do not keep up with these changes and adjust policy and the regulatory environment sufficiently quickly for smaller market players. In many countries, neither the speed nor the direction of change has been recognised and measured and this little economic analysis is available for networked and traditional businesses in content sectors.

**Key factors:** Governments and their agencies have to recognise their role as content creators and model users, the importance of procurement (direct orders) and the establishment of best practice know-how and guidelines (see: [www.EUROPRIX.org](http://www.EUROPRIX.org) ; World Summit Award [www.wsis-award.org](http://www.wsis-award.org) ).

**Critical Steps:** Governments have to cooperate with industry to speed up the creation of infrastructures for and the public acceptance of micro-payment systems, electronic signatures, and authentication. They have to counteract piracy, develop frameworks for DRM as enabler of business models, and assist in the clarification of use rights along content creation and delivery value chains, digital rights clearing systems. Finally, governments should consider supporting and investing in the creation of content clusters and digital content fund for all those areas where there is a significant public interest (health, education, cultural identity).

This book is one of the results from the ACTeN Scholars' Conferences which were put on by the EUROPRIX network of the European Academy of Digital Media (EADiM) and financed in part by the IST-FP5 Project. The conferences go back to 1999 and were held in cooperation with and hosted by the MindTrek Association of Tampere, Finland. Leading researchers and academics, practitioners and policy makers presented their projects on the subject of E-Content and discussed problems and solutions of today's research in the field. With the presentation of solutions and the various meetings of all parties involved, the ACTeN scholars' conferences helped to understand market developments better and have built a bridge between science and business.

I would like to thank Jak Boumans and Cai Melakoski, my colleagues from EADiM, for their support and all the work they did in preparing the conferences and keeping EADiM alive and developing. Without them neither ACTeN nor this book would exist.

I would like also thank the authors of this book from all over Europe who agreed to have their texts published and revised their manuscripts. Jana Egger and Rainer Steindler are the key networkers and deserve special mention for the care in connecting e-content professionals, researchers and instructors from the 33 countries in which EUROPRIX and EADiM are active.

I would like to also acknowledge the eleven ACTeN partners from ten European countries who worked together for two years and reached out to thousands of people in the European e-content industry, both on the technology-research side and on the content -business side: MFG Baden-Württemberg Agency for IT and Media (Germany), EADiM European Academy of Digital Media (The Netherlands), Electronic Media Reporting (The Netherlands), ICNM International Center for New Media (Austria), MindTrek Association (Finland), Digital Dispatch (France), ELET (Slovakia), OPI Information Processing Centre (Poland), SC ITC SA Institute for Computers (Romania), MATISZ Hungarian Association of the Content

Industry (Hungary) and TC AV Technology Centre (Czech Republic). Thanks go also to Pascal Jacques and Werner Janusch from the European Commission and the IST Information Society Technologies programme.

Finally, thanks go to all the participants in the Scholars' Conferences, the many speakers and the people who assisted the organisation at the ICNM. The successes of the conferences and the papers in this book are due to their work.

Salzburg, 2005

Peter A. Bruck

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## A. HIGH PERFORMANCE CONTENT BUSINESS

### 2 From Ambient Multimedia to Bio-Multimedia

*Artur Lugmayr, Finland*

#### 2.1 Abstract

Between user-interface design, high-quality video and audio, ubiquitous computing, pervasive designs, and advanced input devices, multimedia and its related fields transitioned from ‘integrated presentation of information’ (multimedia), to ‘computer generated simulated environments with its peripherals’ (virtual reality), ‘the surround in which the user is the interface’ (ambient multimedia) to this novel and newly introduced field of *Bio-Multimedia (BiMu)*: ‘*integrated human capacity*’. Multimedia and its derivatives generated a cyberspace which connects people to virtual communities and experiences in ways that not only allow them to work more efficiently but also to engage in new leisure pursuits including participation in virtual sex and role play in imaginary worlds. As the next generation of mediated engagement, bio-multimedia – the integration of human capacities in a Bio-Space – serves a similar purpose: provision for leisure engagement through biological metaphor.

#### 2.2 Introduction

The goal of this area of multidisciplinary scientific inquiry engages the disciplines of theoretical computer science, bioinformatics and systems biology, medicine, as well as multimedia; as such, it suggests a transition from the world-class concept of ambient multimedia to the next generation: bio-multimedia. The underlying question is simple - although the answer lies far in the future - beyond current bio-technological possibilities. *What challenges, possibilities, and facilities are provided by bio-technology to span a bio-space for the experience of leisure content?* The focus of this research paper is the introduction of bio-multimedia as new branch of multimedia.

Within the scope of this research work we understand under the term **synthetic space** a human created “boundless [...] limited extend in one, two, or three [...] dimensional extend in which objects and events occur and have relative positions and direction” (Merriam-Webster). A **world** is “the sphere or scene of one's life and action” (Merriam-Webster), which also includes ‘real’ and artificially created places. The term **synthetic universe** refers to “body of things and phenomena observed or postulated [for] the world of human experience [created



by humans]” (Merriam-Webster). The world is the world as it is perceived by human beings, either if artificially created or as it is in nature.

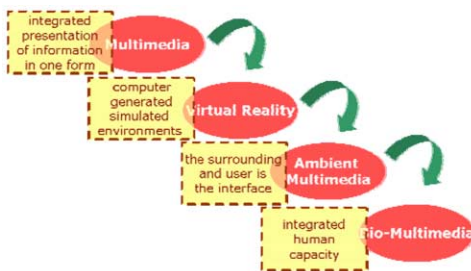
One of two viewpoints can be adopted when applying biological models and metaphors in computation:

- incorporating nature inspired behaviour into technical systems;
- building a stand-alone biological-based synthetic universe;

The first viewpoint relates to rebuilding observations and happenings from the nature or its sub-parts into technical systems.

Technical systems can be improved by biologically inspired metaphors. In contrast to re-building nature, we imagine the creation of nature or of biologically-based synthetic universes. These universes incorporate bio-feedback for reactive purposes as well as generate the actual feedback. This view highly differs from the first viewpoint.

In other words incorporating nature inspired behaviour into technical systems deals with observing nature and its phenomenon. Observations are incorporated into technical systems as e.g. already applied in neural network theory, genetic algorithms, amorphous computation and the like. To build a natural or self contained biologically based synthetic universe is a rather different and more complicated task.



**Figure 1. Development of presenting leisure content**

Currently we do not have the knowledge for building a synthetic universe for trees, animals, humans, the sky or the sea. In virtual reality the synthetic universe is represented by 3D modelling languages such as VRML. A synthetic universe build on biological metaphors goes one step beyond. Let us consider an example: (Borgens) researches how to help human beings with spinal cord injury. With this approach electronic nerve impulses are generated and bridge spinal chord nerves that have been severed. What if this technique is used to interface human beings with computer systems? It could be used as novel input, as well as novel output device. Nerves are stimulated and the consumer perceives a new synthetic universe. The issue is how to represent the universe that creates impulses? Which model language will have to be used?

The borderline between technical systems and natural systems either vanishes or completely disappears. In this case a technical system is better described as a certain form of techno-biological system.

## 2.3 Related Work

It is problematic to pinpoint on related works. Many disciplines work on this issue independently. There is less work done to bring several aspects together and present a unified theory. *Bio-Multimedia* attempts to unify these aspects and conceptualises a more unified framework. The research group "Synthetic Characters Group" (Blumberg 2000) focuses on graphical worlds in which synthetic dogs learn. The system models what we know of canine learning. A lot of work is currently done with biosensors for biofeedback systems. One example is the European Biofeedback Foundation (BFE) (Foundation), which promotes the awareness of biofeedback among health care professionals. A good starting point for the exploration of biologically inspired research is (Research), that contains further links for biological inspired architectures for the brain, robotic research, bio-sensors, biological inspired computer systems among many others. A glove that senses position of fingers and creates music depending on finger positions has been presented in (Luigi Pagliarini 2002) . Another example is to create music where systems are based on natural evolutionary modes.

The MindGames group at Media Lab Europe focuses on a concept which has been termed "Affective Feedback" which asks the question: "...is it possible to constructively affect the state of the human mind through a combination of sensory immersion, intelligent bio-feedback and multi-modal interface technologies?" Technologies such as Bio-melodics and Brain Child are combined with games such as "Relax to Win" creating feedback and circumstance to inform and change the human behavioural state.

Steven Johnson reviews emergence and collective behaviour models in biology in (Johnson 2001). Interesting new thoughts of viewing digital and real universes have been presented by Bentley (Bentley 2001). His viewpoint is to pinpoint on happening in nature and how they can transform technology. Networks and interlinked systems are nicely described by Barabási (Barabási 2002). More visionary thoughts about computer science and technology in general are given in (Denning 2002). First successful experiments in coping with NP complete problems by DNA computers are described by Adelman et. al. (Adelman 1996). Algorithms used to enhance processes in nature are described by Baldi et. al. (Baldi and Brunak 2001). Howard et al. describe how to control computers by thought in (Howard 1999). A very comprehensive work about cell biology has been contributed by Lodish et al. (Lodish 2000). Amorphous computation as another not so well known approach for biological inspired models in technology are described (Sussman 1998).

## 2.4 Components

On very abstract level, the goal of any type of multimedia is to present leisure content or present content in a way easy perceivable by people. Independently where content gets presented there is one major aim valid for presenting leisure content: the consumer has to get immersed into the story, presentation or performance. On very abstract level the components for presenting leisure content are:

*environment*: technical platform or architecture enabling presentation of leisure content (e.g. theatre stage, computer);

*synthetic world*: soft component of the synthetic world that gets presented via the environment to the human (e.g. 3D model, multimedia assets);

*interaction/feedback mechanism*: devices and models for altering the presentation flow that enable to interact with content either as physical entity (e.g. joysticks, cameras) or as virtual devices available in the presented space (e.g. 3D gloves are controlled via a joystick in a virtual world);

*culture*: provisioning sociological and psychological phenomenon into fictive worlds (e.g. life-style, community building).

The environment is the technical platform for immersing consumers into the leisure content/experience. In the past this might have been the theatre stage, nowadays it is the computer and its peripherals including network facilities. The world provides the virtual or synthetic space in which the participant user becomes immersed. All fiction creates such a world. In theatre, this world is articulated on and limited to the stage, where as in massively multiplayer game the world extends beyond the action to the interaction amongst the players.

Interaction encompasses both the input method and the potential the input exerts on the flow of how a show gets presented. The audience in most theatrical performances is considered "passive" because they do not affect the dramatic flow of the story. However, for at least the better part of the 20th century examples exist of performances which incorporate mechanisms that invite the audience to "interact" in ways that affect the outcome of the story. Interaction in interactive computer mediated media is nowadays predominant, and many fictive worlds generate new cultural models for interaction and community. Virtual communities brought together by web-portals or digital chat rooms are very simple example for the integration of cultural aspects in technical systems.

A very problematic issue is how to measure quality or "good multimedia". It includes media aesthetics, social factors, human factors, usability and covers another wide range of fields. Within the scope of this research work we leave the question opened.

But what does the consumer want to do with all the components? One would like to get immersed in a factual world. Whether he watches news, surfs the Internet or studies with edutainment software, the consumer would like to sense and act in a synthetic space. Two ideas follow: first how one gets immersed into the environment and second how easily the form of the presentation can be understood. Stories provide an example. Narrative models not only cover 'story telling' they are also intended to create a compressible flow of information for the consumer.

## 2.5 Immersion and narrative

Immersed means "...to plunge into something that surrounds or covers; especially: to plunge or dip into a fluid..." (Merriam-Webster). To consider the borderline between illusion and reality is a useful measurement for the degree to which humans get involved in synthetic environments. It simply describes the ability of the consumer to distinguish between reality and synthetic world. A simple example is found in virtual reality (VR) and its history.

If a consumer would have been put into a synthetic universe 200 years ago, he would have perceived this world as real. He would be completely immersed in it, as he would not have been used to this world. The art of bio-multimedia now goes into a similar direction. Imagine technical possibilities in 200 years - if we would be immersed and dive into a biological space? How would we perceive this environment if we could experience it today?

One type of leisure content one can present to consumers is the creation of a fictive-world. Tribal dances, tales told around bond fires, books, movies are traditional story media. Each delivery media generates its own social conventions. Today's modern multimedia systems in the form of digital TV, video games, etc. provide a similar story sharing function in the modern culture. Bio-multimedia will go one step further, it will immerse consumers entirely and the borderline between fictive-world and real-world will completely disappear.

Let us keep with the idea of 'multimedia is telling stories' and express the thematic from the viewpoint of story telling. Story telling in any form convolves *interaction*, *multimedia assets* and *narrative*. Multimedia assets are the types of content used to present the narrative to the consumer. Multimedia assets present a world to the user. Within this world the consumer is given the potential for some amount of interaction has interaction possibilities to certain extent. This space also limits story development or narrative boundaries. In other words, all three components of story telling create a fictive-universe where the consumer gets immersed.

To represent this fictive universe, let us take a look at Fig. 2. Each axis spans a space. The interaction space gives information about the type of possible

interactions. The participant engages by interacting through within the narrative. On the other hand, the consumer travels through the representation of the narrative, i.e. through multimedia assets. The narrative space determines the type of narration and allows development, thus manifesting the story as multimedia assets.

The volume of the space gives information about potentials and possibilities of the consumer to move within the fictive world. The substance of the space is the story itself. The measurements for each axis differ.

The interaction space is made up of interaction models (e.g. passive, input devices as well as virtual devices in a 3D world);

the multimedia asset space consists out of the substance assets are made of, even though they might be created artificially (e.g. video, synthetic space, 3D world);

the narrative space about limitations of narrative development (e.g. parallel or linear narration).

Seeing multimedia technology development during recent years and looking at how humans are embedded in - or are presented to - with content, we can make the following: we can make the following observation: multimedia assets represent a manifestation of arbitrary content types (e.g. images, video) evolving from monolithic assets towards ambient assets (spaces surrounding the consumer - such as a light-switch with speech interfaces) towards mixed assets (mixing the real-world elements with artificial ones) to synthetic assets completely embedding humans in an artificial world (e.g. virtual reality) and opens the possibility for creating artificial worlds which are married in the physical as well as virtual realm to human existence.

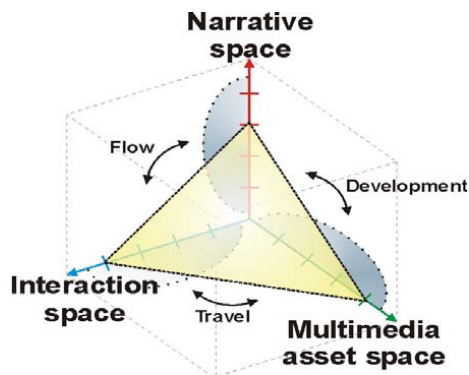


Figure 2 Narrative cube as representation for the fictive-world

Seeing our first two statements concerning creating spaces by embedding humans and leaving humans in the real world, this leaves some discussion points opened: As bio-multimedia tries to create immersion the first statement is mostly

predominant. Let us consider a hypothetical example to underline our argument. A human creates a biological synthetic universe. This space is represented by a yet not known representation. VRML would be the synthetic world in computer graphics. For a synthetic universe we have currently no representational model. A human is immersed into this synthetic universe by connecting strains of nerves. Input and output operations come through them. Thus the user is left in the real world, but perceives the synthetic universe as another narrative reality. The perceiver can hardly distinguish between both realities. The consumer passes some (marginal) threshold of emotional engagement through implants. A very strong sense of another narrative reality is created.

The nature acts as source for ideas for realizing artificial technical systems. It also allows a clear distinguishing between real-world and synthetic world.

And exactly this is the task of creating multimedia, ambient multimedia or bio-multimedia: making the borderline between illusion and reality vanish. And exactly this is an excellent measurement for the quality of presenting content. It also is a measurement of how the user gets immersed into a synthetic or fictive-world. Let us look into this borderline a bit deeper:

the borderline of multimedia is the equipment;

ambient multimedia immerses the consumer naturally by surrounding him with multimedia equipment;

virtual reality uses equipment for immersing the consumer, but he can distinguish clearly between reality and virtual reality;

bio-multimedia lets the consumer dive completely into an synthetic environment, depending which technology is applied.

## 2.6 What now?

Still we did not consider some basic definitions and questions that are still opened and under investigation to develop the concept of bio-multimedia. Both require still fine-tuning and intelligence for bringing theoretical research in bio-multimedia into the right direction.

## 2.7 Definition

**Definition 1:** *Multimedia*. Integrated presentation of information in one specific computer generated form by involving interaction and information presentation and representation models.

**Definition 2:** *Ambient Multimedia.* Humans embedded into multimedia technology enabling natural interaction and seamless integration of multimedia into the natural environment.

**Definition 3:** *Bio-Multimedia.* The field of integrating human capacity into a synthetic service space interfaced with biological devices for immersing humans into services.

## 2.8 Ambient Multimedia

Between user-interface design, high-quality video and audio, ubiquitous computing, pervasive designs, and advanced input devices: Multimedia and its related fields transited from 'integrated presentation of information in one form' (multimedia), to 'computer generated simulated environments with its peripherals' (virtual reality), to 'the surrounding and user is the interface' (ambient multimedia).

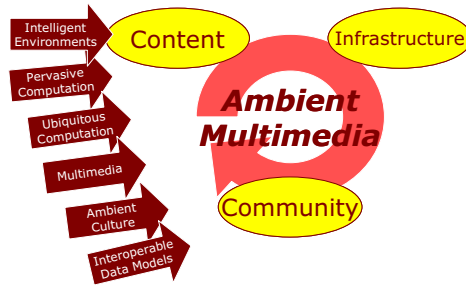


Figure 3 What is ambient multimedia?

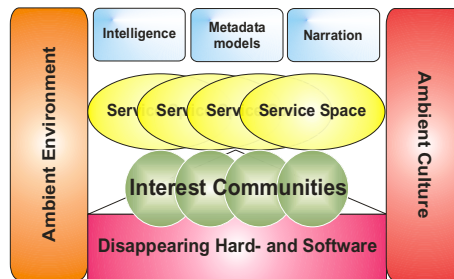
Simply, multimedia needs more than:

- video quality, compression and user-interface design;
- systems where humans are surrounded by services;
- transparent software and hardware;
- services for the mobile consumer anywhere and anytime;
- innovative, ambient, and wireless services;
- business strategies to sell disruptive technology;
- the mobile-radio-TV-lamp-computer-coffee-cup;

Ambient multimedia as based on two efforts emerged in the field of computer science recently: pervasive computation and ubiquitous computation.

Pervasive computation means "...computers and sensors 'everywhere' in devices, appliances, equipment, in homes, workplaces and factories, and in clothing. Another element involves pervasive communication - a high degree of communication among devices and sensors through a ubiquitous and secure network infrastructure with a wired core and wireless adjuncts that communicate with the core..." (Pervasive Computation)

Ubiquitous computation has as its goal "...the enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user. A number of researchers around the world are now working in the ubiquitous computing framework. Their work impacts all areas of computer science, including hardware components (e.g. chips), network protocols, interaction substrates (e.g. software for screens and pens), applications, privacy, and computational methods..." (Weiser 1993).



**Figure 4 Principles of ambient multimedia**

Extracting the principles out of both fields and merging it to new paradigms in multimedia following principles can be crystallized:

- the surrounding is the natural user interface;
- location dependent and regional;
- intelligent and autonomous systems;
- Mobile output/input devices;
- Semi-automatic adaptation to ambient user context;
- Interoperability through metadata;
- Semi-automatic adaptation to environmental context;
- Natural user-interfaces;
- Gadget-free interaction;
- Interaction with content;



- Intelligent context aware systems;
- Creation of wireless communities;
- Aesthetics and semantic content design.

## 2.9 Bio-Multimedia (BiMu)

The vision of bio-multimedia is to define, create and promote the idea of bio-multimedia as new field in multimedia. Human capacity shall be interfaced with biological devices (e.g. measurement of body signals) for getting immersed into a leisure content space.

*"...creation of the transition from ambient multimedia towards bio-multimedia as concept and knowledge pool for biological inspired leisure content distribution in bio-spaces as future challenge and contribution to biotechnology..."*

## 2.10 Biological inspired metaphors

Biological or natural inspired computation models are already all-present. Examples are:

- Neuronal networks;
- Artificial intelligence methods;
- Amorphous computation;
- Complexity theory;
- Swarm theory;
- A lot of fields contribute to bio-multimedia:
  - Biometrics;
  - Medical field;
- Human/Computer Interface;
- Software development;
- Biological inspired algorithms;
- Biomedical hardware devices;
- Human signalling;
- Psychological issues.

## 2.11 BiMu – A first definition

Bio-Multimedia integrates human capacity for spanning a bio-space for leisure content. Human capacity convolves perceptive senses, bio-signals, and interface capabilities with machinery. A bio-space is a biological inspired generated realistic environment where human capacity is integrated with peripherals.

Bio-Multimedia integrates several aspects of a human-computer interface which means leisure content creation based on human-computer interfaces. It deals with the question "Which leisure service that can be developed based on devices capturing and transmitting human signals?"

## 2.12 Bio-Multimedia as logical consequence

Peripherals are biological hardware components connected to equipment capable of measuring and interpreting bio signals of any type. Bio-Multimedia is the next logical step after the development of ambient multimedia services, and integrates biological metaphors and biological advances. Bio-Multimedia is the basis for integration of system components towards an integrated and embedded multimedia space for the experience of new types of leisure content.

- Bio-Multimedia is the natural temporal consequence after ambient multimedia;
- Metadata is an essential part of describing static and dynamic behaviour in form of computational models of bio-multimedia;
- Biometric systems are one example for bio-multimedia services;
- There exist methodologies and technology for creation of bio-spaces.

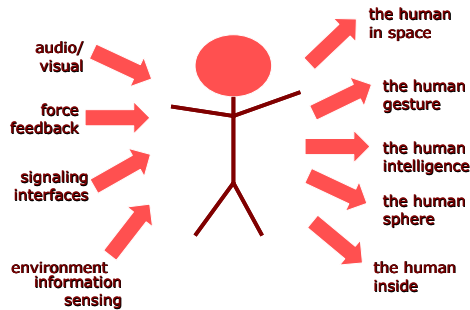
## 2.13 Components

Due to the novelty of the field, the next steps are rather hard to predict, but will evolve by following research components.

### 2.13.1 The Bio-Multimedia Model (BMM)

Information needs to be processed, created, transmitted, stored, and consumed based on biological inspired models. The introduction of a biological inspired logical unit for distributed data processing is required. Currently cell-based biological computer systems, based on cells consisting of infinite states,

communication based on analogous models, aging, and a time based spatial (consensus) based memory, as based on a long-term construction plan (e.g. DNA) are introduced.



**Figure 5 Interfacing humans**

The main problematic is to find an abstract logic model that describes how bio computers as central processing unit might work and can be integrated with 'a life' organisms. Computational models (e.g. amorphous computation) need to be based on schemes as developed in the field of theoretical computer science (e.g. Turing Machines).

The outcome of this part would be more of abstract nature and shall identify bio-multimedia system components and requirements for integrated human capacity.

### **2.13.2 Intelligent Synthetic Bio-Spaces (ISBS)**

The space of where to present biological inspired multimedia where human can be embedded is defined by synthetic bio-spaces. The research of the substance or model presented scenes, where integrated human capacity can interact with is scientifically researched within this work-package.

The goal is the development of a model for the presentation of content in the context of bio-multimedia, comparable to virtual reality scenes in computer graphics or 3D models. Out of which nature they are, how they are furnished, how they are artificially built, and which biological models will be used to describe them is major part of research. Metadata and new description languages are substantial part of research.

**Table 1: Research components leading to the Bio-Multimedia Model (BMM)**

<b>Research Component</b>	<b>Objective</b>
<i>Ambient Multimedia (AM)</i>	Research of metadata its relation to bio-multimedia models, and bio-multimedia basic services as based on bio-signals, transparent user-interfaces...
<i>Bio-Multimedia Mode(BMM)</i>	Creation of a concept, identification of its system components, and required theoretical models by integrating efforts in bio-technology;
<i>Synthetic Bio-Spaces (ISBS)</i>	Creation of intelligent virtual 'realistic' description for integrating human capacity with metadata models;
<i>Bio-System Software (BSS)</i>	Algorithms, software and data structures to be applied on a distributed bio-multimedia platform;
<i>Bio-Multimedia Matrix (BMM)</i>	Creation of biological inspired network and communication infrastructures including potential periphery;

### 2.13.3 Bio-System Software (BSS)

Research of algorithms, computational models, hardware architectures, bio-computational models, interpretation of measurements, etc. and their impact on the development of bio-multimedia as concept. Obviously algorithms, theoretical models of computation and metadata models are required for performing computational tasks within a bio-space.

### 2.13.4 Bio-Multimedia Matrix (BMM)

Bio-Spaces require three levels of communication models: human - bio-space, human-human, and bio-space - bio-space. The theoretical aspects and which potential communication models have to be build is of major concern.

## 2.14 Services

Picking the example of biometric systems: services as based on user perception are mostly based on biometric systems. Metadata is a substantial part for the description of e.g. visual features such as faces by MPEG-7 face descriptors. Fingerprints and other identification classifier provide other combination of

biometric modalities. The issue is the integration of metadata models with biometric data, and the storage within distributed biometric databases.

Other closely and already now typical fields in multimedia are:

- Education
- Customer profiling & behaviour analysis
- Persons with special needs
- 'touch-less' interfaces
- 'vision-less' interfaces
- 'sound-less' interfaces
- Enjoying leisure content
- Medical analysis of patient behaviour
- Data mining
- Brain interface
- Bio-Metrics as Input Device
- Lie Detector Board Game
- Bio-Sensors in Retail

## 2.15 Conclusion

...simply Bio-Multimedia is novel, the bottom of the S-curve model, 'sell-ative', already hype and the future of multimedia...

## 2.16 Acknowledgements

My grateful thanks and respect go to Gloriana Davenport from MIT Media Laboratory. The quality and content of this paper highly benefited from the discussions with her during the EUROPRIX conference in Tampere, her email conversations and patient revision of this paper. I would like to thank all my research colleagues at the Digital Media Institute, Tampere University of Technology. Special credits go to Samuli Niiranen for his very long and fruitful discussions, as well as to Prof. Seppo Kalli for his guidance and help during my PhD studies. Furthermore many thanks to Prof. Irek Defee for his hypothetical discussions trying to answer the question "What is after multimedia?". Basically these discussions resulted to giving birth to the term "bio-multimedia"... Many thanks also to Ismo Rakkolainen, for the provision of some excellent background materials.

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### 3 Value creation patterns and current trends in digital media service creation: A case study of the Finnish digital media industry

*Tommi Pelkonen, Finland*

#### 3.1 Abstract

Research questions and methodology The key objective of this paper is to create an analytical framework to help digital media companies to understand their strategic positions within their key business areas both in the domestic markets and in foreign operations. Furthermore, the paper presents and discusses the key current trends in this challenging service creation industry. In practise, the objectives are will be met by answering the following research questions:

1. What kind of actors are operating in the field of digital communications and service creation markets and how are these actors interrelated?

2. What kind of key challenges are the companies currently facing in their business development domestically and in international operations?

3. What means can governmental organisations employ to reinforce a positive development within the digital media business field?

The research is based on a seven-year follow-up program of the industry development in Finland. The effort was carried out in the Helsinki School of Economics applied research institute, LTT-Research Ltd. The empirical data consists of four surveys (1996, 1998, 2000 and 2003) complemented with manager interviews carried out in simultaneously with the interviews.

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<sup>1</sup> Acknowledgements: Creation of the understanding of the digital media industry development in Finland has been a joint effort of several researchers, industry actors, experts and industry professionals. I have had the privilege of working in both roles – as an industry professional and research analyst. In addition, I have obtained strong support from my faculty and several foundations for my research. I would like to take the opportunity to send my warmest thanks to all the supporters of this research focus area. Especially I would like to thank the openness of the Finnish digital media companies on their willingness to provide information of their development. In addition, I would like to send my special acknowledgment to the parties listed below. Special thanks to: Antti Lehtinen, Association of Finnish advertisers, Mainostajien liitto, Culminatum Oy, Helsinki School of Economics, Helsingin kauppakorkeakoulun tukisäätiö, HPY:n tutkimussäätiö, ITP-program/Helsinki School of Economics, Jari Aalto-Setäl, Jorma Pietala, Liikesivistysrahasto, Marcus Wallenbergin liiketaloudellinen tutkimussäätiö, Ministry of Trade and Industry Finland, Pienyrityskeskukseen tukisäätiö, Re-Media Oy, Satama Interactive, Suomalais-ruotsalainen kulttuurirahasto, Teemu Väänänen, Vivikka Richt, Wihuri foundation



### 3.2 Introduction<sup>2</sup>

Professionally oriented companies and highly skilled individuals create digital services. The industry formed by these actors originates from early 1990s multimedia production agencies. It developed into a full-scale professional business field led by the exponential growth and business need for Internet services. At the turn of the century, the industry was characterised by unrealistic earnings and growth expectations, so-called hype. Venture capital flooded into service creation, as well as to its related areas, e.g. to start-up companies selling their products online. Salaries in the industry were on the constant increase, and aggressive recruiting and rewarding schemes were used. In 2001, the global economic downturn smashed the positive prospects as well as the market value of digital media related companies.

Currently, the situation is about to normalise – digital services are being created and bought just like any other business services, such as consulting or advertising and marketing services. The digital service creation industry has been the subject of several studies. For example, Sandberg and Sandberg & Augustsson (1998, & 2001)<sup>1</sup> analysed the development of Swedish digital media companies and New York New Media Association<sup>2</sup> (1997, 1999 & 2001) carried a series of analyses of the industry development in the New York region. In Finland, the digital service creation industry development has been analysed the most thoroughly. The research program jointly led by Digital Media Knowledge Centre of Uusimaa<sup>3</sup> and LTT-Research Ltd<sup>4</sup> put out a total of seven separate publications on the industry development in Finland.

The Finnish case was analysed by covering multiple points of view: 1) general market trends (1997, 1999, 2000); 2) professional requirements and job profiles (1999); 3) production processes and business networks (1998 & 1999); 4) the client relationships development (1998) and 5) internationalisation challenges (1999). Though the industry was thoroughly analysed at the peak of the hype in 2000, only few current studies exist Europe- wide with a strong focus on the current status of digital service companies or on the actual service creation process and value-webs in the business area. This paper aims partly to fill this gap.

The key objective of this paper is to create an analytical framework to help digital media companies to understand their strategic positions within their key business areas both in the domestic markets and in foreign operations. Furthermore, the paper presents and discusses the key current trends in this challenging service creation industry. In practise, the objectives are will be met by answering the following research questions:

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<sup>2</sup> See also: 1[www.arbetslivsinstitutet.se/publikationer/](http://www.arbetslivsinstitutet.se/publikationer/) | [www.nynma.org](http://www.nynma.org) | [www.culminatum.fi](http://www.culminatum.fi) | [www.ltt-tutkimus.fi](http://www.ltt-tutkimus.fi)

1. What kind of actors are operating in the field of digital communications and service creation markets and how are these actors interrelated?

2. What kind of key challenges are the companies currently facing in their business development domestically and in international operations?

3. What means can governmental organisations employ to reinforce a positive development within the digital media business field?

Implementation of the research the analysis is based on a thorough case study of the development of the Finnish digital media industry during 1996-2003. The empirical data for the paper was collected in four separate surveys and interview sessions in 1996, 1998, 2000 and 2003. The research effort was carried out in the Helsinki School of Economics' applied research institute LTT-Research Ltd. The key researcher in the study was the author of this paper. Although the findings are based on the Finnish sample, they can to a great extent be generalised to companies Europe-wide - the core actor groups and key activities remain the same regardless of regional differences. This paper presented at the Europrix Scholars conference highlights the key findings of the most recent study. In addition, it will present some additional data of not yet published work carried out in spring 2003.

Reliability and validity of findings and conclusions the analysis was based on seven years follow-up of the development of the digital media industry in Finland. The databases collected by the development of the Finnish case are among the most thorough of this industry. They have data of digital media companies still at their very early stages up to the current, larger and more experienced, professional service companies. The data consists of both quantitative and qualitative elements and, as already mentioned, was collected during 1996-2003 in four separate, but still comparable surveys and interview sessions. Patton<sup>7</sup> points out that triangulation, i.e. combination of multiple methods to a same research, is a powerful way for guaranteeing research quality. In practise this means of using both quantitative and qualitative approaches simultaneously, using multiple methods and many researchers as well as having several perspectives to the same phenomena. Within the seven digital media analysis in LTT-Research Ltd., these aspects have been carefully kept in mind. The research effort has been carried out as a team supervised by many external experts from the industry. In addition, the author of this paper has been actively involved in the field both a researcher and industry participant and thus has a very strong insight to the industry development.

The findings presented are based only on the Finnish sample of digital media industry development. Thus, special caution has to be taken in broader scale generalisations. Yet, the author strongly believes, that the e.g. the value-chain based definitions and industry activities of the industry are applicable to describe the market

positioning challenges in any geographical markets. This paper, though presenting the Finnish case, is written in a way, that the research could be also, to large extent, repeated in other areas. By this repetition, the validity of the models presented would be tested and possibly developed further. As a synthesis of several years of research effort, this paper aims to offer an value-adding input for both researchers and industry professionals to deepen the understanding on the challenging and evolving field of professional business services related to digital media solutions.

### 3.3 Digital media as a field of business

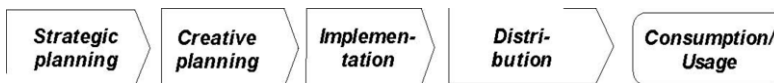
This section of the paper defines the digital media industry by using three closely related approaches: 1) value creation based, 2) work-process based and 3) business network -based definitions. The definitions are then used to describe the business activities the companies in their three most important operational areas. The key objective of the section is to create a common framework for analysing this service industry, independent of the geographical location the company is placed in.

#### 3.3.1 Defining the digital media industry

In the rapidly developing digital media industry, only change has been permanent. The participant groups of companies and the activities companies are involved in have changed radically since the mid 1990s. The rapid change increases the challenge to achieve a simple definition. Yet, it is important to clarify the activities carried out in the hyped up industry to be able to focus this analysis of a specific group of companies. The definitions presented below are produced from multiple angles to create a holistic picture of the actual phenomena. They are a synthesis of several studies.

1) Value creation-based definition The main objective for a company operating in the digital media industry is to create substantial benefit for its clients with the help of new technologies, e.g. internet technologies. The benefits are created by: 1) *adding more efficiency* into company organisation and working processes; 2) *creating additional sales/revenues* and/or 3) *increasing corporate brand recognition*. These three activities can be seen to have similar four-stage value creation process. The four stages in the process are: strategic planning; creative planning; implementation and distribution of the actual service/production. The process is illustrated in Figure 1.

Figure 1: Digital solution development value chain



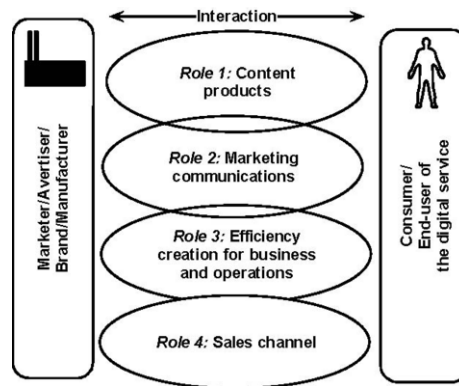
In addition, to providing value added to their customers, digital media companies create “content products”, that are sold either via intermediary or directly to consumers. This content creation production process has a special value creation model. This process also has four main stages and is illustrated in Figure 2. Content creation business has been analysed thoroughly in multiple studies<sup>8</sup> and is not the core focus of this paper.

Figure 2. Content creation value chain



To sum up the value creation-based definition, a digital media company creates value for its customers by forming solutions that operate in one of four roles. Figure 3 below summarises these.

Figure 3: Different roles of digital media <sup>3</sup>



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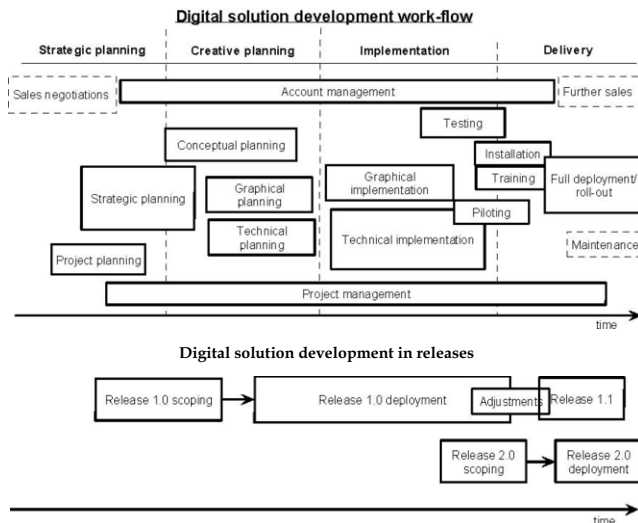
## 2) Work process based definition

The work objects in the digital media service creation are digitally formatted text, picture, voice, video and database materials. These are modified in such a way that they can be used and consumed with information technology equipment: e.g. personal computers or mobile phones either locally or through data networks. In their production process digital media companies use computers, data networks and equipment and software and programming languages closely related to them. Professional experts carry

<sup>3</sup> See e.g. Baubin, Bruck & Hofbauer, 1996 (p.21); Sacerdote, 1993 (in Blunden & Blunden, 1994, p.574); Condrinet team, 1998; Bruck (ed.) 2002.

out the digital media production. They create solutions in close relationship with the customer information system or product to be consumed and utilised by the client. In addition, digital media companies offer training and consulting services related to their field of expertise. Digital media company operates in project-delivery mode i.e. *allocates its resources to meet the customer need in the most efficient manner*<sup>4</sup>. When the project is delivered, the resources are re-allocated into new projects. Typically, a project related to digital media is carried out in phases somewhere similar to the value creation process in the previous chapter. In larger scale customer solutions, the operational mode is changed into delivery /site operation programs. A development program consists of several linked projects. Within these a more stable organisation is created. The service to be delivered is very often developed in phases/releases. Figure 4 below illustrates both the project and program delivery modes of digital media companies<sup>5</sup>.

**Figure 4: Digital media solution development workflow and release planning**



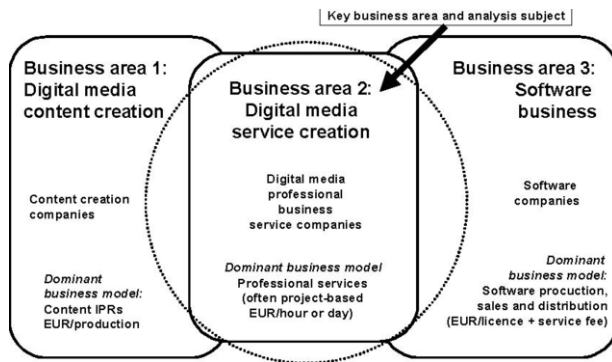
The business model of a digital media company is thus very often based on selling the projected time of the professional working in the company. This business is often supplemented with selling either content products (e.g. CD-ROMs, mobile games) and/or obtaining licence fees on the products used in the customer projects (e.g. annual

<sup>4</sup> See e.g. Helomaa 1999 and Pelkonen, 1999b

<sup>5</sup> Compare with e.g. Bruck, 2002, p.70

fees on the licence for a content management system. These three areas are illustrated in Figure 5 on the next page.

Figure 5: Digital media company's key business areas



3) Business network-based definition Based on the network-approach developed originally by the IMP-research group<sup>6</sup>, any business market can be described by the relationships between 1) *industry actors*, 2) *resources* and 3) *activities* carried out in the industry. The key objective of any actor in the markets is to obtain as dominant network position as possible. Pelkonen (1999a&2001) used this framework to describe the digital media industry. His description presents one additional dimension to understanding the structure and nature of the industry. The first element in a network-based definition of the digital media industry is the industry **actors**. In addition to “pure” digital media companies, the activities can be found in the following industries at least: traditional media houses; IT software and system manufacturers; IT hardware producers; telecommunication operators; management consulting; advertising agencies; audio-visual production companies and design agencies. Furthermore, actors that have a significant impact to the industry development are financial institutions, governmental organisations, educational and training institutions, labour organisation and research institutions. The actors are presented in Table 1 on the next page.

It is important to notice, that digital media companies that aim to serve their multinational customers have to be prepared to operate also across the geographical borders. The international dimension adds more complexity to the business networks. Yet, the structure, the key actors and essential partnership relationships within the network remain similar regardless of the location.

<sup>6</sup> See e.g Håkansson & Johansson, 1992 and www.impgroup.org

**Table 1: Actors in the digital media markets**

The core of the network	Extended network
<ul style="list-style-type: none"> <li>• Digital media companies (existing and new start-ups)</li> <li>• Traditional media companies (print, radio, television, cable companies)</li> <li>• Telecommunication operators</li> <li>• Communication equipment producers</li> <li>• Information technology (IT) equipment producers</li> <li>• IT Software and systems companies</li> <li>• Consulting companies (media, communications, service, PR, business etc.)</li> <li>• Advertising agencies</li> <li>• Audio-visual producers (video, audio, 3D)</li> <li>• Design companies</li> </ul>	<ul style="list-style-type: none"> <li>• Financiers (venture capitalists, direct investors, financial institutions)</li> <li>• Governmental organisations</li> <li>• Education and training organisations</li> <li>• Labour organisations</li> <li>• Research institutions</li> </ul>

Source: modified Pelkonen, 1999a

The companies in the new media business network own and compete on the ownership of multiple **resources**. Resources can be classified into five major groups: personnel, hardware, organisational, software and financial resources<sup>7</sup>. The key resource was found out to be the company personnel. The more detailed listing of the required resources in the digital media industry is presented in Table 2.

**Table 2: Digital Media Industry Resources**

Personnel	Hardware	Software	Organisational	Financial
Business Technical Design Other	Office premises Production machinery	Licences Intellectual property rights Proprietary contents Production process knowledge Knowledge about technology Knowledge about customers Production software	Strategies Goals Organisational culture Organisational structures	Finance for operations (e.g. R&D, commercialisation, internationalisation)

Source: Pelkonen, 1999a

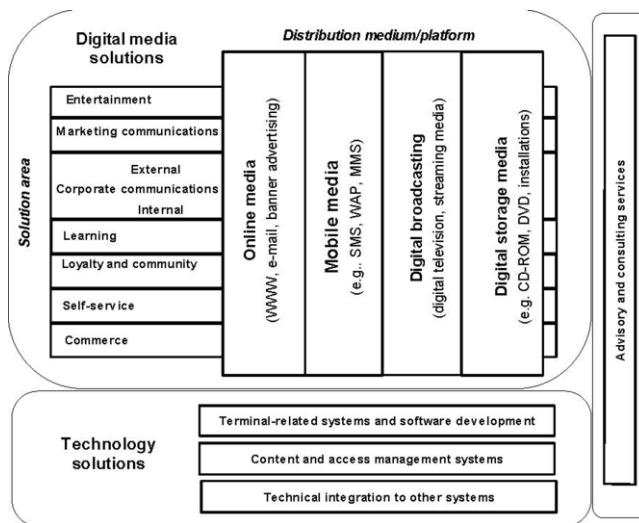
In the evolving field of digital communication, it is more common to discuss a specific technology solution or delivery platform than to really understand the relations

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<sup>7</sup> see e.g. Holmlund & Kock, 1995

of this solution/platform to other similar activities. To assist in defining **industry activities**, a twofold matrix was formed (see Figure 6). On the horizontal axis are the four delivery channels<sup>8</sup> (online, mobile, digital broadcasting and digital storage medias). On the vertical axis are seven different solution areas (entertainment, marketing communications, corporate communications, learning, loyalty and community, self-service, and commerce)<sup>9</sup>. Digital media companies offer these solutions mastering their selected delivery channels to their customers. The solution can be offered only in one channel. Yet, a general trend in the digital business is towards cross-media solutions, i.e. offering suitable features of the solution in each delivery platform. The matrix can also be used to map each companies' business activities within the digital service creation business.

Figure 6: Digital media activities



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To sum up, the digital media industry can be seen as complex network characterised by the links and ties between industry actors, resources and activities. Companies compete in gaining as powerful position within the network both domestically and in international markets. These relations are illustrated in Figure 7<sup>10</sup>.

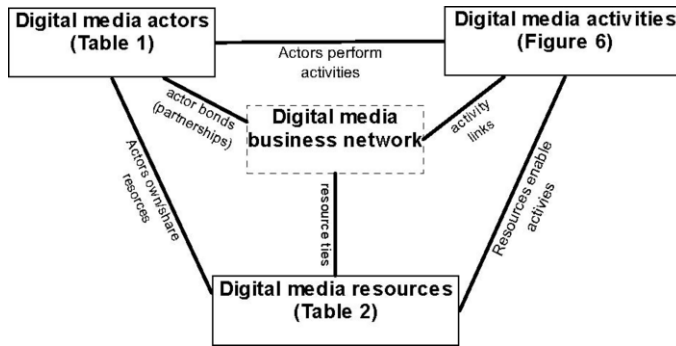
<sup>8</sup> Term "Channel" is used here purposefully to in different meaning than in traditional business literature's distribution channel. In the digital media industry term channel is commonly used to describe the different media tools and their usage in offering digital media solutions the end users.

<sup>9</sup> The solution areas are described in more detail in Appendix 1

<sup>10</sup> Compare with Håkansson & Johansson, 1992



Figure 7: Structure of the digital media business network



### 3.3.2 Value creation within the digital media business

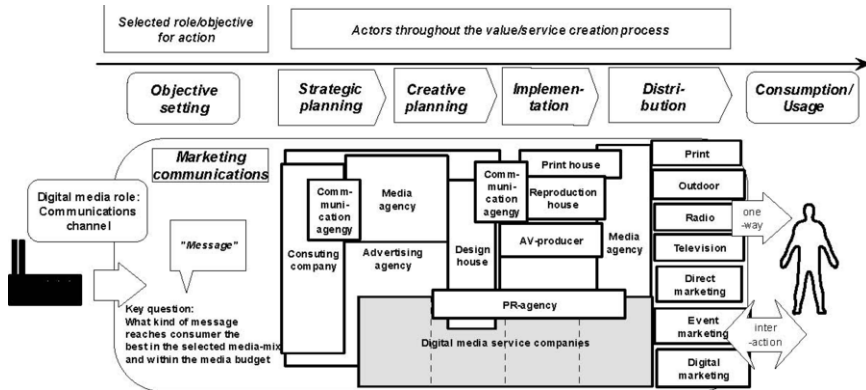
#### Background for the model creation

To analyse the digital media industry activities and market positions in more detail, the value chain approach was linked to the actual industry actors. In this allocation, actors were placed on their most representative position in the value chain. In addition, the actors vary by the offering i.e. by the solution to be created for their customers; communications, efficiency seeking and/or sales/transactions (see Figure 3 and Figure 6). The aggregate of the actors create the *value-web* of the business area. The value-creation within the network is closely related to the value-chains presented in chapter 2.1. Yet, the selected approach aims to create a model that can facilitate market actors to identify their critical partnerships as well as to understand the linkages of their operations in a much broader context than pure digital media solutions. For researchers, the presented framework offers possibilities to target analyses into relationship-based challenges of the companies instead of analysing pure technological possibilities. This is very important due to the fact that currently the most successful digital media companies are the ones that have been able to form and manage efficient partnership coalition with other actors in the markets.

As mentioned earlier, international operations increase the complexity of the network – co-operation, business activities and various partnerships have to be planned and organised to match the needs for international business. These methods include e.g. improved knowledge-sharing methods, offshore operation management, international project and program management capabilities, various collaborative tools, international meetings and audio-/videoconferences. For an internationalising digital media company, creating this crucial substance for international business may become the critical obstacle for growth and access to larger international customer accounts.

Communication solution value-web Digital communications solutions are linked either to marketing or to corporate internal or external communications. The key objective within the discipline is to facilitate the message delivery – reaching the target group with the most efficient manner. A company offering these services to their customers needs to possess expertise in communications channels and their varying roles. Digital tools are only one option in the message delivery, other medium are e.g. television, radio, print, word-or mouth, direct marketing and events. When providing solutions their customers, a digital media company is one of the only actors, which can operate throughout the value chain, from strategic planning through creative planning and implementation into delivery of the solution. Yet, in many cases a digital service company focuses on a selected part of the value chain, e.g. solution implementation. Other actors within the communications value creation process are communications agencies, media agencies, design houses, print houses, reproduction houses, audiovisual producers, PR agencies and in the distribution phases of the production the various media channels (media companies). When providing solutions their customers, a digital media company is one of the only actors that can operate throughout the value chain, from strategic planning through creative planning and implementation into delivery of the solution. Yet, in many cases a digital service company focuses on a selected part of the value chain, e.g. solution implementation. Figure 8 below illustrates the digital communications value chain.

Figure 8: Digital communications value-web



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The most common conflict and thus, the key challenge, for digital media companies lie in their relationships with the communications industry core actor: the ad agency. Advertising business actors, though currently under transformation, have during decades formed a sustainable and pretty stable industry position. It has pre-negotiated key media deals with a 10 media agency (often owned by the same holding company)

and thus motivated to sustain a fruitful situation for their operations. Digital media as the newcomer for the media landscape threatens, to some extent, this balance and has thus not been seen the most lucrative business areas for the large advertising companies. In addition, the advertising agencies most probably do not possess the most up-to-date knowledge of the digital communications possibilities and may thus not reach the same quality level of expertise in their work than with other medium. Yet, the importance of digital medium has been on constant increase and multiple cases already exist in which digital solution has become the core marketing offering - the centrepiece of "*the customer dialogue*"<sup>11</sup> i.e. the interaction between the brand/manufacturer and the consumers.

#### Digital solution creation value web

Creation of digital solutions is most probably the most characterising feature of the digital media business. Digital companies are expected to be able to create lucrative, relevant and easy-to-use services for their customers. The key issue in service creation should constantly be in helping the *interaction between the manufacturer/brand and the end-users of the service*. Solutions that digital media companies design for their customers vary dependant on the need. Based on a consultative analysis of the customer needs, the outcome can be e.g. an tool to help to learn new business area or business strategy; a self-service solution for guiding customers to repair their goods better; a reporting tool for sales personnel of an organisation; and/or a forecasting tool for delivery chain management. At best, the digital solution helps to strengthen the relationship between the brand/manufacturer and its customers.

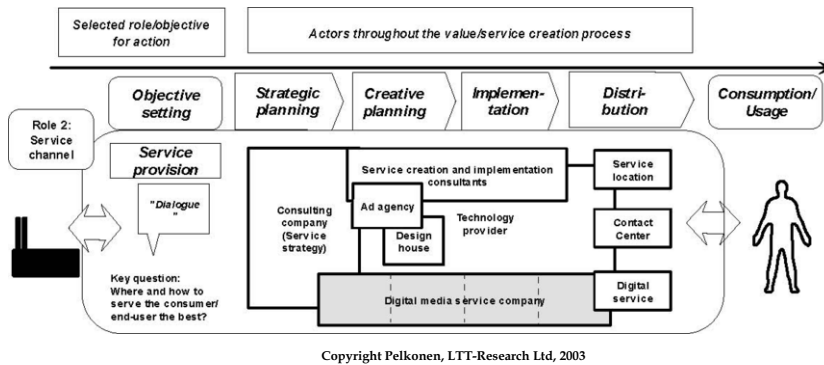
When creating digital solutions, a digital media company needs to co-operate with several other actors - just as in the communication solution markets. These actors include various technology providers, consultants for strategy and service development, ad agencies, design houses and service location planners. As in marketing communications, the group of actors that digital media companies co-operate consist of both domestic and international actors. Especially if the customer is a multinational company, it is very likely that digital media have to prepare itself for international co-operation.

Figure 9 illustrates the value web for digital solution creation. In comparison to the communications value web, the digital agency is often in much stronger position in their customer relationships. The digital media company is very often directly hired to improve certain service area and expected to specialise into their media - to be the experts of the "digital channel and solutions".

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<sup>11</sup> See e.g. [www.bionicle.com](http://www.bionicle.com), Lego's leading marketing and product innovation

Figure 9: Digital solution creation value-web



The key challenge for digital media company in solution creation field is to *gain sufficient credibility* in comparison specialised consultants and well-established technology providers

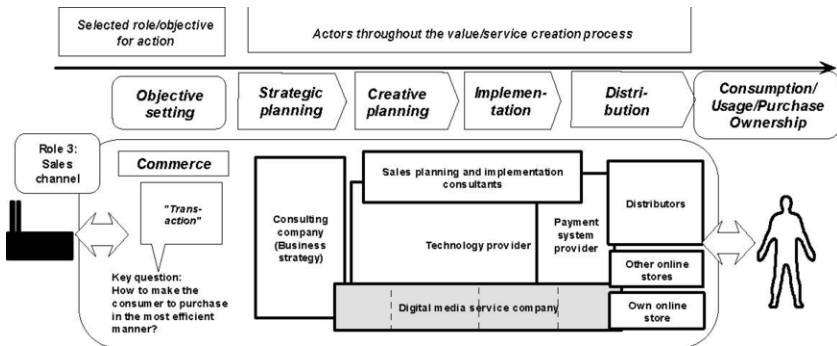
Both these actors are by their history and company size much better positioned in the markets than the service sector newcomers – digital solution designers. Though a digital media company can create direct customer relationships with their corporate customers, they are constantly faced with the pressures of being able to co-operate with companies much larger than they are. In addition, these larger companies are also very experienced in working with the large customers. With well-designed partnering strategy a digital media company may be able to strengthen its position within the value chain.

Transaction service value-web

The third key area that digital media service companies operate in is creation of transaction enabling services – locations that 1) the *ownership of a good is transmitted* from one owner to another and 2) the transfer is *compensated with a payment* in the preferred monetary form. In comparison to the earlier presented service solution creation, the key differentiator is the exchange of valuable goods. Therefore, the digital media company offering services related to this field has to put substantial effort in privacy and security issues of the service to be created. Furthermore, at the core of this offering is the understanding of consumer behaviour, i.e. what makes consumer to make transactions. In the transaction service value-chain the digital media company needs to co-operate with various technology providers, consultants, payment system vendors, security solution vendors as well as logistic partners and retail chain representatives. The service to be created can be part of a larger transaction entity (e-commerce portal)<sup>12</sup> or at the

<sup>12</sup> comparable with department store or a shopping mall in the more traditional commerce

manufacturers own digital service platform (e-commerce site)<sup>13</sup>. If the good to be sold is in digital format and can be transmitted over the communication lines (e.g. software, music, images etc.) the transaction service can be designed to handle the delivery all the way from the manufacturer into the consumer (business customer). On the other hand, if the good is a physical one, it has to be delivered to the purchaser by using traditional means of distribution, e.g. by post, or courier services<sup>14</sup>. To sum up, the role of the digital media company in the transaction service business field is to a) make the service *technologically solid and secure* to perform the requested amount of transactions and b) create *the digital service interface* and *digital environment* as lucrative as possible for the consumers to perform transactions.



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In business analysis, transactions are commonly classified into business-to-business and business-to-consumer services. During to so-called dotcom-boom nearly any kind of business idea obtained high-risk venture financing, several digital media service companies were heavily involved in both building these digital shops- e-commerce arenas – for their clients and participating in the area as founders and co-owners of the transaction This lead to increased risk-taking and high capital needs for the digital media companies. In may cases, the digital media company created the transaction service for their start-up client in exchange of stocks and thus obtained no real cash flow of the service building. These non-cash operations intensified capital burn-rates of the digital media companies and were bound to lead into financial challenges.

Digital transaction services can benefit both the manufacturers of goods and the consumers in multiple ways (see Table 3 on the next page). Manufacturer obtains value e.g. by lowering transaction costs, by streamlining its business processes and/or by optimising the inventory, production and delivery times of goods. Consumers benefit –

<sup>13</sup> comparable with direct sales, factory outlets and/or manufacturers own retail stores

<sup>14</sup> comparable with postal sales

ideally – by enhanced shopping experience, access to larger selections of items and/or improved and personalised service. Yet, the benefits can be substantial, they are still rarely met to full extent. The role of the digital media company in transaction service would be helping the manufacturer to realise as many of the listed benefits as possible.

**Table 3: Transaction service benefits**

Digital service benefit	Definition
<i>For the manufacturer/brand</i>	
Lower transaction costs	The digital service can significantly lower both <i>order-taking</i> costs up front and <i>customer service costs</i> after the sale by automating processes.
Larger purchases per transaction	In many digital transaction services, it is possible to create <i>automated recommendations</i> based on the purchase history of the buyers. In practice, this means that the digital service shows related items immediately at the consumers' purchase. This has been tested by several online services to lead to larger purchases (e.g. at <a href="http://www.amazon.com">www.amazon.com</a> )
Integration into the business cycle	A digital service well-integrated into the business cycle can offer customers more information than previously available. (e.g. Dell tracks each computer through the manufacturing and shipping process and thus customers can see exactly where their order is at any time.)
<i>For the consumer</i>	
People can shop in different ways.	Traditional mail order companies introduced the concept of shopping from home. E-commerce offers this same functionality, but also with some additional features: <ul style="list-style-type: none"> <li>• The ability to build an order over several days</li> <li>• The ability to configure products and see actual prices</li> <li>• The ability to easily build complicated custom orders</li> <li>• The ability to compare prices between multiple vendors easily</li> <li>• The ability to search large catalogues easily</li> </ul>
Larger catalogue	A company can build a catalogue on the digital service that would never fit in an ordinary mailbox. For example, Amazon sells 3,000,000 books for consumers, more than in any physical store globally.
Improved customer interactions	With automated tools it is possible to interact with a customer in richer ways at virtually no cost. E.g. the customer might get an email when the order is confirmed, when the order is shipped and after the order arrives.

Adapted from [www.howstuffworks.com](http://www.howstuffworks.com), 2003

Utilisation of the value-web descriptions The presented three value chains can be utilised in analysing the positions of different kind of companies within the digital media business. Companies' involvement within the value creation process shows also its critical partnerships to produce the preferred solutions. In addition, the value-web models illustrate the dynamics of this area of business. From international business perspective, the networks are more complex than they are in a single domestic market.

Thus, if utilising the presented value models for international activity analysis a particular company, special caution should be put to keeping the analysis understandable.

The value web approach was based on the Finnish sample of companies. Though the Finnish market has some special characteristics (e.g. strong telecommunications-dependence), the models can be seen to have value for further analysis also in analysing the situations and market dynamics of other geographical areas. The following chapter will present in more detail the situation and development of the Finnish digital media service markets. The case study will illustrate both rapid growth and development that occurred around this business area and will present first the development, current situation and key challenges in the Finnish digital media service sector. Secondly, a series of mini-cases is also presented. Finally, selected conclusions are extracted from the Finnish case to create a more general picture of the industry development.

### 3.3.3 Finnish digital solution industry history in brief

#### The pioneering years (end of 1980s – mid 1990s)

The Finnish digital media industry has its roots in the CD-ROM production and computer-based learning companies formed in late 1980s and early 1990s. One of the key centres of development was the Tampere University Hypermedia Laboratory (formed in 1992). Through quality training and piloting projects several industry pioneers became inspired to start their private enterprises to start operating in the emerging field of digital solution production, such as Tietovalta, Sansibar and Works. Other key centres that had a major impact to the early digital industry development in Finland were the University of Design and Arts/Helsinki and Helsinki University of Technology. Companies that emerged from this substance were e.g. *Everscreen MediaTeam* and *To The Point*. The business in the early years was characterised by non-stabilised technology, hobbyism, CD-ROM production, communications solutions and minor turnover and business impact of the production. For the analysis purposes it is important to understand *the many of these original pioneers are still actively participant in the industry* and carry potentially the broadest substance understanding of digital media interaction.

#### Hypergrowth and rapid internationalisation (1996 – 2000)

The dramatic change of the industry started by the need for the graphical online solutions – the Internet. For the pioneering companies the very limited transmission and storage as well as screen interaction capabilities did not attract the pioneering companies to rush into this new field. Yet, several newcomers entered the field of online communications in the period from 1994 to 1997. These included companies such as

*Mindworks, Nedecon, Netmill, Terranova, Interweb Design, Verkkojulkaisut and Key Partners*<sup>15</sup>. These companies had very ambitious business goals to start expanding their business and also initial considerations of the business impact of the e-business possibilities. Yet, the first company that took the full advantage of booming online business was *Interaktiivinen Satama* (later Satama Interactive). Satama Interactive was formed as a merger of the three small digital media agencies (incl. Interweb Design) and the digital media unit a Finnish media company, *Talentum*. Investments to the company by the key owners (Talentum and venture capitalist *CapMan*) were larger than to any professional business service start-up before in the Finnish economic history (~10 million euros). Satama set its targets very high – to obtain a leading international position in the digital service business and getting listed to a stock exchange as soon as possible. This establishment started a rapid boom of international expansion and was constantly linked to the rapid development of so-called “dotcom”-companies and “the internet bubble”. A more detailed description of selected case companies is presented in the end of this section.

Multiple Finnish digital media companies grew and expanded their customer portfolio. Their customers, Finnish corporations, all wanted to produce their own “internet pages” and the emergent service companies filled the gap. The markets were for a while suppliers’ – there existed a shortage of professionals being able to master the HTML-based<sup>3</sup> production as well as the possibilities and capabilities of the “new media”. Aggregate turnover of the companies grew 50-100%/year and strong optimism prevailed among the companies. In addition, venture a capital flood into industry and thus several international operations were started with both greenfield investments and international acquisitions. Several Finnish companies were also acquired for larger foreign service companies, such as *Icon Medialab (Works)*, *Razorfish (Spray Finland)* and *Adcore (Netmill)*.

In addition to digital solutions and dotcom-companies, the Finnish digital media boom was characterised by mobile solutions<sup>16</sup>. The success of *Nokia* attracted venture capital to several Finnish start-ups and the buzz around the “mobile revolution” overdid even the most optimistic digital solution providers. Expectations for rapid adaptation of mobile technology and m-commerce solutions lead investors to take large risks in their mobile technology investments. Yet, the telecom operators Europe-wide took the highest risks in their participation to the auctions for 3G-technology licences.

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<sup>15</sup> See [www.mindworks.fi](http://www.mindworks.fi), [www.verkkojulkaisut.fi](http://www.verkkojulkaisut.fi), and [www.keypartners.fi](http://www.keypartners.fi) (the other companies’ web sites do – unfortunately -no longer exist.)

<sup>16</sup> For a detailed analysis of the Finnish mobile development see e.g. Leppävuori, 2001, Stainbock 2001, Pelkonen & Dholokia, 2004



The crash and rationalisation efforts (mid 2000-2003) The Internet hype peaked in early 2000, when Internet business-related companies worldwide were valued in many cases to possess more assets than traditional giant such as airlines, media companies and manufacturing firms. In Finland, the high valuation was illustrated in practice when Satama Interactive listed in the Helsinki Stock Exchange in March 2000<sup>17</sup>. It was for a very short moment valued higher than e.g. the Finnish leading airline, *Finnair*. Moreover, in 2000 a Spanish mobile telecom operator, *Terra Mobile*, purchased a Finnish mobile start-up, *IoBox*, with close to 220 million euros.

Consequently, there was only one option to come – the financial bubble had to burst. The stock market crash started during summer 2000. Market values of ICT related companies dropped rapidly 70-90 % of their highest value. The trend was global and naturally affected the market valuations of the Finnish companies, too. Digital media companies built on risk-taking and growth-focused strategies had to rapidly start changing their focus into more cost-efficient operation modes. But the cautious customers of digital media companies created the real impact – business benefits were being sought, it was no longer “hip to be online”. The companies that were purely communications focused experienced a dramatic drop of nearly 60 % of their turnover due to this purchasing habit change.

The downward trend was intensified by the disappointing launch of interactive mobile services (WAP-services). Hence, the worsening situation led to major cuts in personnel and even dramatic bankruptcies of several key actors in the markets. For example, Razorfish Finland and Adcore Finland withdrew totally from their Finnish operations and the units filed bankruptcy in 2001.

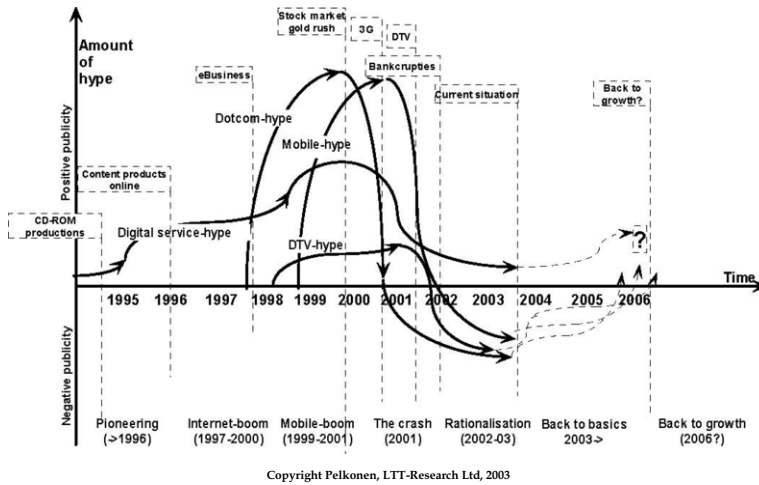
The development of the Finnish digital media sector is summarised in Figure 10. The figure is based on author’s qualitative estimates on the publicity and activities around certain technology and business phenomena. One additional dimension to the previously discussed topics is the digital television. This area barely reached the dimensions of the other hyped areas. It had a very unfortunate timing with its public launch (August 2001), the market being very pessimistic towards it. Lately, this area is about to gain back its momentum and might become one of the growth areas of the future. Several interesting Finnish service companies have emerged to offer solutions for this area (e.g. *Sofia Digital*, *Cardinal* and *Ortikon Interactive*<sup>18</sup>).

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<sup>17</sup> Satama’s market value March 21, 2000: ~660 million euros vs. Finnair’s June 30, 2000: ~385 million euros. Satama’s value in September 2003: ~29 million euros

<sup>18</sup> see [www.sofiadigital.fi](http://www.sofiadigital.fi), [www.cardinal.fi](http://www.cardinal.fi) and [www.ortikon.com](http://www.ortikon.com)

Figure 10: The development of Finnish digital media industry – Four hypes and the crash



Efficient and profitable future? Although, the markets are no longer in hypergrowth phase, it is important to notice that digital services have formed a sound position in the current business environment. Companies and consumers use them still on increasing pace and the technological adaptation and development of digital solutions are still at the early phases on development. The economic downturn was bound to happen as in any emerging industry. Based on the findings of the research effort carried out, the entrepreneurs of Finnish digital media industry are expecting a small positive change by 2005 and possible from there on a more steady growth. The following sub-chapter will focus on more detail in the current market situation.

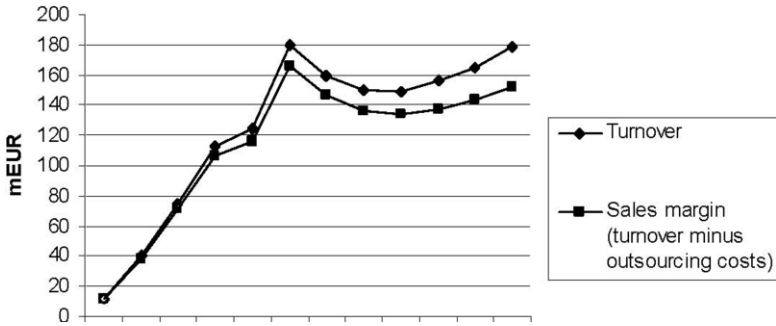
### Key figures and business areas

In 2002, the Finnish digital media industry employed approximately 2300 professionals in 280 companies. The amount of companies operating in the digital media industry increased rapidly throughout end of 1990s and peaked to nearly 350 active companies in 2001. The dramatic changes in the markets lead to a nearly 20-30 % drop in the industry personnel. Several companies merged and filed bankruptcy. Based on the research carried out in spring 2003, the Finnish companies are expecting a modest improvement for the situation in the next few years. Yet, this forecasted growth remains very marginal in comparison to the exponential development in the 1990s.

Similar development is also shown by the turnover and sales margin figures (see Figure 12 on the next page). Digital solution creation rose from scratch into over 180 million euro business in 2000. The crash led the turnover to drop to approximately 150

euros in 2002. Simultaneously, outsourcing has been on constant increase. This shows in the sales margin figures by growing portion of the turnover being generated by one digital media company billing another company in the same industry.

Figure 12: Finnish digital media industry turnover and sales margin



Key business areas: Digital media companies operate in three main business areas. In the 2003 survey, the finding of the spread of the companies' earnings models showed that quite few companies base their business purely on project deliveries only.

The *project business* is clearly supported by offering software products and/or content production for the customers. Smaller companies seem to even expand their offering outside digital tools, they design and implement nearly any kind of project that their customers ask them to deliver either or offline. Larger digital media companies have been better in making their offerings packaged and reusable in many customer projects. On the other hand, smaller companies seem to start to build their solutions for scratch instead of leveraging on their accumulated know-how.

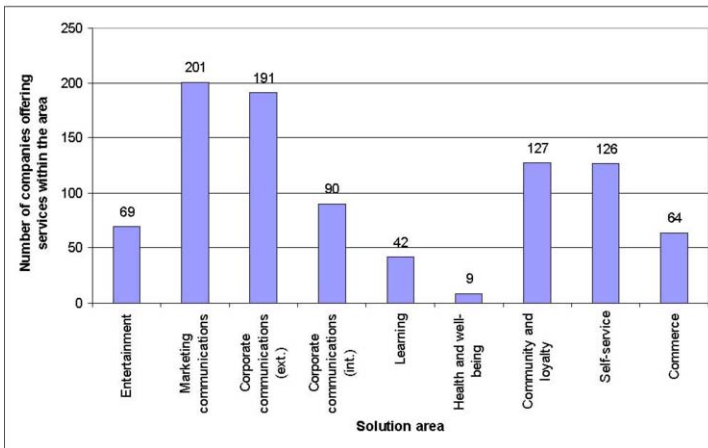
When analysing the Finnish digital media activities in more detail, both solution dimensions and media channels were analysed (Figure 14 and Figure 15 on the next page). In the early 1990s, the initial commercial digital solutions were mainly *communications business* driven, so it was little surprise that solutions related to this area are the most popular among the digital media companies. Quite a few companies offer *community and loyalty* and well as *self-service* solutions. The above mentioned three groups of solutions are mainly offered in online media.

In addition, selected marketing and promotion solutions are offered for the storage media and in so-called ambient media environments<sup>19</sup>. The most popular specialisation

<sup>19</sup> ambient media= digital media solutions that are integrated for places and locations, e.g. large interactive screens in shopping malls and public places; WLAN hot

area for Finnish digital media companies is various entertainment solutions, especially in the area of mobile and offline games. “The Nokia effect” has helped several small companies to access and serve operator customers with their specialised game development expertise. Furthermore, the success of the action game, Max Payne<sup>20</sup>, has opened the door for expansion of the Finnish console game industry<sup>21</sup>. Yet, these operations are closer to content creation business than professional service provision: the core focus of this analysis.

Figure 14: Solution areas of the Finnish digital media companies



Source: Pelkonen & al., 2003

The core of the digital media business is offering services that relate to the online media. Nearly 80 % of the Finnish companies offer online, one-third offer mobile media, one fourth storage media and 15 % broadcast media solutions. Several Finnish companies offer also print and audiovisual communication solutions. Figure 15 below presents the media offerings in more detail.

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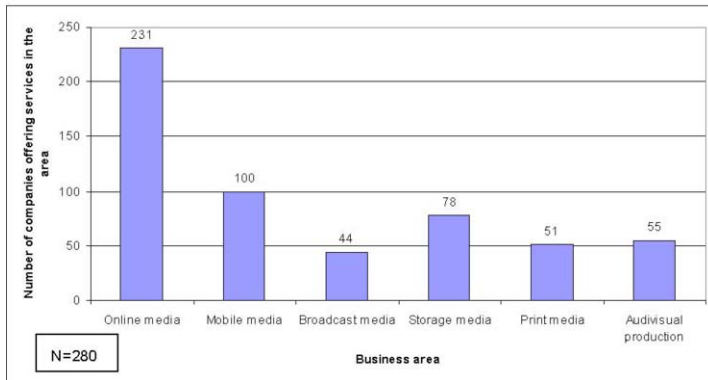
spots with presentation of the services available in the surroundings; mobile phone services with a location-based sensitivity for interaction with the

environment, e.g. in fairs and exhibitions. See e.g. [www.insideambient.com/what.htm](http://www.insideambient.com/what.htm) and [www.mindworks.fi](http://www.mindworks.fi)

<sup>20</sup> [www.maxpayne.com](http://www.maxpayne.com)

<sup>21</sup> See e.g. [www.hermia.fi/neogames](http://www.hermia.fi/neogames), [www.sumea.com](http://www.sumea.com), [www.mrgoodliving.fi](http://www.mrgoodliving.fi), and [www.wes.fi](http://www.wes.fi)

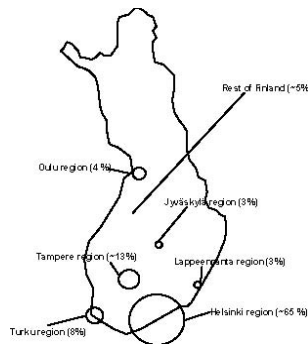
Figure 15: Media offerings of the Finnish digital media companies



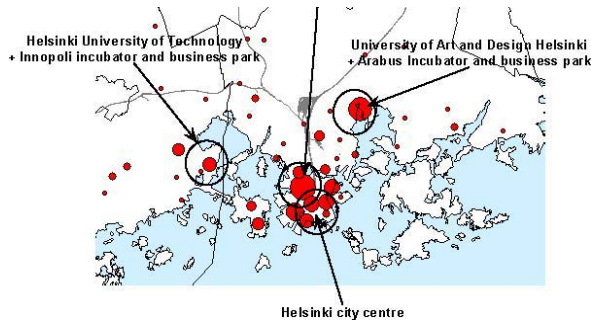
Source: Pelkonen & al., 2003

Key geographical areas: Geographically the Finnish digital media business is highly concentrated on the Helsinki metropolitan area and the regional centre cities. University location correlates also very highly with the location of digital media companies. Nearly 90 % of Finnish digital media companies stated that they operate in the Helsinki capital region and 65 % have a permanent presence in this area. The other key centres are Tampere, Turku and Oulu regions. When analysing the locations in more detail, the key factors for digital media companies’ location seem to have the following patterns. First, *city centres* attract companies, especially the locations with good traffic connections. Second, *university campus* areas offer fruitful locations for digital media companies. Finally, *incubator* activities have attracted multiple digital media companies, they actually seem to be the preferred location start-ups in the area. Figure 16 below presents the geographical distribution of the Finnish companies in more detail.

Figure 16. Geographical distribution of the Finnish digital media companies



Source: Helsinki School of Economics + New Business Center



Source: modified from Pelkonen & al., 2003

### Internationalisation challenges

In the end of 1990s, the Finnish digital media companies sought aggressively after international markets. Nearly half of the companies aimed to co-operate internationally in 1999. Since, only 10 % companies have been able to realise their plans – to have international offices, clients and customers. Many companies had to withdraw from international markets due to non-profitable operations and rapid capital consumption. Fast growth had its side effect – the internationalising companies could not keep up their operations in control and thus reach the set objectives. The digital media companies had versatile market strategies for internationalisation – with some companies targeting the US and the South-East Asian markets. Yet, most of the international activities were targeted to Scandinavia and West European markets, especially to the UK, Germany, the Netherlands. Some digital media companies have also started their operations in the geographically close emerging markets, such as Estonia and Russia.

Key operative mode for *outward* internationalisation of the Finnish digital media companies was in the end of 1990s international acquisitions and greenfield operations. Companies obtained risk capital and share capital by IPOs. The capital was invested into aggressive international growth – with little success. E.g. the leading Finnish digital media company, Satama Interactive spent nearly 10 million euros for its unsuccessful US operation and had to shut down their office only after less than 24 months of operations.

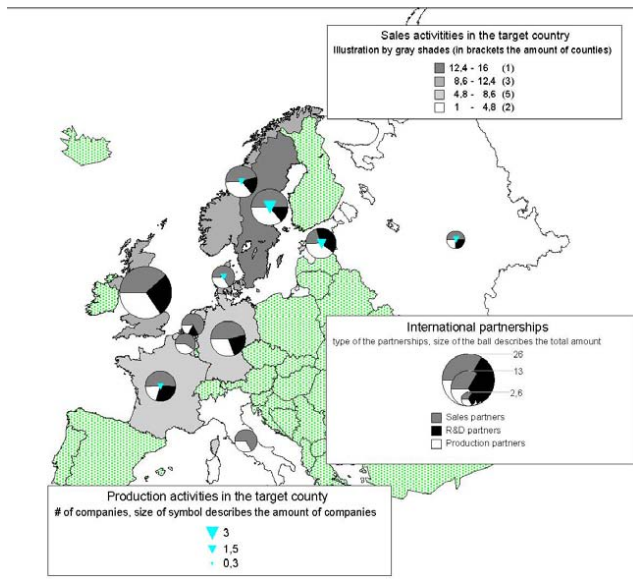
Internationalisation was occurred also in the *inward* direction i.e. international actors, such as Icon Medialab, Razorfish and Adcore, bought Finnish digital companies (see chapter 3.1). The mobile telecommunications substance as well as the Linux know-how attracted these internationals. Yet, none of the mentioned three subsidiaries exist longer – all three filed bankruptcy at the market crash 2001 and 2002 and lead nearly 350 industry professionals with no work. The dramatic turn from aggressive growth into cost cutting and efficiency seeking had a large impact to internationalisation potential of

the companies. Stock market valuations were marginal of their peak value – it was no longer possible to acquire international companies as easily as earlier.

One of the key challenges for the Finnish digital media companies was to *acquire, keep and grow international customer relationships*. Companies’ management time was focused mainly in creation of further growth – the day-to-day operational level issues were not carried out. This led to shortages in serving the customers. Finnish companies acquired from international markets were not integrated deeply and the Finnish management of the companies was in many cases not experienced enough in 1) *international operation management*, 2) *cross-national project management* and 3) *exporting service delivery from one country to another*. International knowledge management issues – transferring know-how from one country to another – also created additional challenges.

To sum up, the combination of substantial amount of *capital available* and the *managerial challenges* may be seen to be one of the key reasons behind the rapid international expansion that was followed by immediate withdrawal from international operations. Service companies currently planning of expanding their operations into international market should take the advantage of these learning from end of 1990s.

Figure 17: Internationalisation directions and operations of the Finnish digital media companies



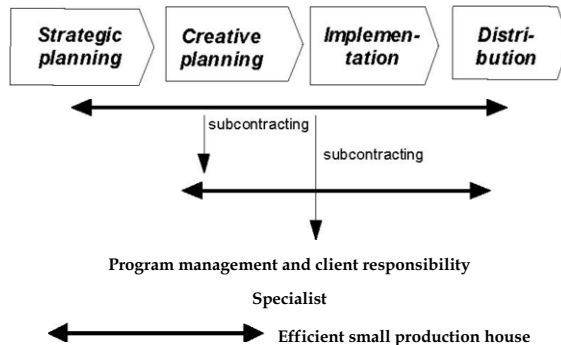
Source: Pelkonen & al., 2003

### 3.3.4 Current development challenges within Finnish digital media

#### Outsourcing of operations

Maister (1993) points out that a professional business service company can have three main competitive strategies: *excellency* (ability to solve very complex problem), *experience* (ability to provide tested solutions for varying needs) or *efficiency* (ability to provide the services in a more efficient manner than others). When looking at the Finnish sample of digital media companies, the companies creating digital solutions should carefully develop their offerings to match one these three roles, instead of trying to simultaneously cope with all the three areas. In the Finnish digital media markets the specialisation of the companies is constantly increasing. Digital media companies used to be offering and delivering nearly all the possible kind of services to their customers. Currently, more specialised agencies are emerging, e.g. to the areas of marketing communications, digital television and entertainment. In project deliveries it is also more common that companies leverage sub-contracting to a growing extent. Larger digital media companies take the total responsibility of a client project/program, but will not use their own resources (i.e. personnel) to create the services. Specialist companies are used to assist in certain areas as well as more efficient small companies.

Figure 18: Digital media specialisation and outsourcing



Source: Pelkonen & al., 2003

Currently the trend in outsourcing and sub-contracting seems to be seeking for international sub-contracting partners. Several Finnish IT-related companies are about to start outsourcing their basic programming and development work to either to the



Baltics, Russia or to India<sup>22</sup>. This development is also influencing the digital media industry. The price of labour is much less compared to Finnish standards. This basic labour transition process will with little doubt intensify with the expansion of the European Union. In addition, the emerging economies are offering aggressive tax benefits to companies, which start their operations in these countries. The Finnish electronics companies have already started to move their operations to the Baltics. Also advertising agencies have taken their initial steps in this area<sup>23</sup>.

No matter what the actual impact the international outsourcing has to the Finnish digital media industry is, it is clear that the Finnish companies have to find their competitive edges based on e.g. Maister's definitions. They have to focus on 1) being *excellent* in a selected solution or technology area, to make unique offerings and products; 2) leveraging their *experience* in solving customers' problems and expand this experience-driven business or 3) being *efficient* in offering in-house or outsourced/sub-contracted services to their customers. It is very rare that these three focus areas would exist within one organisation. Thus, it could be argued that Finnish digital media companies are currently faced with major a managerial challenge – where to focus and why?

Managerial challenges Digital media solutions are created by individual professionals each of which 1) possess special expertise required to complete to solution creation and 2) have to co-operate with each other to make the solution realise. As knowledge- and people-based service business *the key challenge area for a digital media company is management of its professionals*. Several scholars have investigated knowledge-intensive companies and multiple models exist on defining and understanding the challenges of knowledge creation, development and selling challenges. The challenges within digital media do not differ from any other professional service business.

Sveiby (1997) has created a model to illustrate the managerial challenges within professional organisations. He classifies the personnel in four classes: support staff professionals, managers and leaders by their managerial and professional expertise. Sveiby argues that only the people who are appreciated by both their professional and managerial skills can make professional organisations to work. Kuokkanen (2000) applied the model to the field of digital media industry and came up with a fifth category of personnel – administrative staff – the people who take care of e.g. personnel and competence development issues within the organisation. Kuokkanen also argued

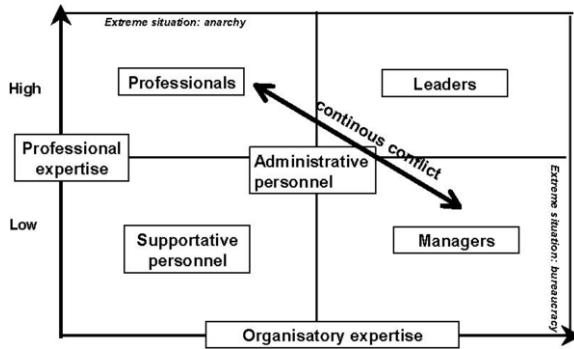
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<sup>22</sup> One leading Swedish digital media-originated service company, Mandator (formerly Cell Network) has already been operating in the Baltics since 2000. The operation has proven to be very successful. For more details, see [www.mandator.com](http://www.mandator.com).

<sup>23</sup> See e.g. Talouselämä, Sep 19, 2003: Cost of labour (average EUR/hour)Latvia: 2,42; Lithuania: 2,71; Estonia: 3.03; Hungary: 3,83; Poland: 4,48; Finland: 22,13 The Finnish ad agency Taivas opened their offices in Tallinn and Riga

that the core challenge for a digital media related company is to understand the differences between the five groups. Kuokkanen’s model (based on Sveiby, 1997) is presented in Figure 19 on the next page.

Figure 19: Professional organisation management challenges



Source: Kuokkanen, 2000, adapted from Sveiby, 1997

In the most recent study of the Finnish digital media industry, the managers of the companies acknowledged that *management is one of the key challenge areas for their company*. When asked, more than 40 % of the CEOs answering the survey agreed to this at least to some extent. This finding was in line also with the internationalisation challenges the companies faced - there were only few Finnish managers who had the capabilities to operate a professional service company abroad or to have substance of leading a chain of agencies operating in many geographical markets

Figure 20: Management as key challenge for Finnish digital media companies **STATEMENT: The key challenges in the digital media business relate to managerial models of the companies**

STATEMENT: The key challenges in the digital media business relate to managerial models of the companies			
	1.3%	1/75	Totally agree
	40.0%	30/75	Agree to some extent
	25.3%	19/75	Do not agree or disagree
	17.3%	13/75	Disagree to some extent
	12.0%	9/75	Totally disagree
	4.0%	3/75	Cannot say




Source: Pelkonen & al, 2003

The managerial challenges of the Finnish digital media companies were analysed also in more detail. Finnish digital media companies were asked to evaluate their

current competence needs, including also technology and design competencies (see Figure 21 on the next page)

The Finnish companies had the strongest need for client relationship management and project management professionals. This came out especially in the medium-sized (20-40 people companies). As technology dependent area of business, software programming substance was seen also of having need for additional personnel/competence. Furthermore, nearly 30% of the Finnish sample stated of having needs for corporate management and business development.

**Figure 21: Competence needs of the Finnish digital media companies**

<b>QUESTION: What kind of competence/personnel needs does your company have currently?</b>			
	46.2%	30/65	Client relationship management
	33.8%	22/65	Project and program management
	33.8%	22/65	Software and solution programming
	29.2%	19/65	Corporate management and business development
	26.2%	17/65	Concept design
	23.1%	15/65	Business consulting
	18.5%	12/65	Technology integration
	16.9%	11/65	Graphical design
	7.7%	5/65	Multimedia design

Source: Pelkonen & al, 2003

The findings are quite surprising in relation to the training and education targeted for digital media industry. Traditionally, the focus of nearly all digital media related training has been either in design or technology substance building. Yet, the *actual needs* in the companies operating in the markets seem *to relate much more to client and project work and business development issues*. Based on the Finnish experience, these findings indicate that there is a need to re-focus several training programs and include more business-driven themes and modules into them.

### 3.3.5 Governmental support activities in Finland

Within the last ten years, the Finnish government has supported the development of whole ICT-cluster in many ways. The basis for digital media related activities were created in the KAMU-program (National multimedia program) in mid 1990s. Within this TEKES program companies of all sizes learned about the possibilities of the digital technology and were able to create many initial products that had demand on the markets<sup>24</sup>. TEKES continued the R&D support with strong focus on mobile communications, user-centric design and internationalisation of the Finnish IT companies<sup>25</sup>. In addition to TEKES, also the Ministries of Education, Labour, Communication and Trade& Industry have been running their own support & development programs to help the feasible development of the ICT-area in Finland. The aggregate governmental expenditure to pure IT-related technology R&D initiatives has been nearly one billion euros during the time period of 1995-2002.

The Finnish government supports also start-up companies through their national business support and development network. The regional centres have created incubators around the leading training institutions as well as to other regionally attractive centres. This activity has also been supported strongly by the European Union Structural Funds. Yet, the key challenge for this kind of support operations has been the small of size of both regional and domestic markets. A Finnish digital media company seeking for growth will very rapidly have to expand its operations to foreign markets. In addition, placing a company in e.g. eastern Finland will not benefit the company of obtaining the leaning clients concentrated in the Helsinki region. Thus, the feasibility of these regional incubator activities to create sustainable business within digital media business can be questioned.

The Finnish government reacted rapidly to the industry-indicated need of trained professionals for the ICT-sector. Multiple training programs were started in late 1990s to educate both students and professionals more about the possibilities within the ICT-sector. As it takes quite a long time for students to graduate from e.g. universities, many of the programs lead un-graduated students to enter the industry. In addition, the degree programs produced substantial amount of labour to the markets after the crash in 2001. Hype and crash hit the educational institutions with short lags – suddenly there was as strong need for new knowledge and as suddenly this need disappeared. This was with no doubt not a “Finland only” –problem.

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<sup>24</sup> TEKES= National Technology Agency of Finland

<sup>25</sup> USIX. DMS and TLX

From digital media company's perspective, the Finnish government has improved its offerings towards the industry significantly. In mid-1990s there was only ad-hoc-based support modes companies focusing on digital media productions. Later, the increased national and regional importance of the area led to improved support programs and to more integrated offerings towards the industry. Entrepreneurs did no longer need to fill in separate forms of application for each governmental institution – the official parties increased their co-operation to facilitate the bureaucratic burden put to the companies in need for government support.

All in all, the Finnish government has been offering versatile support modes to the emerging digital media companies. The key challenge for the support activities has been to match the starting companies with their potential financiers, partners and especially clients. The Finnish export agency, Finpro has been helping the Finnish companies in this. Yet, the results have not always been too feasible. Though the back-office work has been carried out carefully and matches seemed to work in paper, the companies have not been able to realise too much business out of the internationalisation efforts. This may partly be due to the insufficient managerial skills (see chapter 3.3) or also due to not accessing the right business network nodes – the persons who hold the most significant market power. It seems that the matching work is one of the key areas also the Finnish government could put more effort into in helping the Finnish digital media cluster to gain additional competitiveness.

### **3.3.6 Mini-cases of the Finnish digital media companies**

This sub-chapter presents four mini-cases of the Finnish digital media sector. The presentation is based mostly on secondary data, but to some extent also the research effort carried by the author<sup>26</sup>. The purpose is to illustrate the development challenges of the digital professional service companies, not to present complete case analyses of the company and its historical development.

#### **Satama Interactive, [www.satama.com](http://www.satama.com)**

Background of the company: Satama Interactive was founded in autumn 1997 as a merger of the digital media of unit Talentum (a Finnish business magazine and newspaper publisher), Interweb (leading digital media company), Piipää and Ufolabs (small technology companies). Furthermore, Satama acquired the pioneering Finnish multimedia company, Sansibar. It obtained a substantial start-up finance from Talentum and risk capital from several investors. Satama grew very rapidly both domestically and to the international markets. Satama opened its first greenfield office in London, UK, and acquired five foreign companies (Stockholm, Amsterdam, Düsseldorf (2 companies) and in Dallas, USA). Satama

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<sup>26</sup> key information sources were [www.digitoday.fi](http://www.digitoday.fi), [www.itviikko.fi](http://www.itviikko.fi) and [www.tietoviikko.fi](http://www.tietoviikko.fi)

got listed the Helsinki Stock Exchange in March 2000 and was at peak valued higher than many traditional Finnish industrial giants. At peak Satama employed over 500 digital media professionals and planned of further expansion to other markets, though still operating at a large deficit. In addition, Satama had investments in a Hungarian sub-contractor and in two Finnish mobile technology companies. Restructuring activities Satama was not able to turn its international operations profitable within the planned schedule. Though the Finnish operation was profitable already in 2000, the internationalisation constantly diminished the company's capital base. Thus, it started withdrawing from international markets in spring 2001 with closing of the UK office and dramatic restructuring of the US operations. In autumn of 2001 Satama closed totally its US office and started codetermination negotiations at all of its offices, also in Finland. During winter 2002 Satama sold out its investments in Hungary and in the mobile technology companies. The restructuring of operations continued still in 2003 with withdrawal of both Swedish and German operations.

In 2003, Satama continues to operate in Finland and the Netherlands and has still a very strong financial position (~13 million euros in cash 9/2003, debt-equity-ratio of ~75 %). Satama's key client relationships with Nokia, TeliaSonera, Audi, S-Group, Suunto, Amer Group, Talentum, Sampo, ABN Amro, Pfizer, Vodafone and Finnish railroads have deepened and brought the group in total to black. The company has ~270 employees and a turnover of ~20 million euros. Satama has indicated of seeking for new growth opportunities and thus seems to have survived the crash of 2001. In 2002, Satama Interactive obtained also an ISO9001-certificate of its packaged delivery method – Satama Unified Process.

#### **Works Finland - Icon Medialab, [www.iconmedialab.com](http://www.iconmedialab.com)**

Background of the company: Works Finland was formed in 1995 by a Finnish digital media TV-persona to produce initial online services. At the birth of Satama Interactive in 1997, Works was one of the companies that was also planned to be merged to the emerging company. Yet, the company did not join the group and became acquired by a leading Swedish digital media group in end of 1997. The founder of the company became a member of the global management board of the company. Throughout 1997 to 2000, Icon Medialab acquired several international digital media related companies throughout the world (see the company website for details). At peak it employed nearly 1700 digital media professionals in Europe, Asia and the USA (19 countries) and the company turnover reached nearly 150 million euros. The Finnish operations employed nearly 100 professionals.

Restructuring activities: Icon Medialab started its re-structuring in end of 2000 and withdrew from many international operations. The company was losing most of the capital collected by its stock listing and financing rounds and kept on making profit due to re-structuring costs and diminishing turnovers. In end of 2001, Icon Medialab merged with a leading Dutch digital media company. Throughout the year of 2002, restructuring activities continued and in August the

Finnish subsidiary was decided to be discontinued and filed bankruptcy. Part of the times' 45 Finnish employees was hired by WM-Data - Swedish IT-system company.

In 2003, Icon Medialab continues its operations in Western Europe and USA. The company is still making major losses and is still heavily in debt (debt-equity-ratio of ~12 %). Yet, the company has successfully been able to serve its main clients such as Audi, Goodyear, Prada, KLM and MasterCard. The company has an annual turnover of ~ 50 million euros and employs ~550 industry professionals. The company is active in its merger activities and seeks for new partners and expansion in the international digital media markets. The Finnish founder of Works Finland is currently a CEO of Finnish city newspaper and operates also in the board of Satama Interactive.

### **Netmill - Adcore Finland**

Background of the company: Netmill Oy was formed in 1996 by three young business students to plan and design online services. The company focused strongly on LINUX-based technology and gained rapidly a reputation of using the open source technology for corporate solutions. The company grew rapidly and hired some ~40 professionals and a turnover of ~1 million euros in 1999. It took also its first step for international sub-contracting by having production partners in the Baltics and participation into several governmental internationalisation support programs. In 1999, Netmill was acquired by Swedish IT company Information Highway (IH) with 8,5 million euros. In early 2000, IH was rapidly acquired by another Swedish digital media company, Adcore. In the international group, the Finnish unit was operated to be Linux-knowledge centre. In 2000, Adcore grew very rapidly with additional international acquisitions from Japan, Germany and Switzerland. At peak in 2000, company hired ~ 2000 professionals in 12 countries and a turnover of nearly 60 million euros. Adcore Finland employed 100 professionals.

Restructuring activities: In 2001, the company had a deficit nearly equal to its turnover and had to take rapid activities to restructure its operations. As an outcome in May 2001, the Finnish entrepreneurs repurchased their old company and continued to operate under the original Netmill name. The cost structure of the company proved to be heavy for the entrepreneurs to bear and they had to file bankruptcy in August 2001. By end of year 2000, Adcore global withdrew from all its international operations. It focused purely on Swedish operations and had ~ 450 employees in spring 2002. In June 2002, the company brand name was discontinued and the digital media and IT operations divested into a new company called Connecta (one of the founding companies for Adcore). Adcore's real estate ownerships were put into a new company called Klövern.

In 2003, Connecta continues to operate in the IT consulting and digital media business. It employs ~350 professionals and operates mainly in Sweden and has a

turnover of ~40 million euros in 2002. The company creates service for e.g. Sony Ericsson, Ericsson, HP, SAS and Nordea. Netmill founders created two companies (Creanor and Movial). They operate currently in both software business and offering digital media services to their selected old Netmill customer.

**Nedecon – TerraNova – Endero, [www.endero.com](http://www.endero.com)**

Background of the company: In 1994, three business students created a company called Nececon (Network Development Consultants) to serve directly the Finnish top 100 companies in their online service building. The company evolved rapidly into a fast growing service and technology company. It was one of first companies in Finland to base its operation on packaged and standardised software solutions. In early 1998, Nedecon listed to the Helsinki Stock Exchange as the first Finnish digital media company. It acquired capital for its internationalisation and started operation in Brazil and South-East Asia. In 2000, Nedecon purchased two small Finnish consulting companies to support its operations and growth plans. At peak, Nedecon hired nearly 130 digital media professionals.

Terranova was one of the pioneering Finnish technology-oriented digital media companies formed in 1991. In 1997, the company started strong focusing in online solutions and acquisition of another Finnish digital media company, Lemon Interactive. TerraNova started its international operations with a German greenfield operation in late 1999. The company also opened an office in Sweden. At peak Terranova employed ~90 professionals, had a turnover of nearly 4 million euros and was making a small profit. In June 2000, the company changed its name to Endero. The same year, it acquired two mobile and online technology companies. In early 2001, Nedecon and Endero merged to create a listed company – Endero. The merger was backed strongly by the key investor in the both companies – Menire Oyj ([www.menire.fi](http://www.menire.fi)).

Restructuring activities: The merger process of the two companies did not work out as planned. The group kept on making a loss and strong restructuring actions had to be taken. Market development was very disappointing and nearly half of the personnel of the company was cut in late 2001. Furthermore, the business focus was changed for digital solution building into software development business. Endero withdrew all of its international operations and focused purely on Finnish operations. The remaining digital media experts in the group formed their own start-up company (Helsingin Sähköinen Toimisto).

In 2003, Endero continues to operate a software production company with ~30 employees and turnover of ~4 million euros in 2002. Nedecon founders left the company already in 2001 and operate in positions outside the digital media business. Endero founders and financiers remain still active. Helsingin Sähköinen Toimisto ([www.toimisto.biz](http://www.toimisto.biz)) continues to produce digital media solutions and co-operates closely with another Finnish digital media company Wysiwyg ([www.wysiwyg.fi](http://www.wysiwyg.fi)) backed also by the same investor Menire Oyj.



### 3.3.7 Learnings from the Finnish case

The development in the Finnish digital media markets is an illustrative example of events and challenges that occur in an industry under hypergrowth. The global economy was in the throughout the second half of 1990s in an very optimistic and rapid growth phase and one of the key sources for this growth was the digital media technology. The digital media agencies leveraged on the phenomenal boom and tried to grow more rapidly than their actual capabilities enabled them. Companies took risks and were surrounded by investors willing to share the risks with them. The Internet boom had occasionally similar characteristics to the Gold rush in the 19<sup>th</sup> century. There seemed to be no limits for expansion and access to stock-valuation -based richness.

Looking back now only few years after, one could argue that the crash was bound to happen and was obvious. Yet, in 1999 anything seemed to be possible for the industry actors - only few words of warning were expressed. As a key learning from this, *innovation is one thing - business success another*. A company is *always limited by its resource pool and current cash flow*. It is nearly impossible to expand and build sustainable operations based on purely high expectations and risk financing. As in the times of the gold rush, the only ones who got earned a lot were the property owners, advisors (such as consultants, lawyers, ad agencies etc) and some selected individuals who were able to sell their shares before the crash.

Finland, as mobile industry pioneer, has had and still has a special role in the global ICT-sector development. The flagship *Nokia* encouraged several companies to follow the path Nokia took for the international markets. Yet, only few companies have realised that Nokia, as more than 100 -years old company, has a long tradition in business and was nearly in bankruptcy by its earlier internationalisation efforts in the 1980s. Nokia learned from its experiences, took major risk in focusing nearly all its resources into GSM-based business and leveraged this to the maximum. This risk-taking has brought out the company to be one of the leading success stories of the 1990s. Time will show, will other Finnish ICT-companies also have similar deep pockets and the same patience Nokia had in their business development.

*Growth management* seemed to be one of the key problem areas for Finnish digital media companies. There was an immense rush to obtain all in once - get to the global markets as soon as possible. Based on the Finnish sample of digital media companies, it can be argued, that if the Finnish companies are able to take advantage of the harsh international operation experiences, many of the pitfalls can be avoided during the next economic upturn. A new generation of Finnish entrepreneurs learned the business realities and were able to operate with global actors that rarely had things to do in this peripheral Northern country. Many of the entrepreneurs are currently building up their second-round start-up companies and it will be interesting to see, will these companies become a group of truly

“born global” companies. In the next few years, an interesting dimension to the Finnish digital media industry development may arise from the south and east. The newcomers from Baltics and Russia, as well as Finnish companies’ operations in these countries, may bring up an interesting new business opportunity.

Finnish digital media companies had major managerial and personnel development challenges. Delivering *services* for the domestic markets is already demanding business, but *exporting* them from one country to another is even more challenging. People, i.e. company personnel, deliver the services, thus personnel management and knowledge creation, development and sharing principles should be at the core of any digital media company’s strategy. Yet, this was unfortunately very often forgotten, at least within the Finnish digital media landscape.

The governmental actions have an encouraging, but have only a limited impact to the development of the Finnish digital media industry. Market development and companies’ ability to create business and obtain partners has been more influential than the programs lead by the governmental organisations. Yet, the strong support possibilities and the positive signals government gives to the entrepreneurs have allowed several small start-ups to develop their business ideas in a fruitful environment. Within the ICT-business it seems, that a Finnish company will have to operate in the international markets to survive. The competition in these markets is much more hostile than it is in the domestic markets. Thus, the more fertile the Finnish government can create the domestic “soil”, the better the companies can access the international markets. This cultivation takes place in the form of e.g. education, taxation, business environment, R&D support and finance and/or focused development programs. Similar opportunities exist also in broader European context.

### 3.4 Conclusions and suggestions for further research

This paper presented a framework to analyse the digital media markets and value creation processes. In addition, it described a case study of the Finnish digital media market development from mid 1990s to the present. The conclusive section of the paper sums up the key findings and also presents selected ideas for further research.

#### 3.4.1 Conclusions

The paper presented the value-network-based models of the digital media industry. The value-based analysis is a descriptive method to analyse the linkages and market positions of different kind of companies. The findings of this paper indicate, that digital media companies will need to co-operate with multiple traditional business actors to provide their solutions for clients. The three business areas: marketing, service and transaction solutions are already existing business

areas. Digital environment is only one of those opportunities to implement these solutions. Network-analysis also revealed that the better a digital media company can partner within its value-creation network, the better it can serve its customers and their customers – the end-users of most of the digital solutions.

### **Digital media has stabilised its position as a professional service industry.**

Electronically provided services are an increasingly important part of any business activity. The importance of digital communication and transactions via digital devices and transmission networks is expected to grow steadily also in the future. Thus, there natural demand exists for digital media service companies. Regardless of economic up- or downturns, it is clear, that digitisation is here to stay and its application areas are bound to increase also in the future. In the long term, this development promises positive prospects for the dedicated digital media service companies. The expansion of digital solutions into areas such as event marketing, public places and mobile terminals will also expand the need for companies being able to provide services for these application areas.

The unrealistic expectations in the end of 1990s, especially in the area of online commerce, did little damage for the industry's creative core. The companies that have survived the crash seem to be in better positions than ever to implement the emerging opportunities for digital services and solutions. Fixed and wireless network, interface, back-office and production technologies used in the industry are maturing. Thus, the trend is more often in creation of standardised and usable solutions instead of pure technology building. For a digital media company focusing on delivering value-adding services with an end-user understanding, the opportunities seem to be the highest.

### **Hypergrowth is history**

In 2002, the total turnover of the Finnish companies specialized in digital media service provision was approx. 160 mEURO. Most of the companies were profitable. The Finnish industry turnover is expected to grow at 2-5 % / year up to 2006. Digital media has become similar to any other industry – there is no longer a “new” economy. Growth in the number of companies and personnel has stopped: This development is not a Finnish phenomenon. For example, Swedish digital media companies had to cut their operations very rapidly into nearly of the half compared with the peak in 2000.

The Finnish digital media industry employs currently ~2300 people in its 280 companies. There will be only 200-300 positions available during until year 2006. The industry has concentrated both regionally and by its turnover: A typical digital media company employs less than 10 persons. Yet, most of the industry turnover is created in the few largest companies. The Helsinki region represents by far the most important area for the companies as a location for operations, as well as, as its potential for customers. These trends seem also be more universal – the capital of a country attracts most of the creative power as well as most customers operate in

the metropolitan areas. In addition, the large customers prefer to operate with larger units. Thus, concentration to fewer and bigger unit is logical development.

### **Internationalisation continues via business networks**

After the rapid expansion in the end of 1990s, the current trend for digital media industry internationalisation (in Finland and abroad) is to carry out action with caution. Instead of opening new foreign offices, Finnish companies tend to seek for opportunities via cooperative modes – joining into emerging international service networks. All other similar professional service business areas, such as advertising, legal, auditing and consulting services, are dominated by few global chains of agencies and partnerships. In the long run, there is little rationale why this development would not happen also in the digital media business. Currently, the economic downturn prevents companies of aggressively seeking for this kind of expansion, but it is pretty clear that during the emerging upturn the situation will change.

Interesting dimension for the companies operating in the Northern Europe will come from the expansion of the European union. The challengers for the traditional well-fare economies come from the liberal economic policy-driven countries such as Estonia, Latvia and Lithuania. In addition, the central European countries are challenged by e.g. Hungarian, Polish and Czech companies. The emerging economies be in an influential position in for the development of the digital media industry. Indications exist already, that selected parts of the basic programming work is being transferred to sub-contractors in these counties. Time will show, how important this operation mode will become and how competitive will the digital media companies in these countries evolve.

### **Management of people and growth are the key challenges within digital media industry**

As knowledge-driven business, the key asset for digital media industry is personnel. Development of expertise should be one of the key internal processes within the companies willing to achieve and sustain a competitive advantage in this constantly evolving file of business. The personnel should be to personally learn and contribute to the organisational learning of the company. In addition, special caution should be put into management of operations. The digital media experts within the organisations expect their managers to create a fruitful environment for their work. The experts trust on a leader who is both in his/her professional and managerial skills skilled enough.

International service business sets up additional challenges for digital media companies' management. Professional services are offered locally, though the company operating them can be international. In creation of a new operation to another country, large amount of managerial effort must be put into management of this operation. Yet, this effort will always take time to bring in returns and carries always a risk of failure. Based on the Finnish case, the digital media

companies had very large problems of getting their international operations to function. It seems that there is still lot to explored in order to understand the total rationale behind the failures of the operations carried out in the turn of the century

Governments should focus more sharply their investments to education and R&D support. In Finland, there seems to be an overcapacity in digital media-related education. The Finnish education organizations have increased very rapidly their offerings of digital media related training during the last few years. In 2003/4, the main threat for the students is to obtain an education with very little actual value in the slumping job markets. The government should create mechanisms that allow reacting rapidly enough to industry and market changes. It is clear, that the demand for skilled labour will remain very modest within the field of digital media business also in the future. Educating more and more students in an increasing amount of institutions will not benefit anybody within the area. The ICT-cluster's golden years of hypergrowth are history – it is becoming an increasingly similar to any other clusters. Growth can be achieved, but only with hard work and patience.

Governments can act in an important role in creation of an environment in which innovation and creativity is nourished. This requires investments and commitment from both governmental and market actors. It is of marginal use to allocate public funding into projects that will be carried out with markets anyway. Furthermore, for longer term R&D effort is can become very fruitful to obtain support from governmental sources. In Finland, government's support for e.g. mobile communications technology has been in a very influential role for the emergence and growth of the business area in Finland. Yet, finding another "golden egg" for future growth, is maybe one of the key challenges both governments and ICT-companies face in the near future.

### 3.4.2 Further research themes

This paper only scratched the surface of the complexity of the digital media industry. There are multiple areas that require further exploration in this professional service area.

*The key challenge in all of the analyses related to this field is creation of reliable forecasts of the industry development.* Multiple scenarios will be needed to be prepared to the dynamic change that still occurs in this area. Forecast carried out in end of 1990s did not realise as they should. Thus, the key question in the further research should be that how to learn from the experiences of the non-fulfilling forecasts. The additional areas that were identified to require further exploration include e.g.: Client relationships, digital tools and their impact to relationship development

A digital media company is constantly developing its relationships with its clients. These relationships are in critical role for the companies' long-term success.

The customer relationship management is a well-explored research area. Yet, the digital media companies' customer relationships' development from e.g. a small initial web-site project vendor into a full-scale service solution provider for the same customer, has not been evaluated. The digital media company has – at best – been able to use digital tools, such as extranets, to speed up the information exchange between their own and customer representatives. Analysis of this leverage could bring additional value to the research area of customer relationships.

### **Production processes and their impact to business success**

Some digital media companies have been very successful in standardising the ways they deliver digital media solutions to their customers. The standardisation has been based on common software products, components and documentation principles as well as well planned and deployed working methods. The digital media production has proceeded long from the “hobby-like” production of the early multimedia companies. Yet, some companies still seem to have major problems of keeping their deadlines and services quality in an appropriate level. Deeper analysis of the production processes might help to find answers to why some digital media companies are more efficient and cost-sensitive than their competitors.

### **Internationalisation and its success and failure stories**

There are only a few business areas where such dramatic changes have occurred as in the field of international digital media solution provision. International expansion was very rapid, but so was also the withdrawal from these operations. Digital media companies competed in the speed of opening new international offices and acquiring new companies to their groups. And only few months later, the same companies were struggling with their survival. This development requires further analysis.

### **Comparative study between different countries' development**

Though digital media and the spreading of Internet services has been a truly global phenomenon, each geographical market have their special characteristics. These originate from the economic structure of each country and region. The Finnish markets were characterised by the strong dependence to the mobile telecommunications. Other markets carry out their own special features. A study comparing the development trends and linkages between different markets could create additional knowledge.

### **Educational needs and their impact to the digital media industry**

Educational and governmental organisations have invested strongly to the ICT-related education, training and R&D. Yet, only few studies exist in analysing the actual returns on these investments. Digital media companies have; for sure; constant needs to develop their competencies. Yet, it is unclear how well the

training that the educational institutions provide match the needs the companies have. A study analysis these relationships could bring interesting additional understanding to discussion.

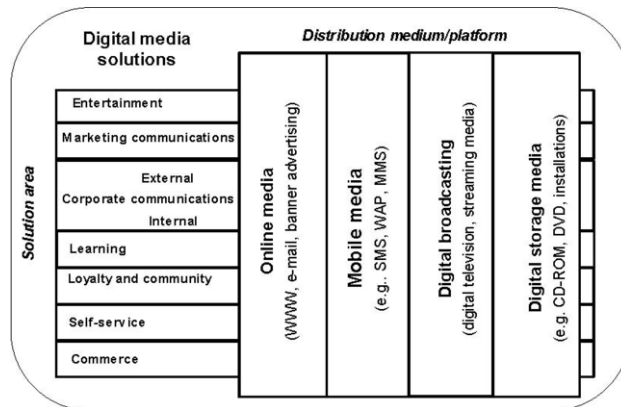
### Financial analysis of the digital media industry earnings and cost structures

At the peak of hype, digital media companies obtained massive amounts of financial capital for risk investors. The capital was spent very rapidly into international expansion, brand building, personnel recruitments etc. Yet, little attention was put on the profitability of operations. Interesting dimension to digital media business analysis could be brought in analysing the companies' finances in very detail. The focus of this analysis should be in identification of the cost items and factors influencing the profitability of a digital media company

## 3.5 Appendix 1: Digital media solution areas

This appendix presents in more detail the digital media solution areas used to illustrate the activities digital media companies perform. In this analysis, the digital media activity area was illustrated with the figure below.

Figure 22: Digital media activity area



**Entertainment solutions:** these services target to provide the feeling of enjoyment, entertainment and fun to their users. Very often the entertainment solutions should be analysed rather as content products, not as services. *Examples:* games, music, videos. *Key focus area:* FUN

**Marketing communications solutions:** these services target to strengthen the brand recognition and experience among their consumers. When linked to traditional marketing campaigns they provide additional information of the products, brand and the manufactures. *Examples:* online campaign site, e-mail marketing campaign. *Key focus area:* MARKETING

**Corporate communications solutions:** these services target to provide rather objective information of the service providers. The area can be divided into two segments: external and internal communications. *Examples:* financial information service, company intranet. *Key focus area:* INFORMATION

**Learning solutions:** these services facilitate the training, learning and teaching processes of their providers and end-users. The objective of a learning solution can be e.g. to communicate a totally new

topic to the personnel of the company and test the level knowledge status after the communication. *Examples:* online learning environments; simulation software for machinery and airplanes. *Key focus area:* LEARNING

**Loyalty and community solutions:** these solutions strengthen the stickiness of the owners of a product for the manufacturer. The owners can be guided to communicate with each other or with the manufacturer. In addition, the product experience and offering can be expanded with the online offering for the product. *Examples:* loyal customer clubs; registration-based online communities. *Key focus area:* CUSTOMER LOYALTY

**Self-service solutions:** these solutions aim to guide the consumers/end-users to help themselves. The solutions target to provide solvers and answers to the most typical questions related to the products. *Examples:* downloading software updates; support areas, online tutorials. *Key focus area:* SUPPORT

**Commerce solutions:** these solutions aim to function as a sales channel of products/services to the end-users. The transaction is performed within the solution and the good is transmitted at the exchange of the ownership of the good. *Examples:* online shops, business-to-business exchanges. *Key focus area:* SALES

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## **4 Patterns of ICT diffusion in Finland in 1996 – 2002**

### *Juha Nurmela, Timo Sirkiä, Finland*

#### **4.1 Abstract**

Statistics Finland has monitored the diffusion of new information and communications technologies in Finland by means of interview surveys since 1996. The first two major waves of home visit interviews were carried out in 1996 and 1999. A dataset of almost the same size was collected in autumn 2002. In November 2000 we conducted the first survey into online shopping, which has been repeated at six-month intervals. Statistics Finland has also compiled three major reviews on the development of the information society under the heading 'On the Road to the Finnish Information Society'. Statistics Finland collects data on the use of ICTs in the business sector as well and publishes all basic data of the information society on its website ( [http://www.stat.fi/tk/yr/tietoyhteiskunta/index\\_en.html](http://www.stat.fi/tk/yr/tietoyhteiskunta/index_en.html) ).

This paper draws upon the sources and documents mentioned above, along with some basic statistics in spring 2003. It is intended first and foremost as a kind of interim review on how far and how fast we have advanced in Finland in the use of information and communications technologies. The main focus of the analysis is on private households and citizens.

#### **4.2 Background and objectives**

The objectives of the paper may be summarised as follows:

1. Finland in an international information society comparison: The purpose is to see where Finland stands in an international comparison of the frequency of ICT use. The relevance and reliability of international comparisons are also briefly discussed.

2. The diffusion of information and communications technologies in Finnish households: A further concern is to describe how the use of mobile phones, PCs and the Internet increased from 1996 through to spring 2002 in different kinds of households. In one and two person households the examination is based on the age of the head of the household, in family households on the age of children. We shall look at the reasons why households without Internet access in spring 2002 have decided not to get the necessary hardware and go online.

3. Uses of information and communications technologies: The next step is to see how Finnish people used information and communications technologies in spring 2002 and to monitor the growing use of those technologies. The background variables in this analysis are gender, age and region. We study also the growing

use of ICTs in different year of birth cohorts for mobile phones, PCs and the Internet.

4. Diversification and marginalisation: One of the key questions addressed is whether the use of information and communications technologies is becoming more diversified, more specifically whether the use of commercial services is increasing during this period that has seen the fastest growth and development of the information society so far.

The frame of reference for these analyses is provided by the innovation diffusion theory and the so-called trickle down phenomenon, i.e. the spread of new innovations across different population groups. Furthermore, we want to find out whether the changes have given rise to marginalisation. It is highly questionable automatically to interpret the non-use of certain information or communications media as a sign of marginalisation. From what are people here being marginalised? From basic necessities of everyday life?

### **4.3 Finland in a comparison with other information societies**

In this section our aim is to see how Finland compares with other information societies. But let us make at first a few comments about international comparisons. They would be much easier to accomplish if they can use harmonised concepts and research designs: in the statistical world several organisations are now working to promote this goal, including the UN, the OECD and Eurostat. It is very rarely that statistical inquiries addressing national needs are directly comparable to those conducted in other countries, in spite of their apparent similarities. Many commercial research organisations also use the same concepts to collect information in different countries, but serious question marks hang over the comparability of this information with official sources.

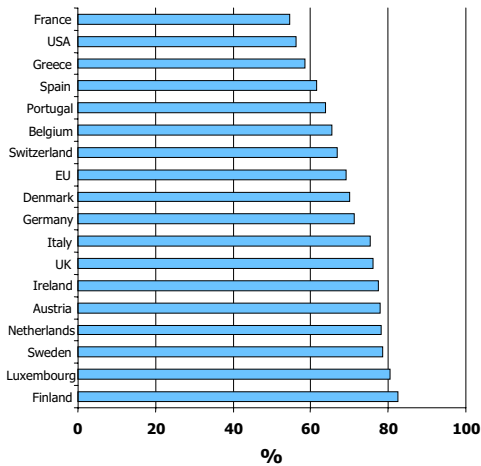
For example Finland was regarded as some kind of ICT wonderland with high mobile phone and Internet penetration rates. To an extent this was perhaps quite true, but the statistics available at the time also lent themselves to biased interpretations. The most widespread of the false images suggested that the number of Internet connections in Finland or USA is extraordinarily high. Indeed when we look at the per capita number of PCs connected to the Internet, this figure is still higher than in other countries in the world – but this says nothing about the actual use of the Internet because the statistics are based upon registered IP addresses. This indicator does not provide a true reflection of the extent of Internet access.

Similar problems are encountered in comparisons of the penetration of telephones. For fixed lines the accuracy of the figures collected is reasonably good, but statistics on the number of mobile phones are unfortunately not entirely accurate, at least in all countries. In particular, statistics on prepaid subscriptions

may include ‘dead subscriptions’ as users switch to a different operator. In Finland prepaid subscriptions account for only a minor proportion of all mobile phone subscriptions, but for instance in Denmark they represent more than 30 per cent of the total.

Surveys conducted in different countries are aimed at different target groups, and the age of the respondents may vary from children over three or over 15 to people aged 64 or 74; sometimes there are no age limits at all. In addition, the surveys may be concerned with consumer behaviour during periods extending from two weeks to three months or the past calendar year or the last 12 months. Sometimes data are collected for an average month or ‘recently’ or ‘in general’.

In some cases the results reported are based on inquiries among individuals, in others among households. Since the size and structure of households vary widely from country to country, the results of both individual and household surveys may obviously vary quite considerably. It is an entirely different matter whether 50 per cent of households have access to the Internet or whether 50 per cent of persons aged 15-74 have Internet access from home. Some surveys are concerned with the use of the Internet from home, others are interested in all uses, including from school, the workplace or a public library.



**Figure 1: Percentage of population aged 15 or over who had a mobile phone in their own use in EU countries and the United States in spring 2002 (SIBIS survey)**

Comparability is also reduced by differences in methods of data collection: it is important to exercise caution in comparing the results from postal questionnaires, home visit interviews or telephone interviews. Furthermore, it should also be possible to weigh the impacts of the sampling method used. It is problematic to

compare the results based on representative samples drawn from population registers with those based upon quota sampling.

#### **4.4 Use of mobile phones in the international perspective**

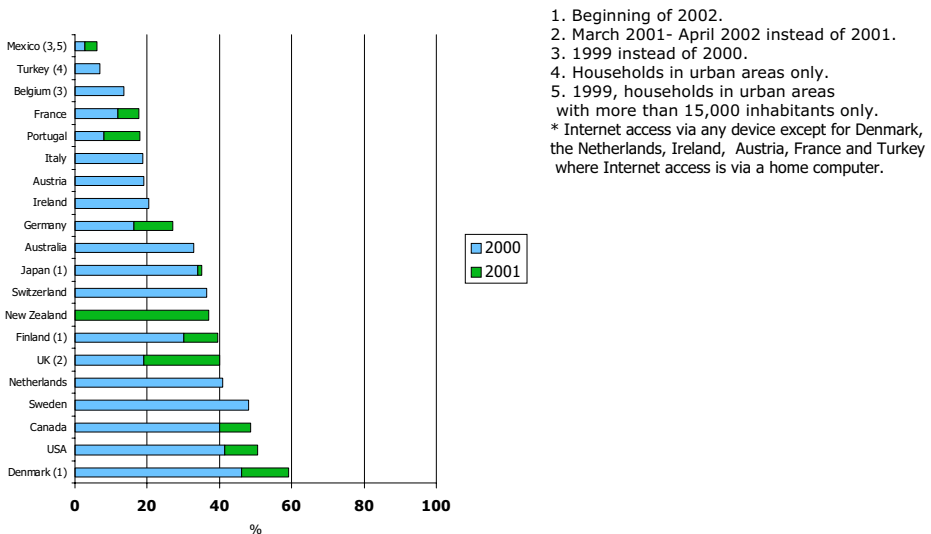
National statistical offices have not collected very much data on mobile phones; for some reason they have not been included among the EU benchmarking.

Indicators: Data on mobile phone subscriptions can be obtained from operators, but there are problems with reliability. The only way to obtain data on the use of mobile phones is through interview surveys. According to figures collected in spring 2002 (SIBIS 2002. General Population Survey <http://www.sibis-eu.org/sibis/>), 70 per cent of all persons aged 15 or over in the EU countries had a mobile phone in their own personal use. In this comparison Europe is way ahead of the United States. The penetration of mobile phones in Europe is highest in Finland. By contrast Italy, for instance, remains around the average, even though the statistics on the number of subscriptions indicated (falsely) that it ranked very high. In Fig.1 the number of mobile phone users in Finland comes quite close to the figures reported on the basis of the consumer survey at about the same time in the population aged 15-74 (86 %).

The cost of mobile phone calls to private households in Finland is among the lowest in the OECD countries. Measured on the basis of a price basket containing the same GSM services, Finnish households paid in February 2002 a total of USD 152 for their mobile phone services, while in Sweden the household costs for the same services were USD 206, in Japan USD 347 and in the United States USD 415-479. The highest costs were recorded in France at USD 683. The average for all OECD countries was USD 351 (Telecommunications Statistics 2002). So according to the Fig.1 the cost of mobile phone calls seems to have clear effect the penetration rate of mobile phones.

### 4.5 Penetration of the Internet in private households

In many countries the majority of households have a PC, yet there are only a handful of countries where even half of all households have access to the Internet from home (Fig. 2). In some countries the number of Internet connections has been growing very rapidly, but in Finland there was only slow growth since 2001. The highest figure was recorded for Denmark, but even there the figure was below 60 per cent. The United States and Canada lag some ten percentage points behind Denmark. Finland ranks in the middle, just ahead of New Zealand and Switzerland. In the United States and Canada only one in ten PCs in private households are not connected to the Internet.



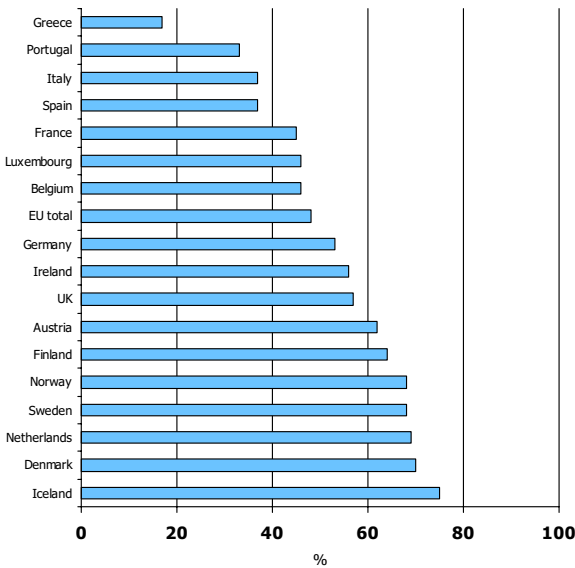
**Figure 2: Households with access to the Internet as a percentage of all households in selected countries in 2000 or 2001**

In Finland the corresponding proportion is one in four, in Germany one in two and in Belgium two in three. It seems that household size has a bearing on having a PC at home in different parts of the industrialised world. In the United States 30 per cent of one person households had a PC at home in 2000, while in 2-4 person households the figure was 58 per cent and in 5+ person households 63 per cent. (U.S.Census Bureau <http://www.census.gov/population/pop-profile/2000/chap10.pdf> ) The figures for France and Finland reveal a similar pattern: the bigger the household, the more likely it is they have a PC in the home. The result is the same when we look at households with and without children. In all countries a PC and an Internet connection are more common in households that have children than they are in those where there are no children.



## 4.6 Internet use

Data on Internet use in the population aged 15 or over were collected in December 2001 in the so-called Flash Eurobarometer, an instrument used by the European Commission for its instant research needs. In this case the target population was asked whether they use the Internet, anywhere and generally speaking, without any specific time frame. About 48 per cent of the EU population aged 15 or over said they used the Internet. Nordic EU Member States as well as Iceland and Norway recorded figures clearly above the EU average, while the figures for southern Member States remained below the average. The figure for Finland, about 64 per cent, is at more or less the same level as indicated by the data collected by Statistics Finland in November 2001, according to which 59 per cent of the population aged 15–74 had used the Internet during the past three months. Irrespective of who has commissioned or conducted the survey, and irrespective of the age groups or time frames use, Finland invariably ranks among the countries with the highest Internet usage figures.



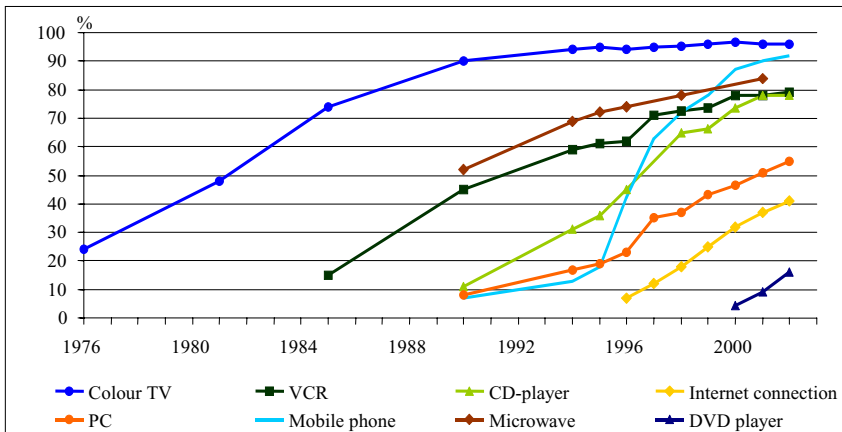
**Figure 3. Internet users in EU countries as a percentage of the EU population aged 15 or over in autumn 2001 according to the Flash Eurobarometer**

## 4.7 The increasing use of information and communications technologies in households in Finland

This part describes the use of information and communications technologies in different kinds of households in Finland. We begin by looking at ICT penetration

rates in comparison with certain other domestic appliances. We then move on to describe the diffusion of mobile phones, PCs and the Internet in different kinds of households. The third section is concerned with the reasons that are thought to explain why households have not taken out an Internet subscription. The last section makes regional comparisons.

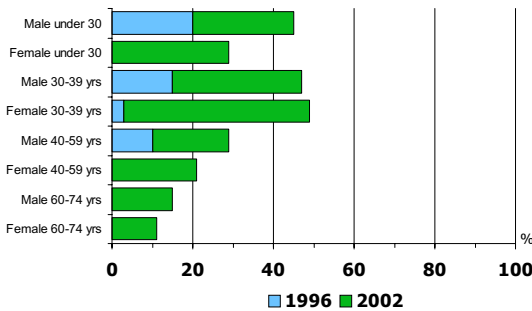
Fig. 4 illustrates the long-term trends in ICT use and comparing these figures with those for other traditional household appliances. Fig.4 shows that the increase in the number of home PCs and Internet connections has not accelerated to any significant extent, although the proportion of home PCs with Internet access is growing somewhat faster than the total number of home PCs. As far as mobile phones are concerned it seems that the trend of is fully unique and saturation point has more or less been reached. Less than 10 per cent of all households have decided to make do without a mobile phone. Today virtually every household in the country has some telephone. It is noteworthy that more than 30 per cent of households only have a mobile phone.



**Figure 4. The penetration of certain household appliances until August 2002, per cent (at least one appliance)**

It is worth noting that the changes differ by household size and by different stages of the household life cycle. In all size categories the proportion of households that have acquired a PC and Internet connection has increased, but in most cases the growth rate has clearly slowed down recently. In 2002 the share of two person households that acquired a PC and Internet connection grew somewhat faster than for other households. The differences between family households of different sizes are less pronounced than previously: even in three person households the standard of equipment is approximating the level of larger households. This is explained not only by purchases of new equipment, but also by children leaving many households that formerly had four or five members. When the last child moves out, we get a new two person household with or without a PC.

From the outset one of the underlying assumptions of our research project on ‘The Finns and the future information society’ has been that the stage in the household’s life-cycle has a major impact on its adoption of information and communications technologies. Let us begin from one person households, who it has been feared are at serious risk of being marginalised from the information society. There have been two outstanding trends in development in the diffusion of PCs from the autumn of 1996. First of all women aged under 40 and living alone have purchased large numbers of home PCs; the difference compared to men remains significant only in the youngest and oldest age group. It seems that age is still a factor in the acquisition of home PCs, but its influence has shifted to older age groups. However even people living alone in the age bracket 60 or over have purchased quite a lot of PCs.



**Figure 5. One person households with Internet access at home, per cent by type of household and gender in autumn 1996 and spring 2002**

Internet access from home is regarded as one of the most important indicators of information society development. In this regard together with the penetration of home PC, produce some quite interesting findings. First of all in spring 2002 the number of PCs connected to the Internet was not highest of all in households of young men, while in 1996 they recorded by far the highest frequency of connections. Even women aged 30-39 and living alone had access to the Internet more often than men under 30 (Fig. 5). All in all the increase in Internet connections was faster among female than male households. These results draw our attention the motives for taking out an Internet subscription.

The results of earlier research that two person households differ markedly from one person households in terms of ICT equipment they own. They are beginning to approximate the standard of equipment seen in family households. The youngest couples do not have the largest number of Internet connections among couples. The number of Internet connections in two person households was around 10 percentage points higher than in one person households. In single-parent households Internet penetration is only slightly lower than in two person households in the age bracket under 50, but is clearly lower in family households.

Our comparison of households of different sizes and at different stages of the family life-cycle has shown that PC ownership and Internet access has grown most particularly among women. It seems that right now, men and younger consumers are in fact less interested in getting online than middle-aged women. The differences between family households remain minor. Looking at how the number of households that have purchased a PC and subscribed to the Internet has increased over the past six years, there are good grounds to argue that the concerns voiced about digital marginalisation are probably unfounded, at least as far as hardware access is concerned.

#### **4.8 Why have households not gone online**

The interview survey in spring 2002 also wanted to find out why those households that did not have Internet access had decided not to go online. The majority of the small households in this category did not even have a PC. In family households a considerable number did have a PC but not Internet access.

The perception of the Internet as not interesting or not useful also significantly affected the motivation to get Internet access in many households. That was stated by every fifth under 30-year-old without a home Internet connection and by one half of 60 to 74-year-olds. It seems that this was a major decision factor especially in small middle-aged and elderly households. Among young people who lived alone access to the Internet somewhere else was a major factor in the decision not to take out a subscription at home. This was also a consideration in many family households. High costs were a major decision factor only among young people living alone, although it also figured to some extent in the decisions of young couples and families with children. Setting up an Internet connection was not in itself considered difficult, although a small number of respondents in the oldest age group did refer to this as an obstacle.

#### **4.9 Regional differences**

We conclude this section on household ICT equipment with an examination of regional differences in the late 1990s. The regional differences have narrowed down. In households with at least three persons, there are hardly any differences at all in the use of mobile phone. In one and two person households the diffusion of mobile phones has continued at the same rate in all regions. Given that even in the most remote areas as many as 80 per cent of all households have a mobile phone, there certainly are no grounds to talk about marginalisation. There are, by contrast, marked regional differences in the penetration of PCs and the Internet, although these differences are no doubt largely attributable to the high average age of small households in remote regions and to their lower income level. As we have shown earlier, elderly one and two person households had a PC and Internet access much

less often than younger households. Viewed from the opposite angle, this means that in the metropolitan Helsinki region there are in relative terms more small households of younger people. When we further take into account the income differentials between different regions, it should be clear that the notion of 'resistance to information society' hardly goes very far towards explaining the regional differences in the penetration of PCs and the Internet. Nonetheless there is cause for at least some concern about the development in remote regions. Community centres where even older people can come and try out the services offered by the Internet are needed in these regions.

#### **4.10 The use of ICT innovations in Finland**

This chapter describes the infiltration of new hardware and new services into Finnish people's everyday life. To what extent have various ICT innovations made their breakthrough in Finland, to what extent are they now in regular everyday use? We begin with an overview of the past trends in development from 1996 through to 2002, and then move on to look at the extent to which the services are used today.

We start out at the individual level from the diffusion of mobile phones: the measure we use is that the respondent has a mobile phone in his or her own use. First, though, a few words on the method of analysis, i.e. year of birth cohorts. Fig. 8 and fig. 9 shows how many people in the birth cohorts concerned had a mobile phone in their own use in autumn 1996 and 1999 and in spring 2002. In other words, these are not the same people that were covered in the panel survey, but we have formed year of birth groups from the samples of each survey. The rationale behind this is the notion that people born in certain years face the changes and institutions of society at the same time, and largely in similar life situations. Secondly, this analysis provides added depth to our examination of innovation diffusion as it allows us to see how the adoption of the innovation progresses from the pioneering group (people born within a certain period) towards groups born earlier or later. The period of analysis that spans more than five years provides an excellent opportunity to monitor all the stages in the diffusion of the mobile phone innovation from the early years through to the point of saturation.

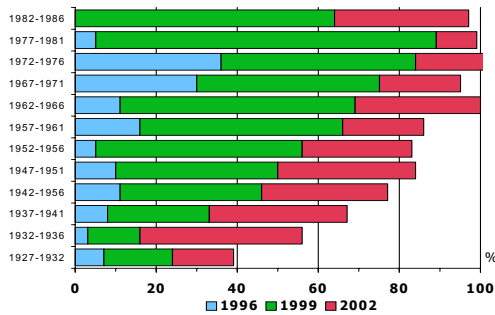


Figure 8. Men with a mobile phone in their own use in 1996, 1999 and 2002, per cent of year of birth cohort

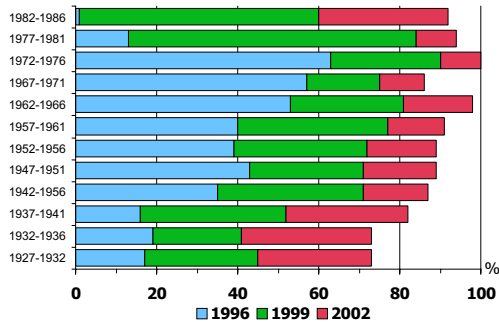


Figure 9. Women with a mobile phone in their own use in 1996, 1999 and 2002, per cent of year of birth cohort

In 1996 men in all age groups had a mobile phone in their own use much more often than women. People born in 1972-1976 were early adopters at the age of 20 to 24 years. Among men, over half had a mobile phone even in the two older five-year age groups. Among women the only groups where significant numbers had mobile phones of their own were those born in 1967-1976. At the time they were aged 20-29 years. By 1999 the number of mobile phones had increased dramatically. In the age groups born in 1967-1986, women had by now at least as many mobile phones as men. One particularly interesting observation is that over 80 per cent of women born in 1977-1981 had bought a mobile phone for their own use during these three years. Even among men over 70 per cent in this age group got their own mobile phone during this same period. In 1999 ownership of mobile phones among women decreased steadily with advancing age, whereas among men there were marked differences between those born in 1962-1966 and those born in 1937-1941. These differences were visible even in 1996.

In 2002 almost all men and women in the five youngest year of birth cohorts had mobile phones in their own use. It remains unclear why a smaller proportion of those born in 1967-1971 (and this applies to men in particular) than in the age cohorts on either side had got themselves a mobile phone by 2002, even though this group was in the vanguard of the mobile phone boom in 1996. In 2002 it seems that people born in 1942-1961 still have the same reasons and arguments for getting themselves a mobile phone as earlier. This means that the number of principal users is somewhat smaller than in younger age groups. In the oldest age groups ownership of a mobile phone was still higher among men than women. Given that the proportion of principal users of mobile phones has continued to show strong growth in older age groups from 1999 to 2002, it is safe to presume that the number of users will continue to grow in the future, reaching the 80 per cent mark possibly with the exception of women born before 1927.

Internet use has grown almost as rapidly fast as the use of mobile phones. In particular, the number of women Internet users has shown quite phenomenal growth. Although part of this is no doubt explained by use at work, women's increased interest in home use is certainly a major factor here. In the youngest year of birth cohorts virtually all people used the Internet. As in other aspects of technology, men born before 1942 were clearly more active than women in terms of Internet use. In all other age groups women showed the same level of interest as men.

#### **4.11 Mobiles phones services and the Internet in Finland in 2002**

In this chapter our concern is with the increasing everyday use of mobile phones and PCs. For the purposes of this analysis which again sheds further light on the diffusion of these ICT innovations, we use our data on how often people in different five-year age groups use services available through mobile phones and the Internet in different areas. As we have already established that people in Finland have adopted these new communication media very rapidly and that the use of Internet services has also shown strong growth, the focus in this section is on how so-called added value services. This is interesting both from the point of view of consumption research and from the point of view of the opportunities offered by the contents markets.

Our background variables in this analysis are gender, age group and region. Since we know on the basis of earlier research that age has by far the greatest impact on the use of information and communications technologies, we will here be using the most accurate age classifications available. According to the innovation diffusion theory there may be considerable regional differences in the adoption of new innovations. The trickle down theory supposed that new innovations will probably first be established in some group and then trickle down to others.

## **4.12 Use of mobile phones in the world of markets**

This section describes the numbers of people who have a mobile phone in their own use and how many respondents use it for purchasing different services. The next figures represent distributions calculated as percentages of all mobile phone users. This allows us to compare different uses or the adoption of charged mobile phone services as part of mobile phone users' everyday life. From the age groups 40 onwards, men have a mobile phone in their own use more often than women, and in the age group over 60 the difference is quite considerable. This is no doubt partly explained by the fact that even after retirement, men continue to move outside the home more than women do. According to Statistics Finland's time use survey, each day men spend around 90 minutes longer outside per day the home than women do.

The Fig. 10 shows that there are no major regional differences in different age groups. In contrast to the basic assumption of innovation theory, young people in large towns and cities do not have a mobile phone as often as youngsters elsewhere in Finland. However when the penetration rate exceeds 80 per cent, even voluntary non-ownership is an acceptable reason for the differences. The remoteness of the region has no bearing upon the number of mobile phones in personal use. On the basis of the Fig. 11 we may infer that Internet or WAP connections through mobile phones have hardly met with a very enthusiastic reception even among younger consumers. In spring 2003 about 20 per cent of Finns aged 15 to 74 and around 23 per cent of mobile phone users said they could browse WWW or WAP pages with their mobile phone. This number was more than double for men (28 per cent) compared to women. There are no regional differences in the numbers that have acquired such a phone.

The Fig. 12 and Fig. 13 illustrate how different 'mobile extras' have been adopted in everyday use. In these respects, too, the result is at variance with the theory of regional innovation diffusion. The metropolitan Helsinki region does not have the highest figures for downloading ringing tones or logos, and the same applies to the use of charged SMS services. It is quite possible that these fads will simply wither away once the novelty value wears off. The only group where these extras have been taken into regular use is the age group 15-29. In older age groups where income would probably be a much less restrictive factor, these extras have not gained popularity beyond a smaller group of experimenters.

No doubt the main finding of the analysis above is that place of residence has hardly any impact on the use of mobile phones. In fact it is quite possible that mobile phones have improved the reachability of people in remote areas to a greater extent than it has in urban areas, because in the countryside people spend more time outside the home and the workplace than they do in towns and cities.



In spring 2003 nearly a quarter of mobile phone users had used fee-based text messaging services that are charged directly on the telephone bill, such as news, weather, stock prices and dictionaries. The proportion was almost unchanged from the year before. Around six per cent had used their mobile phone to order or buy such items as public transport tickets, parking fees, soft drinks, car wash services, golf balls or other products and services charged on the telephone bill. This percentage was on the same level already in spring 2002.

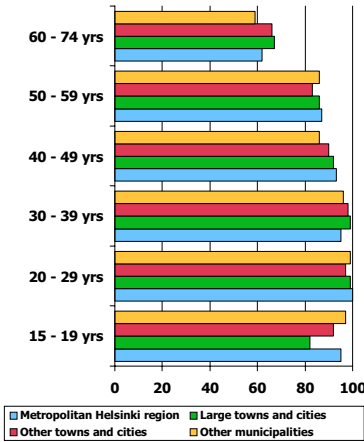


Figure 10. Mobile phone in own use by region and age in spring 2002 (%)

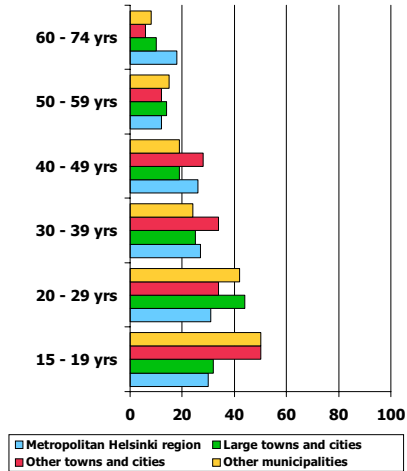


Figure 11. Interent mobile phones users by region and age, per cent of own mobile phone users in spring 2002

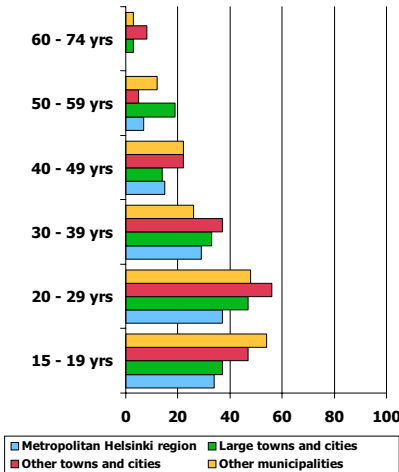


Figure 12. Downloading logos or ringing tones by region and age, per cent of own mobile phone users in spring 2002

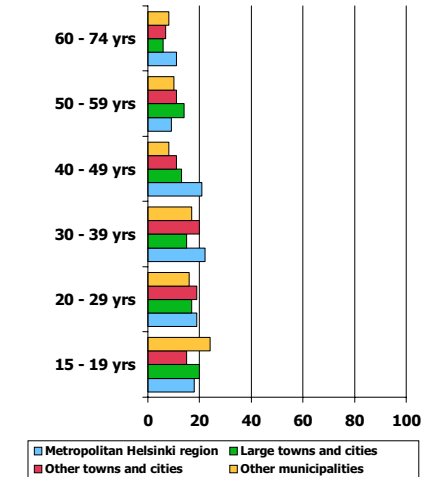


Figure 13. Use of charged SMS services by region and age, per cent of own mobile users in spring 2002

People’s attitudes may influence the acquisition and use of mobile phone. The 2002 interview survey shows that the mobile phone is considered an indispensable means of communications as well as a means for increasing safety. More than four fifths of mobile phone users think that the mobile phone is an indispensable means of communications for one’s family and in one’s circle of friends and that it increases safety. Around a half agrees fully or to some extent with the statement “I learn about interesting events through the mobile phone”, which seems to be most important to young mobile phone users. Nearly a half agrees fully or to some extent the statement “I preserve and protect my leisure time by switching off my mobile phone”.

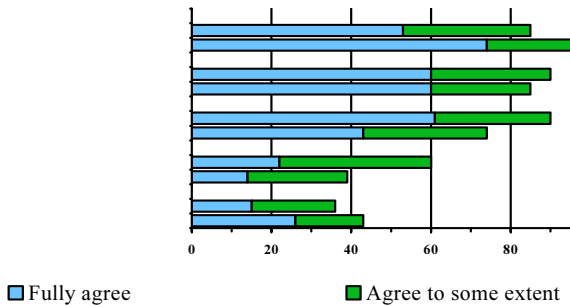


Figure 14. Attitudes to mobile phone use by age in per cent

### 4.13 Use of the Internet in the world of markets

Having reviewed the situation for mobile phones, we move on now to a corresponding analysis of the extent of Internet use. This will help to give us some idea of how integral a part all of this has become in users’ everyday life, measured in terms of the regularity of use. The background variables are the same as in the analysis of mobile phones above.

Nearly two thirds of people aged 15 to 74, i.e. around 2,590,000, had used the Internet somewhere during three months before the survey in spring 2003. When asking about possible use during 12 months before the survey the number of users rose by around 130,000 and by five percentage points. Similarly as for computers, use of the Internet falls with age both for men and women. Compared with 2002, the proportions of use had grown most among people aged 30 to 39 and 40 to 49. In contrast, Internet use by 60 to 74-year-olds had decreased slightly. The Fig. 15 shows the use of the Internet by different age groups.

Around 55 per cent of those having used the Internet had spent at it not more than two hours per week during leisure time. Nearly one fifth said they had used the Internet at home in leisure time for over five hours per week. Two thirds of them were men. Internet use there have been no major differences between men

and women. In the oldest age group there was still very little regular Internet use, and the majority of regular users were men. Women probably have access to a PC and the Internet in their workplace more often than men do. Likewise, the fact that a larger proportion of students are women than men probably contributes to the higher rates of use among women.

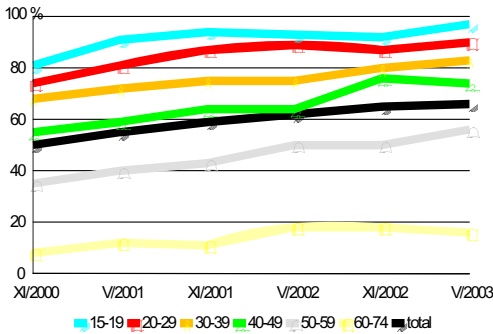


Figure 15. Use of the Internet during past 3 months by age in 2000-2003

The regional differences in Internet use are greater than in PC use. Those living in the Helsinki region had still used the Internet more often than persons living in other big cities or elsewhere in Finland. In 2002, 81 per cent of 15 to 74-year-olds living in the Helsinki region had used the Internet in the three months preceding the interview – in 2003 their proportion was 77 per cent (Fig. 16). In other regions the differences by degree of urbanisation begin to show in the age group 30-39 and then increase steadily with age.

If people had access to the Internet, their uses were very similar regardless of whether they were employed, unemployed, studying or entrepreneurs. The only group recording a lower activity was that of pensioners, but the difference was not very great. Time use and the nature of activities among pensioners differ in many other ways too from people of working age; pensioners generally tend to be less active.

Of all uses of the Internet – for personal, work and study-related purposes – email was the most common. E-mail was used by over 80 per cent of all Internet users. A majority of Internet users had browsed product information and used banking services online. Over one half of the respondents had had dealings with public authorities or at least browsed services produced by them. Over the age ranges there are only slight variations in the frequency of using email, browsing product information and reading net magazines. Younger people use Internet more often for the purposes of education, playing games and chatting, whereas older people use Internet more often for banking services and travelling services.

	15 - 19 years	20 - 29 years	30 - 39 years	40 - 49 years	50 - 59 years	60 - 74 years	Total %
email	85	83	83	84	82	78	83
browsing product information	73	85	86	82	74	66	81
financial services	22	68	78	72	67	79	66
interaction with public authorities	35	57	66	63	61	61	58
using services related to travelling	38	53	60	61	66	61	57
reading net magazines	37	58	53	48	41	39	49
using services related to health	43	54	54	49	40	34	49
using services related to education	80	46	20	13	7	6	29
playing games	61	32	22	16	13	17	26
purchasing goods and services	24	28	28	23	17	12	24
use of chat sites	54	31	17	12	13	6	22

**Table 1: Use of the Internet by age in spring 2003**

The most advanced form of Internet use, describing users who had their own home pages on the world wide web. On the one hand running an Internet website can be compared to a leisure activity which involves doing or making something for public display, and on the other hand it is a way of stepping into the public domain. If we should try to estimate, why even among the youngest age group on only 10 percent of internet users have own homepage, we should need to know how many people are interested in programming more generally and how many think they want to have some kind of visible presence on the Internet. No doubt some people have had their own personal website prepared for them by the employer, at the workplace, on training courses, at school, etc. The preparation of home pages is quite a major project that involves numerous decisions and work stages, so it may well be that it will take more time for people to get into this. However it is unlikely home pages will ever become quite as popular as e-mail.

#### 4.14 Internet commerce

Information search on products and services has become surprisingly widespread in all age groups and in all regions. Within the broad age range of 20-49 years, this has indeed become a routine for the vast majority: clearly online information provided on consumer goods is useful to both the producers and the shops selling the goods. Roughly one in four of the people who have searched for information on the web have actually purchased goods online as well. Searching for product information is less common outside big cities because of missing

Internet connections. If those searching for product information are calculated from Internet users, the difference between the Helsinki region and other areas is still there but it is not that large any more (Fig. 16). According to Fig. 16 the number of consumers who have shopped online during the past three months is not very high in absolute terms, but if the numbers were compared to the range of products available, the picture would probably be quite different. The commerce survey indicated that many people who used to shop from mail catalogues or by phone are now buying over the Internet. The Fig. 17 shows that younger people are most active in online shopping. In several age groups online shopping has been most common in sparsely populated rural areas.

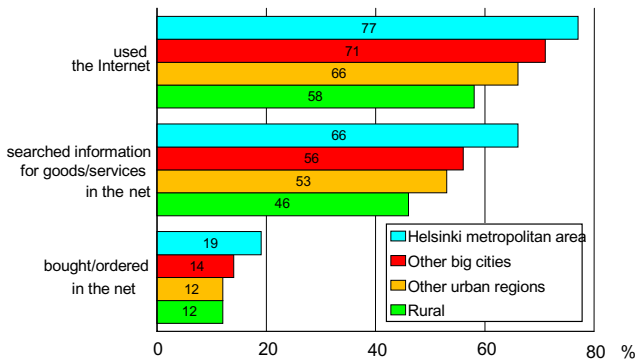


Figure 16. Internet use, information search on products or services and online buying or ordering the goods or services by region in spring 2003

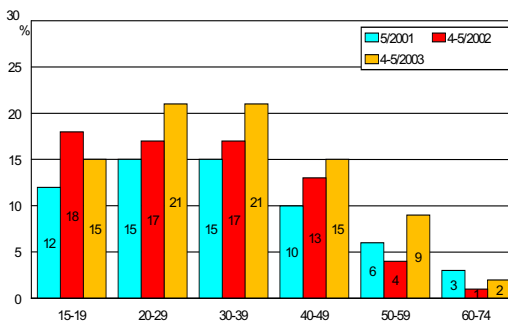
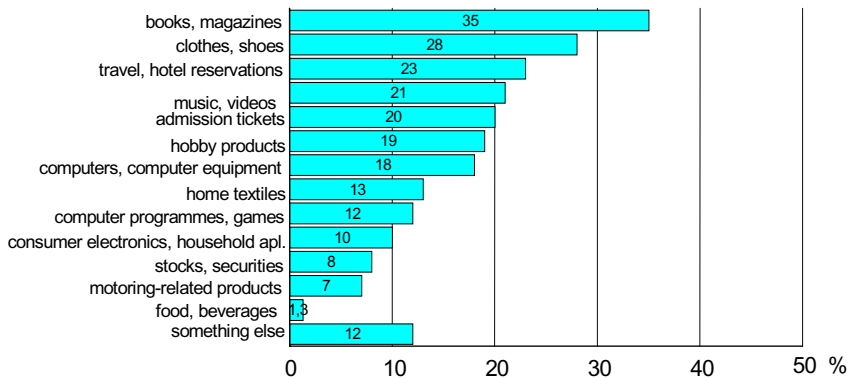


Figure 17. Users of the Internet commerce by age group in 2001-2003

Products purchased online can be divided into a few main groups. The Fig. 18 illustrates the sales of different products. The most popular products are a) books and magazines and b) clothes and shoes. They had been bought by around every

third. The second group includes a) travel and hotel reservations, b) music and videos, c) admission tickets, d) hobby-related products, and e) computers and computer equipment. These products had been ordered or bought by around every fifth. About every tenth had bought entertainment electronics and computer software or household textiles via the net. Buying food online is still sporadic.



**Figure 18. Internet commerce by product group in January-May 2003**

Those Internet users who had never bought or ordered anything online evidently want to see what they are buying, although its significance has waned somewhat as a reason for not buying online. Four out of five do not see any need for buying from the Internet, as there are other places for shopping as well. Almost three out of four were worried about giving their credit card information online, which showed a slight increase over the year. The reason for not having shopped online does not seem to be that the products were too expensive, or that delivery times were long or that products and services were not available. Once the first online purchase has been made, it seems easier to embark on an active online commerce. It is noteworthy that as many as nearly two thirds of those having made purchases online had done so three or more times in the past three months. This proportion was still one third in spring 2002.

Internet commerce volume growth appears to have reached a kind of stabilisation stage, judging by the figures in spring 2003. The slow growth of the economy is probably reflected in Internet commerce at least as decrease in marketing but it probably has more influence on net purchases than other consumption. Evidently non-material commodities will be successful in Internet commerce in future. The proportion of services is growing though products still account for two thirds of net purchases. The proportion of orders and purchases made from abroad raised to the annual level was about 20 per cent. It is quite minor compared for example with Australia where two thirds of orders and

purchases are made from abroad, which might suggest that so called localization is essential at least in non-English speaking countries. In spring 2003, the estimated value of the total of online purchases and orders made for personal use was nearly EUR 210 million. On the annual level it would mean orders and purchases to the tune of around EUR 830 million if the use of Internet commerce remained regular throughout the year.

#### **4.15 Is Finland now an information society**

In this paper we have compared Finland with other information (technology) societies. It appears that people in Finland have a mobile phone in their own use more often than people elsewhere, although the difference compared to the other Nordic countries is quite marginal. It seems that the other Nordic countries, the United States, Canada, Korea and the Netherlands are ahead of Finland especially in the home use of the Internet. As far as workplace use is concerned, we are very much in the vanguard of ICT use in Finland. In an international comparison then, Finland certainly ranks among the top six information societies in the world. This is no minor achievement for a small country in the far northern corner of the world, where income levels are at a lower level than in many other countries.

Overall the majority of people in Finland have embraced information and communications technologies within a very short space of time. In addition, it seems that new users are being recruited even from older age groups. New technology has become an integral part of most people's everyday life, with the exception of those in retirement age. Small households in remote areas still have quite limited access to PCs and the Internet. The results showed that once people have begun to use mobile phones or the Internet, their specific uses are quite similar to each other regardless of whether the user is younger or older, employed, a student, entrepreneurs or unemployed. It seems that there is no cause for concern about marginalisation from information and communications technologies, at least as a phenomenon separate from other marginalisation.

Now that the large majority of people in Finland are active ICT users, it is interesting to see what kinds of widespread applications the extensive everyday use of these technologies will generate. Will we see new successful charged services? One of the first serious candidates is represented by positioning services in mobile phones and other portable equipment. Also, once a workable system has been created on the Internet to collect small charges, the supply of expert information is bound to increase rapidly, and the content producers that already are online may try to fund their operation from sources other than advertising revenue.

Alternatively, we might see large numbers of users create completely new types of contents with the new equipment. In any event, this period after the great

migration to the information society will show whether Manuel Castells was right in predicting that information and communications technologies will become an integral part of the infrastructure of modern society, a universal facilitator comparable to electricity. At least so far the trends we have seen lend strong support to this assumption. Is there a kind of infrastructure developing for social interaction that may pave the way, in one form or another, to the utopia envisaged by some scholars of a genuinely interactive society? Sinikka Sassi is concerned for everybody's basic right to be involved in the future information and communication structures. Everyone should have equal opportunity to participate in the new infrastructure without being culturally or socially discriminated.

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Tiedotustutkimus 3/2003.

Tietoaika 8/2003. Tilastokeskus.

Tietoaika 10/2003. Tilastokeskus.



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## **B. CREATING PERFORMING MULTIMEDIA**

### **5 Usability and emergent properties of multimedia creations**

*Ania Bobrowicz and Bruce Christie, UK*

#### **5.1 Abstract**

The concept of usability needs to be re-examined to take account of the importance of emergent properties which result from the dynamic integration of various media elements in multimedia creations. Such integration within the common space of a computer screen raises questions about how different media are combined to create a new meaning, and what happens when disparate media assets produced separately and from the perspectives of different disciplines are brought together. While the more traditional media of film, video, radio, sound production, graphic design and animation have well established practices, there is a relative paucity of guidelines that can be usefully employed in the creative process of selecting and integrating disparate media assets in a multimedia production. This is made more important because the viewer/listener is typically no longer placed in a traditional, relatively passive role but is now invited to take active control.

In this paper we examine the nature of, and principles behind, two such dynamic combinations: (a) juxtapositions of two or more static visual elements (text, image, graphic) in a multimedia collage and the collage's emergent properties, and (b) juxtapositions of two or more dynamic time-based media elements (video, sound, moving image) in a multimedia montage and the montage's emergent properties. Particular attention is paid to the impact of these emergent properties on the usability of multimedia creations and what we mean by usability in this context.

#### **5.2 Introduction**

One of the main roles of multimedia technologies is to provide means for human-human communication. Such communication is facilitated through existing computer networks which transmit multimedia content in the form of digital data. These digital media elements may originate either in traditional media, such as fine art, music and photography, or may be created in their entirety on a computer screen using various software tools. For those involved in multimedia production, developing multimedia pieces may be compared with

solving a jigsaw puzzle: multiple pieces are selected and brought together with the aim of integrating them into a coherent whole.

Media elements which find their way into multimedia productions are traditionally created and exist in their own individual disciplines. For example, paintings are meant to be hung on a wall and photographs are taken to be published in newspapers, etc. When freed from their traditional context and combined on a computer screen, they enter into a dynamic interplay under direct control of the user. The bringing together of these elements following evolving conventions of computer software results in multimedia collages and montages.

The juxtapositions of media elements in a multimedia creation and subsequent interactions raise a number of important questions: firstly, what qualities various media elements possess in their original context; secondly, how these qualities affect other elements with which they come into contact and, finally, what properties emerge as a result of these interactions. The aim of this paper is to look at illustrative examples of static and dynamic interactions occurring in multimedia creations and to examine their emergent properties.

### **5.3 Multimedia – an area of multidisciplinary enquiry**

Although the term ‘multimedia’ may no longer arouse as much excitement and hype as it used to, say, a decade ago, it continues to challenge practitioners and researchers alike who are concerned with developing credible theoretical foundations for an area which to date has been primarily driven by technology. In comparison with traditional art or science disciplines, it is yet to establish itself as a widely respected academic subject. The problem with its identity may lie with its multidisciplinary nature. Drawing on knowledge and expertise from both the arts (practitioners and critics) and the sciences, it has been struggling to find its own ‘integrating framework’ to guide research. At present, it appears to be largely a practitioner-led discipline driven by rapid developments in computing and telecommunications under the influence of practices from fine art, photography, graphic design, film-making and radio production.

For the purpose of this paper, we will refer to traditional techniques used in fine art and cinematography, such as collage and montage, to discuss the ways in which multimedia creations are being developed.

### **5.4 Collage and Montage – historical background**

Collage, the technique which involves combining different materials and media elements together on a flat surface, for example canvas, was pioneered in the early 1910s by the Cubists, Pablo Picasso and George Braque, who experimented with colour and texture in a series of works called *papier collés*. A

photographic equivalent of collage, named by the Dadaists 'photo-montage', began with the invention of photography in the 19<sup>th</sup> century, and subsequently developed into a form of artistic expression with famous photo-montages created by Hannah Höch and John Heartfield in the 1920s and 30s.

The practice of film montage, where a chronological sequence of events is interrupted by juxtaposed or rapidly succeeding shots, has been used by film-makers for over a century. Beginning with American Hollywood film-makers, such as D.W. Griffith in the early 1910s, and taken up by Soviet cinematographers in the 1920s and 1930s, montage has been used extensively as a powerful film editing technique. Lev Kuleshov, who is best known for introducing Hollywood's use of montage to Soviet film-making, used its "capacity to organize disjointed fragments into meaningful, rhythmical sequence" (Stam, 2000). He developed his own experimental technique (nowadays referred to as the Kuleshov effect) to show that editing can create emotions and impressions which go beyond the content of an individual shot. His ideas about montage were further developed by a Soviet montage theorist, Sergei Eisenstein, who established different kinds of montage devices, from a rhythmic montage which "conveyed images in terms of a musical beat" (Gillespie, 2000) to so-called metric, tonal, overtone and intellectual montages.

In the more recent past, the work of the French cinematographer, Jean-Luc Godard, who refers to himself as a 'combiner' and "explorer of videographic juxtaposition and superimposition" (Temple & Williams, 2000), provides further insight into the idea of montage by extending it to include the concept of 'seeing life'.<sup>1</sup>

The current state of multimedia development may be compared to experiments with montage in the early years of cinematography and the Cubists' collaged art pieces. Technological advances in computer hardware and software application design, for example the arrival of Adobe® Photoshop®, have resulted in these traditional techniques being emulated in a digital environment. Lev Manovich compares this progress to "the nineteenth century progression: from sequences of still images...to moving characters over static backgrounds...to full motion" (Manovich, 2001).

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<sup>1</sup> It might be worth mentioning that the use of the terms 'collage' and 'montage' is rather blurred at the boundaries. They appear to be used inconsistently by various commentators. In our paper we refer to *collage* as an inter-media relationship of static elements and *montage* as inter-media relationships of dynamic elements.

<sup>2</sup> Adobe® and Photoshop® are registered trademarks of Adobe Systems Incorporated.

## 5.5 A Multimedia Model

In this paper we will be referring to collages/montages as principles of production concerning the combinations or juxtapositions arising out of: (a) inter-media relationships between two static elements placed together within the same space, for example text and text, image and text, or image and image; and (b) inter-media relationships resulting from one or more static media elements (e.g. image) being combined with one or more dynamic elements (e.g. sound), or from two or more dynamic media elements (e.g. video and sound) being combined along a timeline. To illustrate these possible interactions it may be useful to refer to a conceptual model (see Figure 1) which is built around three axes of space, time and medium.

- i. The SPACE axis extends from location 1 to location N. Any given location is a point in real three-dimensional space or in some mathematical space with a higher number of dimensions. It might only be a two-dimensional space – that of a computer screen. In that case, the locations can be counted as positions in a grid from top left of the screen to bottom right (or in any other sensible order). The grid can have any number of rows and columns.
- ii. The MEDIUM axis corresponds to the media used by the multimedia author. They are ordered in any arbitrary but convenient order.
- iii. The TIME axis starts at time zero and progresses to any time as specified by the author. It can be counted in any units, such as seconds, minutes and hours, or it may be useful to count it in frames.

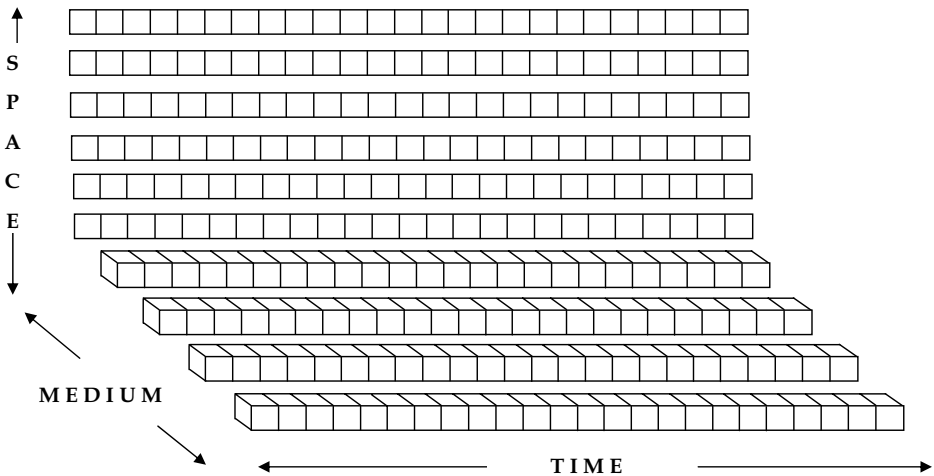


Figure 1: A multimedia model

Like any model, the proposed example is a simplification which may be useful when illustrating clear-cut examples. It may not be possible, however, to explain all the possible combinations and relationships that can occur within a multimedia creation.

In usability terms, the main challenges facing multimedia authors are:

1. What routes through the model to make available to the user?
2. Which of them to suggest in preference to others?
3. How to indicate the 'better' or 'preferred' routes?
4. How to make the routes? The standard 'hyperlink' type of mechanism is obviously one way, but there might be others.
5. How to design interaction routes whilst preserving the artistic and content integrity of the piece?

Some of the issues relating to these usability design challenges can be subsumed under the general question facing the usability specialist: How to ensure that interactivity is designed into an application in such a way that it genuinely adds value to the application rather than simply enabling the user to wreck the integrity of what would otherwise be a perfectly good (but non-interactive) multimedia production?

### 5.5.1 Emergent properties

"I contemplate a face, and then suddenly notice its likeness to another. I see that it has not changed; and yet I see it differently. I call this experience 'noticing an aspect'..." (Wittgenstein, 1998)

Each piece of a multimedia jigsaw puzzle constitutes a structurally autonomous object which was created according to aesthetic qualities and technical standards appropriate to a particular medium. As such, it possesses certain qualities or 'aspects' at the level of **presentation** which identify it as belonging to the same medium; for example, in a sound element we may identify the following media properties: file format, bit depth, sampling rate, stereo or mono, etc. This information about technical aspects may suggest initial interpretation in terms of the quality of the digital sound, its duration and size, etc. In addition to this initial interpretation, and when the media element is displayed (in the case of images or text) or played back (in the case of moving images, video and sound), certain connotations may be brought to light which may or may not have been intended by the author but which arise out of a person's own knowledge and experience as well as a particular context of use. These connotations arise at the level of **interpretation** where "the mind looks beyond what it immediately perceives" (Fitzgerald, 1999) to suggest that there are **emergent properties** arising out of the act of seeing/hearing and knowing at the same time. In this context,

Wittgenstein's (1998) notion of 'seeing-as', which refers to an object being perceived by the viewer not only in terms of its inherent original properties but also in terms of its internal relationships with other objects, may be usefully employed. When proposing the notion of 'seeing-as', Wittgenstein is considering not just our perception of objects and things, but also a particular way of treating what is perceived by their emerging connotations. In this respect, multimedia creations may be viewed as complex systems of signs, with every level containing aspects that can be treated semiotically.<sup>3</sup>

### 5.5.2 Collage in multimedia

"...when two images (or sequences of images) are placed together they inevitably combine 'to create a new concept, a new quality, arising out of that juxtaposition'." (Cotton & Oliver, 1997)

Let us start with a relatively simple case of text collages. The juxtaposition of words as well as their positioning with respect to one another in a sentence is significant in creating meaning. For example, when the noun **flag** is combined with the adjective **red**, the resulting **red flag** creates powerful connotations at a semantic level. In this context, it may be useful to refer to schema theory, whereby we perceive and interpret inputs by relating them to existing knowledge (organised into what are called schemas or schemata), and we modify existing schemas or construct entirely new ones to take account of new experiences. "A schema is a generalised mental model which is used to organise memory, to focus attention, to interpret experience, and to codify actions. It is similar to a prototype or template, except that schemas are active, self-activating, self-revising processes" (Grow, 1996). Often, which schema is activated will depend on a number of factors, for example context.

Similarly, the order in which words are placed within a sentence may be important. For example, when the caption **Women Mourning** appears as a newspaper heading, it may refer to women being in a state of mourning for someone who died or has been killed. When the order is reversed, **Mourning Women**, in addition to the original reading of the caption, a new interpretation may arise meaning exactly the opposite, i.e. women who died or were killed are being mourned. In this example, new possible interpretations emerge.

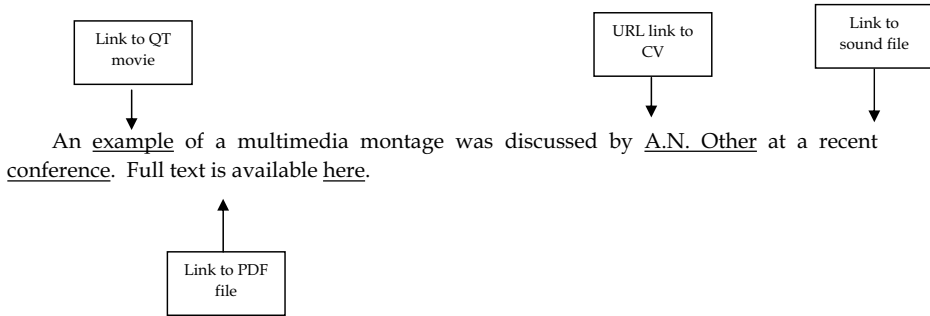
Word combinations can also be examined in the digital environment. Here, in addition to the possibility of creating semantic and syntactic juxtapositions, a new dimension is added, that of hypermedia linking. Two interesting usability issues arise out of hypermedia linking: (a) there are different possibilities for embedding

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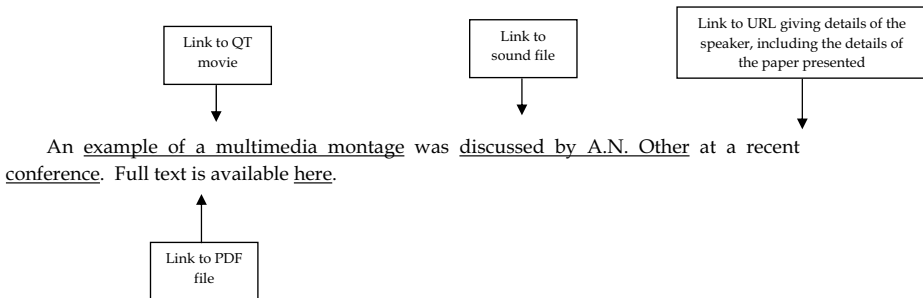
<sup>3</sup> Semiotics has been defined by a famous Swiss linguist, Ferdinand de Saussure (1966), as "the science of the life of signs within society". It refers to the general theoretical framework for analysing and understanding phenomena such as language, media and the arts.

hyperlinks, and (b) when users follow links and the content encountered does not appear to be related to the page from which the link originated, users feel disorientated. In the first instance, the question arises as to which are the more usable ways of embedding links? Let us consider the following examples:

Example 1:



Example 2:



In terms of usability implications, the differences seem to arise at two levels:

- i. What is it appropriate to link to? For example, in the first solution, 'conference' links to a sound file of the speaker speaking, but in the second solution it links to details of the speaker and the conference (the sound file being attached to 'discussed by A.N. Other').
- ii. Where exactly does the underlining go? For example, in the first solution, the underlining emphasises the person, whereas in the second solution it emphasises the point that the person was speaking (discussing).

Now let us examine what happens when images and text are put together. In the following example (see Figure 2), we note that, when considered separately,



both the photograph and the caption have individual aspects which suggest their initial interpretations. However, when brought together, they create emergent properties, in this case a powerful emotional effect.



**Figure 2: The last picture of little Annie**

The abovementioned example was inspired by the work of Christian Boltanski, one of France's best known contemporary artists, who early on recognised the strong relationship between text and image and their powerful interactions. One of his pieces shows a snapshot of a young boy; the caption 'The last picture of Paul Chadron' creates an emotional effect, precisely because it is identified as the last photograph taken. Another work shows a gallery of photos of young children. The caption reads 'Images from a year of news items'. It showcases a collection of over four hundred images of criminals and their victims. What Boltanski found fascinating was that "once the photograph was separated from its caption, it was impossible to distinguish victims from criminals" (Gumpert, 1994).

In the following example (see Figure 3) our initial interpretation of image content may be affected by our own experience in seeing similar images in the media, usually in a negative context. The photograph presented by itself may initially elicit a particular schema to do with how we organise our understanding of that aspect of our world that includes knowledge about the illegal drugs trade. However, when we are then presented with the caption 'Students shown around a brewery in Papua New Guinea', the caption elicits an entirely different schema to do with our knowledge about breweries and guided tours. That latter schema causes us to re-interpret the inputs from the photo.



**Figure 3: Students shown around a brewery in Papua New Guinea**

If schema theory is relevant, it might be helpful in training usability engineers to take account of the power of different media elements to elicit users' existing schemas. It suggests that training usability specialists to be more sensitive to media (in the way that film-makers and others are) might help them to construct more usable multimedia montages. Usability here refers particularly to that aspect of what we might call cognitive usability that concerns the need to elicit appropriate/helpful schemas rather than inappropriate/unhelpful ones. What happens when two or more images are placed together within the same space? Combining images is relatively easy, if one is familiar with image editing software, such as Photoshop®. Blending, layering, superimposing, cropping and adding filters are just some of the effects that can be achieved. The evidence of this ubiquitous use of image editing software is evident on the web, where we have witnessed an explosion of home-made digital collages. The relative ease of use, however, is not necessarily an indicator of aesthetically pleasing outcomes. Although the technical skills required to create such photo-montages (as the Dadaists called them) are relatively easy, the process of seeing and interpreting them is far from simple. For example, what does the following image communicate to the viewer?



**Figure 4: Photo-montage**

The ease with which images can be juxtaposed within the same browser space also needs to be considered. When taking images from different web sites and placing them in the same browser window via hyperlinking, the original context of use, and therefore original meaning, may be disrupted. Efforts to contextualise such interactions are currently underway. An interesting example is the PhotoGlas project, carried out by a team of researchers at the MIT Media Laboratory. The team developed a web crawler which retrieves photographs from a number of pre-determined news sites. The images are presented to the user as a montage which reflects a particular news topic. What is interesting about this project is that an attempt has been made to "...categorise photographs retrieved in real-time...and present these photographs in meaningful juxtapositions for users" (Srinivasan *et al.*, 2001). One such example is the presentation of photographs found on the Electronic Intifada site, which promotes the Palestinian cause, alongside photographs taken from the Israeli Defense Force web site.<sup>4</sup>

A challenge for usability specialists in this context would be to enable users to understand the ways in which hyperlinking can alter the meaning of an image by removing it from its original context of use.

### 5.5.3 Montage in multimedia

"When people saw a film, there was something that was at least double, and since someone was watching, it became triple. In other words, there was something, something else, which in its technical form became gradually known as montage. It was something that filmed not things, but the relationships between things. In other words, people saw relationships, and first of all they saw a relationship with themselves." (Godard, 2000)

Complex time-based inter-media combinations can be explored by examining classic films. In Steven Spielberg's film *Jaws* (1975), the famous shark theme adds a dramatic suspense effect when the juxtaposition of nearly silent tension is accompanied by deep probing notes. Despite the fact that three decades have passed since the film was released, it is still instantly recognisable and creates the same powerful effect. Alfred Hitchcock, the famous 'Master of Suspense', used sound effects to great aesthetic effect, developing a consistent aural style, one that is inseparable from his visual style.

Given the powerful effect that music, sound effects and speech can have in film and, in fact, in a multimedia production, it is surprising that sound has not received the same attention as visual imagery. There appears to be a relative scarcity of research concerning its use and effects. Weis (1982) points out that "...the only directors whose sound styles have attracted wider critical attention are

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<sup>4</sup> Incidentally, this example demonstrates that appropriate consideration also needs to be given to Intellectual Property Rights when gathering images for re-presentation.

those whose aural style is most obvious, such as Orson Welles, whose sound track is as flamboyant as his visuals; Robert Altman, whose use of multiple tracks and mumbled dialogue sequences draws attention to the non-cognitive aspects of his dialogue; and Michaelangelo Antonioni and Jacques Tati, whose absence of dialogue calls attention to the presence of sound effects that help describe the depersonalized modern environment.”

Whilst it is possible to point to some classic examples in film that have shown how sound can be used to take the making of films a step forward, similar achievements in the use of sound in the field of multimedia have yet to be widely acknowledged. Perhaps they have yet to be made. If sound can be so important in managing the relationship between a film and a viewer of that film, is it not appropriate for the usability specialist to ask how sound can be used most effectively to help manage the relationship between a multimedia production and the user? We are witnessing a rapid evolution in information and communications technologies, exemplified well – but only exemplified – by the rapid evolution of the Internet towards broadband. In the light of this evolution, we would argue that multimedia services delivered without sound may soon be as anachronistic as silent movies are in the field of film. Reflecting that, we would argue that research on the contribution of sound to the usability of multimedia productions could turn out to be one of the most fruitful areas of research on usability during this decade, but only if the area is approached from a perspective that truly reflects the media-laden design issues of the current decade rather than the relatively content-free usability design issues of the age when the focus was on word processors, spreadsheets and similar applications.

In multimedia, dynamic interactions occur when time-based media such as sound, animation and moving image, are placed together along the timeline. Technological advances in digital video production have resulted in a much faster and more efficient production of audio-video montages which are no longer reliant on expensive equipment or, indeed, experienced production crew. Audio-video montages can now be easily created by an individual multimedia author with a digital video camera and manipulated on a personal computer. A significant difference between film and multimedia, however, exists in the relationship of the viewer/listener to the presented montage. The viewer/listener is no longer placed in a traditional, relatively passive role but is now invited to take active control by being in charge of the playback and navigation through the dimensions of space, time, and, sometimes, media. This is surely a positive step forward, or is it?

That may seem a surprising question. After all, how can adding interactivity not be a good thing in multimedia? But consider an analogy with film. Considerable care and expertise may be put into deciding on a particular camera angle at a particular point in the film. Now allow a user – any user, possibly someone having no relevant expertise at all – to decide on a different camera angle at the time of viewing the film. Does that enhance the film or damage its integrity?

Consider another example: the choice of music to accompany visual images. Think about the choice of music in Steven Spielberg's *Jaws*, for example. Allow the user to change the music and is that likely to improve the montage or damage it? It is the difference between a professionally produced film and a home movie.

What the usability specialist needs to do is to help the design team to create a multimedia montage with mechanisms that allow the user to move through that montage in ways that meet the design objectives and serve the user's purposes, rather than in other ways. In terms of our model, the design has to help the user to create – in real time – any of a set of alternative possible montages that are all equally valid whilst discouraging (or even preventing) the creation of invalid possibilities. Valid possibilities maintain the integrity of the application. Invalid possibilities damage its integrity.

Marikki Hakola, a Finnish media artist, has suggested that the concept of montage should be explored from a new perspective of interactivity. Her interactive installation called *Figure studies* forms of "the interactive moving image where the existence or action of an audiovisual work of art is dependent upon the spectator's active physical participation...that surpasses that generated only on the level of mental experiencing" (Hakola, 2001). The installation is based on the interaction between a moving body (photographed using a thermal camera) and various cinematic devices, projected onto a screen. This work raises an interesting usability question as to what we mean by 'space' (2D computer screen, exhibition space, 3D space) from the point of view of human-computer interaction.

The examples presented in this paper aim to shed some light on the complexity of creating and interpreting multimedia collages/montages from the point of view of: a) the author who is placing different media in relation to one another in the time and space dimensions of the multimedia production, and b) the user who is interacting and interpreting these collages/montages by placing medium-time-space combinations in relation to one another in real time and activating various schemas as appropriate to the context.

#### **5.5.4 Multimedia and usability**

The International Standards Organisation (ISO) defines usability as 'the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use' (ISO 9241-11).

It would be difficult to argue against helping the user to achieve specified goals. And it is certainly true that the emphasis on that helped usability specialists to make important contributions to the design of hardware and software as computers and other forms of information and communications technologies evolved during the 1980s and 1990s, especially in the business area. However, there is something about framing the definition of usability in this way that does

not quite seem to capture the nature of modern multimedia applications sufficiently.

We do not at this stage have a specific definition to offer but we suggest that, somehow, we need to show that usability is also about helping the user to interpret multimedia content appropriately. That is not inconsistent with the current ISO definition, but it is something that the current definition does not highlight in the way that it highlights the need to achieve specific goals.

An alternative position would be to argue that helping the user to interpret multimedia content is important but is not the responsibility of the usability specialist. This might be a valid position but would have an interesting implication for usability as a profession or discipline. This is because the growth of multimedia means that an increasing proportion of design effort (and budget) has to be directed towards design issues relating to content. If as usability specialists we were to opt out of addressing those issues, we would be consigning ourselves to an ever-diminishing proportion of the total design problem. Added to that, we should note that many of the more basic usability problems that faced designers with the advent of the personal computer have now been solved. True, there is still room for better solutions, and new problems of the kind facing designers during the 1980s and 1990s still continue to emerge, especially in niche application areas. But the really big news is that applications are becoming multimedia. Indeed, this is already in danger of becoming old news, but the field of usability still has to take it fully on board. This is likely to become even more evident over the next few years as broadband increases its penetration into offices and homes alike, interactive DVD applications become more common, and even portable devices such as mobile phones and 'handhelds' increasingly support a range of different media, no longer just voice or just alphanumeric data.

Given the complicated nature of multimedia and the ever increasing influence of society over technology and media, one might argue that both multimedia authors and multimedia users ought to become more 'media literate'; in other words, to have the ability to critically and independently analyse and evaluate different forms of existing media communications and to create new forms of communication. This requires an understanding that multimedia draws on existing conventions from many disciplines, requiring a new type of literacy which includes digital literacy, computer literacy, media literacy and visual literacy, to name the most prominent ones. It seems equally true, though, that the usability specialist must also be trained to understand this new level of literacy if he or she is to be able to work most effectively with applications that are so heavily dependent on media. For further discussion of this issue see Nagy *et al.* (1999).

Opinions as to what constitutes the current dominant multimedia aesthetic vary. Manovich, for example, argues that montage has been replaced by anti-montage or digital compositing. Commenting on the origins of multimedia montage and its current stage of development, he makes an interesting

observation: "Montage aims to create visual, stylistic, semantic and emotional dissonance between different elements...In contrast, compositing aims to blend them into a seamless whole" (Manovich, 2001). Is digital compositing the new 'Holy Grail' of multimedia? Perhaps the way forward, as Andersen has stated, is to allow it to develop a "suitable aesthetic which will sever its links with other traditions and make it into a medium in its own right" (Andersen, 1992).

## 5.6 Conclusion

In conclusion, static and dynamic inter-media collages/montages and their emergent properties need to be examined from two perspectives: (a) that of multimedia authors and their existing schemas, and (b) that of users who interact with the content in real time and interpret it by activating their own schemas. The remit of usability specialists should be extended to helping the user interpret multimedia content appropriately. And finally, both multimedia authors and users need to be made more aware of the importance of media literacy in order to be able to critically and independently evaluate existing multimedia creations and create new ones.

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## **6 Exploring Value Networks: Enabling Access to Content for Mobile Workers**

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### **6.1 Abstract**

Designing business models for mobile services is a complex undertaking because it requires multiple actors to balance different requirements and interests. A business model can be seen as a blueprint of four interrelated components: service offering, technical architecture, and organizational and financial arrangements. Although little attention has been paid to how these components are related, we need this knowledge to enhance our understanding of what constitutes a viable business model. In this paper we explore the connections between two of these components, namely service offering and organizational arrangements, i.e. network formation. Our focus is on services with which mobile workers can access back office information systems. We present two case studies exploring the dynamic relationship between service offering i.e. access to back office databases, and the organizational network that enables access. Both cases indicate that the shift from the development of a service to its exploitation is an important step in organizational network formation. One important issue to consider is scalability, both from a technological and an organizational point of view. Furthermore, existing relationships and trust between organizational partners play a significant role. Network formation is an important part of the development of a business model for innovative mobile services. The organizational network should match the service proposition.

### **6.2 Introduction**

The mobile telecommunication industry faces tremendous changes and challenges in the technological, regulatory and economic domains. These developments create opportunities for mobile network operators and service and content providers alike. However, building a viable and feasible business model in the telecommunication industry is a complex matter. A business model can be seen as a blueprint of four interrelated components: service offering, technical architecture, and organizational and financial arrangements (Timmers, 1999, Weill & Vitale, 2001, Bouwman & van den Ham, 2003). Innovative mobile data-services require access to technological resources, relevant databases and other resources controlled by a large number of actors. Services combining the Internet with mobile, location-based, customized, and/or multimedia applications cannot be produced by a single business (unit) or actor. These services are

produced by complex value networks in which business units, both within and between several organizations, have to work together to share the necessary resources and capabilities in order to create customer value.

As yet little research has been conducted on the effects the formation of value networks has on organizational outcomes (Gulati, Nohria and Zaheer, 2000). This paper focuses on the relationship between two of the above-mentioned components, namely service offering and organizational arrangements, more specifically on network formation. How does the formation of organizational networks play a role in providing a service that has customer value and is based on a viable and feasible business model? This paper studies the relationship between network formation and customer value with regard to mobile business-to-employee services that provide access to back office databases and content. Based on a review of existing literature we have constructed a model that specifies the organizational arrangements of a service network, within the broader conceptual framework of business model design (Faber, Ballon, Bouwman, Haaker, Rietkerk and Steen, 2003). This paper is intended as a contribution to the development of design guidelines for business models for mobile services, especially with regard to issues concerning network formation and service delivery. Over the last year a number of case studies have been conducted in the mobile service domain within the context of the Freeband B4U<sup>3</sup> project. In this paper we will discuss the results of two cases that specifically deal with access to back office services (A2B). We define mobile A2B as *"services offered by organizations to their employees enabling mobile access to organizational resources when away from the office."* Examples are access to e-mail, calendars, tasks, or product information databases accessed via mobile devices.

The mobile telecom industry currently has a number of opportunities that may radically change the field of mobile telecommunication. Technological developments, regulatory changes and changing market conditions offer new opportunities for mobile services. The development of new networks like GPRS (2,5 G), UMTS (3G) WLAN (WiFi), and Personal Area Networks (beyond 3G) will spark the development of mobile services. When speaking of 'mobile services' we mean all kinds of innovative services that combine technologies from the domains of telecommunication (e.g. mobile services), information technology (e.g. the Internet, PDA's) and consumer electronics.

The Freeband Impulse programme aims at the generation of public knowledge in advanced telecommunication (technology and applications). It specifically aims at establishing, maintaining and reinforcing the Dutch knowledge position at the international forefront of scientific and technological developments. The Dutch Ministry of Economic Affairs is co-funding this programme as part of the policy plan "Concurreren met ICT Competenties" (Competing with ICT Competencies). The general intention is to prepare the grounds for the big leap forward towards 4G, in which seamless integration of fixed, wireless and mobile networks will be the standard and in

which an attractive environment for user centred applications will be the norm. The B4U project is part of the Freeband Impulse programme.<sup>3</sup> The findings reported in this paper are based on research conducted within the B4U project (<http://www.freeband.nl/projecten/b4u>). The acronym B4U stands for 'Business 4 Users'. In the B4U project, the Telematica Instituut, TNO-STB, TNO-Telecom and Delft University of Technology investigate the conditions for a rapid and effective introduction of context-aware services for healthcare professionals and knowledge workers (e.g. cameras). These new technologies, in combination with the 'convergence' of these domains, and concepts of content and services providers, offer opportunities for the mobile telecom industry. However, the development of sound business models to market these services in a profitable way is very problematic, as the experience of many mobile operators show.

To exploit the opportunities companies need to buy licenses, build networks and develop new services. Since most industry players currently lack the resources and capabilities to do so, mobile services are increasingly being developed and provided by networks of organizations. It is assumed that flexible 'value webs' will arise and replace traditional, static and linear 'value chains' (Moschella, 2003). In such a 'value web' each player has different capabilities and resources, and innovation thrives on the combination of these capabilities and resources.

Cooperation in value webs is by no means straightforward. Various studies (Levine & Byrne, 1986; Harrigan, 1988; Bleeke & Ernst, 1993) indicate that companies encounter serious difficulties in trying to realize the anticipated benefits from cooperation, similar to issues of EDI, et cetera. First of all, organizations may use the cooperation to pursue different strategic goals, which may induce partners to act against what is agreed upon, hide the truth or try to extract confidential information. Secondly, partner organizations often come from different industries (e.g. network operators, financial institutions, and retailers), each with their own distinct business logic. Such diversity may be necessary for the development of new innovative services, yet at the same time disrupt cooperation. Finally, cooperation gives rise to complex interdependencies between organizations because none of the partners has formal authority over the others. Hence, every adjustment has to be discussed and jointly agreed upon (Klein-Woolthuis, 1999).

Given the disappointing success rates of inter-firm co-operations and the risks and cost involved in the introduction of new mobile services, it is not surprising that practitioners and academics pay a great deal of attention to the concept of business models. In our view a business model is a blueprint for how a network of organizations co-operates in creating and capturing value from technological innovation (see Chesbrough & Rosenbloom, 2002). Although existing literature on business models is extensive (Afuah & Tucci, 2001; Hedamn & Kalling, 2003; Madehevan, 2000; Osterwalder & Pigneur, 2002; Weill & Vitale, 2001), the predominant focus has thus far

been on defining and classifying business models. Little attention has been paid to the way the various elements of a business model are and have to be related to one another. Designing business models is a complex issue because the needs and requirements of technical, financial, organizational and professional users or consumers have to be balanced. For instance, what makes sense from a technical point of view (better specs of positioning technology) may not make sense from a financial (higher costs) and user perspective (privacy concerns).

Moreover, organizations have to balance their different interests and business logics to create a 'win-win' situation, in which each player has incentives to co-operate, and in which the combined benefits are higher and the combined efforts smaller compared to a situation whereby each player is working separately. Although extensive literature on strategic alliances (i.e. Carlson, 1996) and network formation (i.e. Monge & Contractor 2003) is available it fails to provide insight into the subtleties involved in the design of viable business models for the provisioning of mobile services in value webs. This knowledge is needed to enhance our understanding of what constitutes a viable business model.

The objective of this paper is to explore the relationship between two business model elements: the customer value of service offering and the value network. The paper is structured as follows: first, a descriptive framework for studying the interrelatedness of business model elements is developed. This framework is then used to analyse the business models of two recent mobile initiatives offering workers access to back office databases and content, focusing on the relationship between the customer value of service offerings and the value network required to realize a service offering. We conclude by drawing conclusions concerning important issues regarding the design of viable business models and providing directions for further research.

### 6.3 A descriptive framework for studying business models

We view a business model as a blueprint of the way a network of organizations co-operates to create and capture value from the implementation of technological innovations. We look beyond the individual firm and expand the business model to include models for networks of companies: a collaborative effort by a number of companies to offer a joint proposition to their customers. When comparing the various existing definitions of business models it is possible to distinguish some common components that are network-oriented or can easily be extended (see e.g. Faber et al., 2003a):

- *Service offering*: a description of the value proposition (added value of a service offering) and the market segment at which the offering is targeted

- *Technological architecture*: a description of the technological architecture needed to realize the service offering
- *Organizational arrangements*: a description of the structure of the multi-actor value network required to create and distribute the service offering, and to describe the focal firm's position within this value network
- *Financial arrangements*: a description of the way a value network intends to generate revenues from a particular service offering and of the way risks, investments and revenues are divided across the various actors in a value network.

A business model can be regarded as a set of design proposals or blueprints for each of these domains. This paper focuses exclusively on the organization domain, i.e. the service network and its relationship with the other domains.

In this paper we focus on the connection between the customer value of services and the value network offering them. These two components are elaborated in greater detail below. Although the technological architecture -both cases make use of proven technologies -and financial arrangements -both case are funded publicly -are important, they are less relevant in the cases we will discuss later on.

An important element of a *service offering* is customer value. Value is seen as part of an equation in which customers in target markets compare the perceived benefits and total costs (or sacrifice) of (obtaining) a product or service (Chen & Dubinsky, 2003; Petrovic & Kittl, 2002). Customers must perceive the value proposition as superior to what competitors are offering, in terms of the desired satisfaction and effectiveness. The key factor is customer experience (Bouwman, Staal & Steinfield, 2001). In many cases customer value as perceived by the end-user has little to do with that which is envisaged in initial business models and to a large extent depends on the user's context as a person, professional or consumer (Chen & Dubinsky, 2003).

In general, *organizational arrangements* revolve around the resources and capabilities, configuring roles and relationships among a constellation of actors designed to mobilize the creation of value by new combinations of players (Normann and Ramirez, 1993). In their analysis of business models, Hedman & Kalling (2003) conclude that in the final analysis economic value is determined by a firm's ability to trade and absorb ICT-resources, to align (and embed) them with other resources, to diffuse them in activities and manage the activities in such a way as to create a proposition at uniquely low costs or with unique qualities in relation to the industry in which the company is operating. Increasingly, organizations have to work together to deliver customer value in so-called 'value networks'. Depending upon which actor(s) contribute key assets in the creation of value and what the operating risks involved are, different configurations of actors are likely to emerge, with some taking on structural, integrative roles in the alliance and others taking supporting, facilitating roles (Castells, 1996; Gulati, Nohria & Zaheer, 2000;

Kothandaraman & Wilson, 2001; Selz, 1999; Stähler, 2001; Tapscott, Ticoll & Lowy, 2000; Wigand, Picot & Reichswald, 1997).

The customer value of service offerings and the value network needed to realize customer value are closely related, as depicted in Figure 2. An important research question is how the design of a value network influences the customer value of a service offering and vice versa.

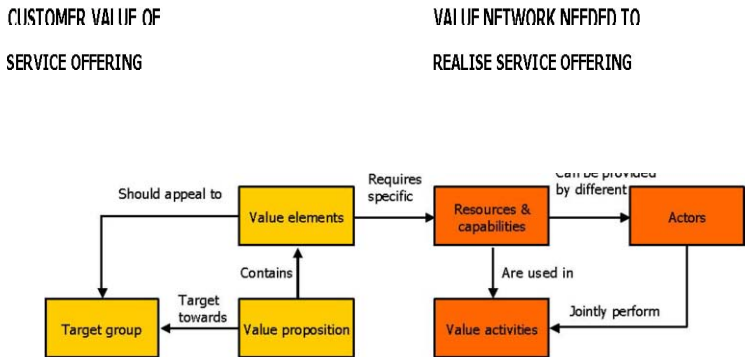


Figure 2: Connection between customer value of service offering and value network

We will explore this relationship by analyzing the business models of two cases involving access to back office information. Before doing so we will first elaborate on what services offering access to back office information involve.

### 6.4 Access to the back office services

Access to back office services is not restricted to access through cellular networks only, but also includes other wireless technologies such as wireless LAN or infrared. A2B services are offered to people on the move who need to communicate, make transactions or stay in touch with the office for other reasons. Executives, account managers, sales personnel, field technicians, nurses and policemen are examples of employees that might benefit from A2B services. Using A2B services mobile users can interact with databases, calendars, email systems and organizational Intranets. Devices that are typically used are PDA's, laptop computers or mobile phones. People using A2B services are able to access information such as customer account status, sales orders or product availability while at a customer's office or at another location. The key benefits of A2B are improved workflow and increased productivity. Improved workflow refers to a better flow of information while increased productivity stands for improvements in the employees' efficiency. Other benefits that are mentioned are cost savings and additional or new sources of income.

Figure 3 is a simplified representation of the technological architecture of A2B services (e.g. www.palm.com, www.geodan.com, www.kpn.com, www.wavehop.com, www.xora.com, IBM Global Services).

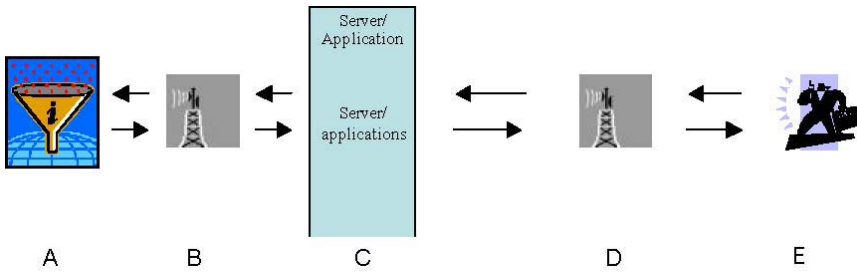


Figure 3 Technological architecture of A2B services

To offer some insight into the way A2B services function we will describe the streams of data caused by an information request. First, the user (A) enters a query on his device, which is connected to a mobile network (B). When working on the organization’s premises this can be a wireless LAN, but in most cases a public mobile network will be required that connects mobile workers to the server. Sometimes several networks are used between blocks A and C on the figure. An example is a combination of a mobile network and the Internet (tunnelling). The network establishes a connection with a server (C). This can be a direct connection, but in some cases the request is partly routed over the Internet or another network (D). Next, using specific applications (software) the server searches for the requested information and extracts it from its source (E), the company’s back office. The server is connected to back office information resources through a network as well. Generally speaking companies use a LAN or the Internet to connect the server to the requested databases. Finally, the requested information is sent to the employee following the same route back.

In theory all the technological aspects can be provide by one organization that offers in-house solutions to its employees. On the other hand, each element can also be supplied by an organization with which the employee has no relationship whatsoever. Considering the fact that most organizations do not possess all the (ICT) resources and capabilities required, the result will be a mix of these two possibilities. Some ingredients are offered by the organization for which the employee is working, while others are provided by other organizations. The picture presented above could take place inside one organization or it could involve various organizations. In general, the following technological ingredients are required to offer A2B services. *Devices* The employee needs a device to receive and send information from and to the back office. A wide variety of personal devices with wide-ranging capacities can be used to mobilize the company’s workforce including mobile phones, smart phones, notebook computers, PDA’s or a



combination of these devices. Currently these devices are widely available. *Networks* There has to be a (mobile) network connecting the mobile user to the required resources. The choice of networks is expanding rapidly, including Ethernet and Wireless local Area networks at the office, traditional telephone networks, digital cellular networks (both circuit switched and packet-switched) and WLANs at home and in hotels. Wireless and fixed broadband communications technology allows for increased mobility of the corporate workforce. Additionally, the wireless wide area and LAN connectivity enabled by cellular systems such as second-generation global system for mobile (GSM), 2.5G general packet radio services (GPRS) and future 3G networks, 802.11 WLAN and Bluetooth technologies makes it possible to transmit voice and data signals over wireless links. Advances in network security technologies also help foster security-rich communications, which is an essential consideration for any business. *Hard- and software.* None of these networks and devices can be used without some level of systems integration. For mobile communications to be both cost-effective and efficient a company must select the proper hardware and software to allow for wired and wireless network connections and easily integrate and manage mobility as part of the overall enterprise-computing environment. It is not enough merely to equip the workforce with notebook computers. They must be equipped with the right devices, network and infrastructure for their personal environment and contexts.

In practice we notice that many types of organizations offer (parts of) A2B services. For instance Palm (originally a device supplier) and IBM offer a complete solution including, servers, wireless LAN, software, and devices. However, most organizations only offer parts of the service. Wavehop and Geodan, for example, focus primarily on delivering applications and/or servers. Furthermore, network operators such as the Dutch KPN mobile offer A2B network services as well. Most A2B services we encountered are offered by at least two organizations that take on one or more roles, depending on their capabilities. To gain insight into these partnerships or value networks and to extract lessons with regard to improving value networks we conducted case studies.

## 6.5 Case study methodology

The research reported in this paper has been conducted within the B4U project, which includes not only mobile payments cases, but also cases dealing with mobile information and entertainment services, location-based services, communities, tracking and tracing, and personalized instant messaging. The research is based on desk research involving service networks that provide mobile business-to-employee services and case studies focusing on these services. The desk research gave us an overview of the innovative mobile business-to-employee services provided by service networks. For the

case studies we have conducted in-depth interviews with representatives of relevant actors that were involved in developing the services. In total we conducted six interviews. For the case study a case and interview protocol (Bouwman, Ballon, Faber and Hille, 2002) was used that was developed within the Freeband B4U-project and pre-tested in earlier projects (see for instance Maitland, Van de Kar & Wehn de Montalvo, 2003). The interviews were recorded and transcribed. Information from the interviews was supplemented with data from company websites, industry reports and academic literature. The data were stored in a central database, made accessible to all the researchers involved and systematically analyzed, and the results were validated by interviewees, whose comments were subsequently incorporated into the final paper.

## **6.6 Results**

To understand the dynamics of network formation we looked at the differences between the networks in the pilot phase and the exploitation phase of two business-to-employee services. We assumed that changes in the composition of these networks are driven by a desire to optimize the service network and balancing it with other domains of the conceptual framework. Analyzing the reasons for these changes give us insights into the dynamics of network formation in relation to the services offered. First, we describe the changes the networks have gone through during the transition from pilot to exploitation.

### **6.6.1 P-info**

P-info is a mobile business-to-employee service currently available in four police regions in the Netherlands. ITO (Information- and Technology Organization), the ICT provider for the regional police forces, provides the service via GPRS and GSM. P-info is a service that enables police officers to query office databases and national criminal investigation registers at any moment via their mobile devices. They can also send and receive e-mails, plan meetings in calendars, and request and store addresses and telephone numbers. ITO provides the service in cooperation with several other public and private organizations. The following organizations participate in the service network: Regional Police Departments, KPN Mobile, The Ministry of the Interior and Kingdom Relations (BZK), Geodan Mobile Services (a Dutch software provider), Nokia (mobile devices), and Oracle (software). The roles of each actor during the pilot phase and the exploitation phase are depicted in table 1.

\* GMS = Geodan Mobile Solutions, \*\* BZK = Ministry of the Interior and Kingdom Relations

<i>Actor Role</i>	<i>Pilot Phase Actors</i>	<i>Exploitation Phase Actors</i>
End user	Police officers	Police officers
Service provider	Regional Police	ITO
Content provider	Regional Police/ ITO	Regional Police/ ITO
Mobile Network Provider	KPN	KPN
Fixed Network provider	ITO	ITO
Application provider	GMS*/Regional Police	ITO
Device provider	Nokia	Nokia
Platform provider	Oracle	Oracle
Budget provider	BZK**	BZK

**Table 1 Service network for P-info in pilot phase and exploitation phase**

The service was introduced as a pilot in the police region “Gelderland-Midden” in 2000. During the pilot the service was provided to 24 police officers. The regional police force bought the devices from Nokia and developed the applications in cooperation with Geodan Mobile Solutions. The applications ran on a server on which an Oracle platform was installed. The content was provided by the regional police force, which manages regional databases, and ITO, which manages nationwide databases. The nationwide databases and the regionally owned databases are connected through a nationwide fixed network (Policenet), which is controlled by ITO.

During the pilot users of P-info and the regional police force indicated that the service was supporting daily operations and other regional police forces expressed an interest. ITO and BZK recognized the relevance of the service for other police regions. However, the service network that delivered the P-info service was considered unsuitable for a broad introduction. The technological and organizational scalability of the service was a major problem. A restructuring of the service network was required, since it is impractical and relatively costly to develop the service in separated regions at the same time. ITO took matters into its own hands and the current service network of P-info emerged (see third column of table 1).

The service network in the exploitation phase is different from the service network in pilot phase in two respects. First of all, the service is now provided by ITO, which offers the regional police forces access to all databases connected through Policenet. When a user requests information from a database (either regional or nationwide) he sends a query to a server located at ITO. The server accesses the necessary database(s) and returns the requested information. Secondly, ITO is now offering applications that connect the mobile network to the fixed network. These applications are owned and managed by ITO. The development of the applications takes place in cooperation with GMS. The applications enable the exchange of information between the databases and the policemen on the street. Formerly, the applications were owned by the regional police forces.

### 6.6.2 Caremore

Caremore is a mobile application allowing employees of the homecare institution Sensire to connect to the back office for care registration, planning and patient files by means of a PDA and mobile phone. It is one of the few examples of a new ICT service in the healthcare sector which appears to be considered a success by all the stakeholders. The data and reports available for this case allow us to follow the development of this service from the initial idea up to the current rollout involving 1100 homecare workers.

The case study provides us with two different service networks: one from the pilot phase of the service and one from the exploitation phase. We have compared the actors involved in both networks in table 2.

\* CGE&Y = Cap Gemini Ernst & Young

Actor Role	Pilot phase actors	Exploitation phase actors
End user	Homecare workers	Homecare workers
Service provider	Sensire	Sensire
Support provider	CGE&Y*	Sensire
System integrator	CGE&Y	Sensire
Hosting provider	Sensire	Sensire
Application provider	CGE&Y + MoTel	Intraworks
Network provider	Telfort (O2)	KPN
Handset provider	Ericsson	Nokia + HP/Compaq

**Table 2 Service network for Caremore in pilot phase and exploitation phase**

Some shifts in the service network can be observed. CGE&Y, Telfort and Ericsson disappear from the network in the transition from pilot to exploitation. Sensire took over two roles from CGE&Y. Especially the fact that Sensire claimed the dominant central role as systems integrator had implications for actors within the initial network. New actors replaced the pilot actors. Sensire decided to swap network provider Telfort (O2) for KPN. Telfort provided the necessary connections and support during the pilot phase for free. Despite this generous gesture, Telfort was not selected as network provider in the exploitation phase. The relationship that already existed between Sensire and KPN, combined with the image of trustworthiness and competitive pricing, led to the selection of KPN as network provider. During the pilot phase end users were dissatisfied with the small screen. KPN searched for other suitable devices and found that only a combination of two devices with a Bluetooth connection could provide the user interface that was required. Therefore, two new actors in the network (Nokia and HP/Compaq) replaced Ericsson. Although Sensire valued the (informal) cooperation with CGE&Y during the pilot phase, the company decided that its IT department could take over the roles of CGE&Y in the exploitation phase. The role of application provider was transferred to a small actor: Intraworks, plainly for reasons of cost reduction, especially by avoiding high costs for consultancy. There was also friction between Sensire and CGE&Y about who could claim the 'invention' and success of the Caremore application, which may have contributed to this decision. CGE&Y acquired the right to market the Caremore service to other care institutes.

### 6.6.3 Analysis

Because of the success of the P-info pilot it was decided to expand the service to other regional police forces. The service network that existed during the pilot was not longer sufficient to *deliver* the *value* that was required to exploit the service. Therefore, the service network needed to be modified. The regional police forces do not possess the *resources* and *capabilities* and *technological architecture* to support the rollout of such a complex and nationwide service. A regional police department cannot perform the role of a service provider and application developer for P-info. Since there already were *organizational arrangements* in place between the regional police departments and ITO, the *actors* agreed that ITO should take over these activities, as it was considered capable to perform the required *activities*. The centralized development and service provisioning improves the scalability of the service, including expansion to other regional police forces.

The results of the Caremore case show the leading role of the *service domain* over the *technical domain* by clearly redefining requirements. To meet the new technological demands of users other *resources* and *capabilities* were required which could only be obtained by replacing *actors* in the service network. The service network was clearly

redefined due to decisions in the service domain that led to changes in the *technical architecture*. The reason for Sensire to replace Telfort with KPN lies in the “*relationship*” concept of the service network model. Sensire had a good relationship with KPN and therefore preferred KPN above Telfort. However, this can also be interpreted as an example of a locked-in relationship or a desire on the part of the incumbent operator not to lose a client to a competitor. The case study results furthermore suggest that there was insufficient trust between Sensire and CGE&Y. There was a mismatch in *strategies* between these two actors. Sensire thought the activities of CGE&Y were too costly and their behaviour opportunistic. The results show that trust in the *relationships* between *actors* influences the shape of the service network.

## 6.7 Discussion and conclusions

The results of the case studies should be interpreted with caution. They were conducted in a not-for-profit environment. The reasons for choosing certain network partners may be different in a profit-driven environment. The kind of economic considerations that are characteristic for companies that strive for profits may result in other, perhaps more rational decisions or another timing, whereas decisions in a public environment tend to be based more on social considerations.

We assume that the dynamics we encountered in the networks have been primarily the result of a desire to maximize the performance of the service network. In the case of P-info, scalability and access to a number of regional and national databases were of major importance. In the case of Caremore, access to the service via other devices was important to improve performance. Based on the assumption that a proper selection of network partners is of key significance to service performance, i.e. customer value, the dynamics within the service networks offer an explanation for the performance levels of services. There are, however, alternative explanations available. It may be possible, for instance that the selection of network partners is motivated by opportunistic reasons, although this does not seem very likely and the interviewees did not mention it.

The reasons behind the above-mentioned shifts in the composition of the service network do not seem to be unique to the mobile business-to-employee services domain or even to mobile services in general. They seem to be of a more general nature. This leads us to believe that the framework and its elements might have a more general validity for services that need the cooperation of actors to deliver the required value. The concepts seem useful in describing the relevant issues regarding service network design. However, the indicators that can be used to measure the concepts may vary depending on the kind of service. In the cases we studied it would appear that that trust between partners based on an existing relationship and scalability were important indicators.

Other cases (Haaker, Faber and Bouwman, 2003) analyzed within the Freeband B4U project also focus on the relationship between the customer value of service offering and the service network itself. There appears to be a direct relationship between the *intended value* of the service offering on the one hand and service network requirements. We can see this, for instance, as an explanation for the change in the service network of P-info. When the pilot turned out to be a success, the service was expanded. Scalability became an issue. In other words, the *intended value* of the service changed: access to more and other databases was requested. As a result service network requirements changed, which led to new organizational arrangements.

We investigated two phases (the pilot phase and the exploitation phase) in service networks. We examined two static pictures and searched for reasons for the differences that existed between the two stages. We did not examine the sequence of changes that took place over time. Taking a look at every change individually and the resulting sequence may have shed more light on the specific reasons and circumstances. Future research should analyze the dynamics of service networks in greater depth in order to arrive at a better understanding of why and how service networks change over time.

Our case studies merely caught a first glimpse of the dynamics of network formation, and we feel that more in-depth analyses should be conducted in order to create design guidelines for the development of business models. The first step towards a design methodology is the definition of indicators that enable the measurement of the concepts in the service network model. Some indicators found in literature, such as trust and commitment, seem to influence network and thus service performance. Furthermore, it turned out that finding the right match between the network and customer needs is also important, as was already suggested by Martha and Bovet (2000).

Our research indicates that the concepts used in our model help us understand the relationship between network formation and the performance of a service network. The case studies also demonstrate that designing a successful service network is only a small part of designing a business model for a new mobile B2E service. The service network should match the service proposition. Even though we could not discuss the dynamics involved in greater depth, there is clear evidence of a relationship between network changes on the one hand and improves performance on the other.

Although we are aware that our conclusions are based on a limited set of cases, we see similar patterns in other cases studies conducted in the B4U projects. We also want to emphasize that the objective of our case studies was to improve our knowledge of the design issues that are critical to the success of innovative mobile services and to determine what the interdependencies between the four design domains are. In this paper we discussed the relation between customer value of the service offering and the organizational arrangements, i.e. network formation.

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## **7 Searching for Content: Information Behaviour of Users on the Internet**

*Sona Makulová*

### **7.1 Abstract**

In line with the developing of new information technologies and emerging digital libraries, information behaviour of users has been revived as part of library and information science research. In Slovakia, practitioners and researchers need to pay more attention to these issues, especially in the new light of electronic communication and digital libraries.

The aim of this study is to analyze the information behaviour of users searching for information focusing on specific content areas of the Slovak Internet. Besides the analysis of the results and methodologies of similar research conducted abroad, we present our own comprehensive research on the information behaviour of users. The research analyzes the search habits and content preferences of Slovak Internet users. The research shows that the information architecture and the usability of a web site influence greatly people's search habits. The research also analyses how well Slovak search tools meet the search requirements of an information architecture. The transaction logs on the Slovak server Surf.sk as well as other surveys are analysed to determine the information seeking behaviour of users.

### **7.2 Introduction**

According to the data of WebSideStory, Inc. from March 2003, the search engines are becoming important source about new web sites. Search sites accounted for more than 13,4 percent of global referrals, up from 7,1 percent the previous year. It means that people are more efficient in their Web use, the trend is that they either navigate directly to a Web site they already know, or use a search engine to find a new one (Search Engines Continue.. 2003). In spite of this, on the basis of the results of many surveys, people find that the biggest problem of Internet, is information overload, and the problem of finding relevant information.

A report by Peter Lyman and Hal Varian at the University of California Berkeley states that the world produces between one and two exabytes (a billion billion 8-bit bytes) of information each year. Most of this information is in the form of images, sound, and numeric data; textual content represents only 0.003 percent of all content published

annually in the world. For every sentence published in print there are 30,000 sentences published digitally. Nearly 90% of the published information being produced is created, stored, and may be retrieved in digital form. But only very little of this information is available via digital libraries.

The vast quantity of digital information is not as structured as we were used to find in professional information services. This unstructured content requires new methods and new techniques of accessing information anticipating the behaviour of different types of users.

The aim of the study is to analyse the information seeking behaviour of the users with the special emphasis to Slovak Internet and its users. We use the results of an extensive survey that was conducted in September and October 2002. 1686 respondents answered 30 questions. The information seeking behaviour analysis is also based on the analysis of transaction logs of the Slovak server SUR.sk.

### **7.3 Survey dealing with the information behaviour of internet users**

With the enormous growth of the World Wide Web, there has been an increased demand for an understanding of the WWW audience. There are many studies providing detailed information about the Web and its demographics. But there has been no large-scale, quantitative or qualitative study of user behaviours of searching the Web. How do they search the Web? What do they search for on the Web? We have to take into account that the Web is an information universe of users who have different types of user needs.

This is a very important concern because according to the latest estimates, there were about 605 million users online in September 2003. There are numerous studies concerning the traditional information retrieval systems and online public access catalogue users. But the lack of web users' studies is surprising and disappointing. We have to take into account that the Web is a heterogeneous collection of information resources with minimal standards for selection, organization, and retrieval of information.

Bernard Jansen, Amanda Spink and Tefko Saracevic (2000) did one of the most comprehensive research studies of Internet user behaviour. They analyzed transaction logs containing 51,473 queries posed by 18,113 users of Excite. The most interesting findings of the study are:

- web users do not use Boolean operators and other advanced forms of searching, as compared to the users of DIALOG or other professional retrieval systems,
- the users do not browse the search results beyond the first page.

The vast majority of Web searchers make little use of advanced query techniques. Keily (1997) conducted a study utilizing queries from WebCrawler and Magellan. Of the 2,000 queries, only 12% contained Boolean operators. Silverstein, et al., (1999) presented results from an analysis of nearly billion queries submitted to the Alta Vista search engine over a period of six weeks. Again it was shown that web users differ significantly; they type in short queries, mostly look only at the first 10 results, and seldom modify the query. This suggests that traditional information retrieval techniques may not work well for answering web search requests. Jansen, et al. (2000) published a study concerning searching on the Excite search engine. In his analysis, approximately 8.5% of the queries contained Boolean operators. Approximately 9% of the queries contained some other advanced query operator.

The use of Boolean operators in these Web searching studies is substantially lower than the rates reported in studies of searchers using traditional information retrieval systems such as DIALOG or LEXUS/NEXUS. For example, Siegfried, et al. (1993) reported Boolean usage of over 36% on the DIALOG system, which the researchers considered a low rate of usage.

The implication of these findings leads to the question: Do Web searchers increase the probability of finding relevant information by increasing the complexity of their queries? Advanced searching techniques are well known and one can find numerous articles on advanced searching strategies. However, based on the Web studies, it appears that the majority of Web searchers continue to use very simple queries.

Recent studies suggest that Web users are finding the information they want. A survey of users on a major Web search engine reports that almost 70% of the users stated that they had located relevant information on the search engine. Searchers appear to be finding information using a technique that should be ineffective or at least inefficient.

Some of the very interesting results were shown in the study of Jansen (2000). He presented findings from a study of the effects of query structure on retrieval by Web search services. Fifteen queries were selected from the transaction log of a major Web search service in simple query form with no advanced operators (for example, Boolean operators, phrase operators, etc.) and submitted to 5 major search engines - Alta Vista, Excite, FAST Search, Infoseek, and Northern Light. The results from these queries became the baseline data. The original 15 queries were then modified using the various search operators supported by each of the 5 search engines for a total of 210 queries. The results obtained were then compared to the baseline results. Findings suggest that the use of complex queries is not worth the trouble. The behaviour of Web searchers adheres to the principle of least effort (economy of effort, perhaps a form of Occam's razor). This can explain the behaviour of Web searchers. The results obtained via simple queries are good enough.

These facts emphasise the new approach to the design of the Web information retrieval systems, search engines and also Web site design in a different way. While the searching in the professional commercial services was mostly done by information professionals, on the Internet more and more users rely on themselves. But, according to the research, not many Internet users understand how the search engine interprets their requirements, what are the differences between the search engines and the directories, and how to use the Boolean operators, etc.

Search engines owe much of their historic development to an implicit assumption of a well organized, relatively homogeneous collection as we were used to finding in a library or commercial abstracting and indexing database. The Web violates this assumption because its information resources are highly diverse, distributed and heterogeneous, with greatly varying content and quality. The increased complexity of search tools is not likely to significantly assist the average Web searcher, whose queries rarely include more than two key terms. There are even some opinions that the search tools will be adapted to the behaviour of average Internet user (Larsen, 1977).

#### **7.4 Search behaviour of typical internet user**

On the basis of many surveys regarding search behaviour of Internet users, we can state following facts (Makulová, 2002):

- most of the queries have in average 2,35 terms,
- individual terms do not represent the content of what is the user looking for,
- the users do not know how to use the Boolean operators (80% of the searches are without Boolean operators),
- 85% of the users do not browse the search results beyond the first page,
- 78% of the queries are not modified,
- 22% of the users are looking for the certain page,
- 24% of the users would like to download something from the internet,
- 10% of the users use the internet as the place for shopping,
- many of the users do not search, they just follow the hyperlinks.

It is evident that people are spending increasing amounts of time working with electronic information and its sources. In the next table (table 1) we see searches per day in the most known search tools (Sullivan, 2003).

**Table 1: Searches per day in the most known search tools.**

<i>Service</i>	<i>Searches Per Day</i>	<i>As Of/Notes</i>
Google	250 million 130 million	February 2003 October 2001 (for queries at both Google sites and its partners)
Overture	167 million	February 2003
Inktomi	80 million	February 2003
LookSmart	45 million	February 2003
FindWhat	33 million	February 2003
Ask Jeeves	20 million	February 2003
AltaVista	18 million	February 2003
FAST	12 million	February 2003

Chris Sherman (2002) published in SearchDay 2001 (table 2) most searched-terms at Google, Yahoo and Lycos. In the case of Lycos there is last year's rank in parenthesis.

**Table 2: 2001's most searched-for terms at Google, Yahoo and Lycos**

<i>Google</i>	<i>Yahoo</i>	<i>Lycos</i>
1. nostradamus	1. PlayStation 2	1. Dragonball (2)
2. cnn	2. Britney Spears	2. Britney Spears (1)
3. world trade center	3. WWF	3. Napster (8)
4. harry potter	4. Dragon Ball Z	4. Tattoos (7)
5. anthrax	5. Napster	5. Osama bin Laden (-)
6. windows xp	6. World Trade Center	6. IRS (23)
7. osama bin laden	7. Harry Potter and the Sorcerer's Stone	7. Pokemon (3)
8. audiogalaxy	8. Dale Earnhardt	8. World Trade Center (-)
9. taliban	9. NASCAR	9. Nostradamus (-)
10. loft story	10. Internal Revenue Service	10. WWF (4)

In Slovakia the most searched-for terms for the year 2001 at the portals Atlas and Centrum was the term SMS. Among the first ten terms there were the word mobile, the themes for entertainment and relaxation (chat, video, etc.), and employment (job,

profession, brigade. In the following table (table 3) there are most searched-for terms at Atlas, Centrum, and Surf.sk.

**Table 3: 2001's most searched-for terms at Atlas, Centrum and Surf.sk**

<i>Atlas</i>	<i>Centrum</i>	<i>Surf.sk</i>
SMS	SMS	sex
mp3	sex	SMS
sex	www	gay
porno	porno	mp3
mobil	praca	erotika
mapy	mob	porno
praca	CD	lolita
pohľadnice	mobil	praca
zoznamka	video	pohľadnice
gay	chat	inzercia
erotika	web	video
inzercia	zamestnanie	nokia
hry	zoznamka	mobil
logo	brigada	reality
nokia	obchod	knihy
chat	zoznamenie	chat
práca	pokec	download
auto	globtel	obrázky
referaty	sutaz	hry
zamestnanie	shop	zadarmo

## 7.5 The analysis of transaction logs on Slovak server SURF.SK

From January 2003 till March 2003 we analysed transaction logs on the Slovak server SURF.SK, (<http://www.surf.sk>) that contains information about more than 20,000 web sites of the Slovak

Internet. It is a portal with a well designed search facility. The individual websites are evaluated, and the best websites are put into a TOP category. The system has a very well elaborated advanced options for searching. Despite this, when we analysed the 500 most frequent used queries, out of 40,000, we found that very few queries contained more than one term (napaľovanie CD, erotické povídky, cestovná kancelária, práca v zahraničí, teen sex, tetris 4000, logo zadarmo, britney spears, Harry Potter, ponuka práce, obchodný register, free SMS, Banská Bystrica, brigády v zahraničí, pracovné príležitosti). The most frequently used terms were the words sex (frequency of occurrence 660), sms (494), gay (298), pohľadnice (277), mp3 (264), erotika (236), porno (156), incest (152), práca (143) a pod.

## **7.6 Information architecture and its influence on the design of the website**

Nowadays with the growing number of new websites, an emerging discipline, information architecture, is focusing on applying principles of information design and architecture to the digital landscape. There are many approaches to the definition of the information architecture, we can define it broadly as (Rosenfeld - Morville 2002, p. 4):

- The combination of organization, labelling, and navigation schemes within an information system.
- The structural design of an information space to facilitate task completion and intuitive access to content.
- The art and science of structuring and classifying web sites and intranets to help people find and manage information.

There are already several recommendations of the information architects concerning the navigation paths, classification schemes, searching and designing of metadata.

It is evident that the usage of advanced search options is rarely used by Slovak Internet users. According to our opinion, it is mainly caused by imperfect (poorly designed) user interface, none of the most known Slovak search tools offers a predefined form for the formulation of the query for an advanced search. Also, they do not adhere to the following recommendations of the information architects concerning searching on the websites:

- The basic search box should appear on every page on the website, preferably in the top right, or near the top left, just underneath the organisation logo. The link to the advanced search should be placed next to the box of the basic search.
- A help link, close to the Search button, should be provided on how to use the advanced search functionality.



- As Boolean search is not well understood by most people and should be always supported by comprehensive help. To simplify Boolean search, options such as "with all the words", "with the exact phrase", "with any of the words", "without the words" should be available. This is so called predefined form.

In the next table (table 4) we see the way to which the most used Slovak search tools fulfil the recommendations of the information architects.

**Table 4 : How the Slovak search tools fulfil the recommendations of the information architects for the advanced search**

	Zoznam <i>http://www.zoznam.sk</i>	Atlas.sk <i>http://www.atlas.sk</i>	Centrum.sk <i>http://www.centrum.sk</i>	Surf.sk <i>http://www.surf.sk</i>	Superzoznam <i>http://www.szm.sk</i>
1.	there is no link to the advanced search	the link to the advanced search is just next to the box of the basic search	the link to the advanced search is just next to the box of the basic search	there is no link to the advanced search, the advanced search may be used already from the basic search box,	there is no link to the advanced search
2.	there is no help link	there is no help link	there is a detailed help at the page of the advanced search	there is a detailed help just next to the search box	there is no help link
3	no predefined form	no predefined form	no predefined form	no predefined form	no predefined form

As we see from the table none of the Slovak search tools meet the recommendations of the information architects for the search tools, that are de facto standards in the world of search engines (Google, Alltheweb, AltaVista, Teoma). This can be illustrated by the following picture (figure 3) where we see the very well designed predefined form of the search engine Teoma.

Figure 3: The predefined form for the advanced search of Teoma

**TEOMA** [Advanced Search Tips](#)

**Advanced Search (BETA)** Results per page: 10  Open results in new window

Find:

Include or exclude words or phrases:

One phrase or word per entry

Anywhere on page, page title, or URL:

Language:

Domain or site:

Geographic region:

Date page was modified:

Before

Between    and

The not up to standards design is perhaps also one of the reason why in Slovakia the advanced search option is not used at all. What is the most surprising is that the most visited Slovak search tool Zoznam slovenského Internetu (The directory of Slovak Internet) does not provide the possibility for the advanced search option at all, nor the help facility for searching. According to the audit of Taylor Nelson Sofres, it has more than 36,000 unique visitors daily. In January 2003 it was visited by nearly 360,776 unique visitors, representing nearly 41.49% of the Internet population in Slovakia.

The results of the surveys of using Boolean operators abroad are different. We made a check of a random sample of the queries in the meta-search engine MetaCrawler. We monitored the queries with the help of (<http://www.metaspys.com>), in real time the queries that were just submitted to the system. According to our observation most of the searches used multiple keywords, as well as the Boolean operators.

## 7.7 Search behaviour of the Slovak internet user

In the following table (table 5) we see the most used search tools and the results from their audit for August 2003 (source Taylor Nelson Sofres).

**Table 5: iAudit of Slovak search tools for August 2003 (source Taylor Nelson Sofres)**

<i>Search tools in August 08/2003</i>	<i>Unique visitors per month</i>	<i>Unique visitors per day</i>	<i>% reach monthly</i>
zoznam.sk <a href="http://www.zoznam.sk">http://www.zoznam.sk</a>	376 535	44 941	46.90 %
szm.sk <a href="http://www.szm.sk">http://www.szm.sk</a>	193 545	14 414	24.11 %
centrum.sk <a href="http://www.centrum.sk">http://www.centrum.sk</a>	120 680	11 177	15.03 %
atlas.sk <a href="http://www.atlas.sk">http://www.atlas.sk</a>	108 591	7 367	13.52 %
best.sk <a href="http://www.best.sk">http://www.best.sk</a>	32 297	1 589	4.02 %

A study examining search habits and content preferences of Slovak Internet users was conducted in September and October 2002. The most frequently visited sites in Slovakia provided special links to the survey. Specially designed banners promoted the survey. 1676 users answered 40 questions. The study was conducted by EL&T with the cooperation and sponsorship of media agency SITA, Computer Press and EuroTel. Here are some interesting preliminary statistical results:

- Internet usage in Slovakia is growing. According to the survey of MVK Internet was in June 2003 used by 31,8 percent population (in December 2001 it was 23 percent and in November 1997 only 5 percent of the population).
- Of those completing the survey, 82,1 percent are men and 17,9 percent are women between the ages of 21-25 (39,56 percent) and 26-30 (22,37 percent);
- 78 percent of the Internet users surveyed found information about new web sites by searching the Internet, 71 percent by following links, and 53,34 percent from their friends;
- 51 percent of the users surveyed do not know the difference between a search engine, directory and meta-search engine;
- Only 8 percent of the surveyed users are always satisfied with the found information, while 70 percent are mostly satisfied and 20 percent are sometimes satisfied;

- When using search engines, irrelevant results (71,3 percent), banner advertisements (36,69 percent) and too many results (32,16 percent) are problems for those surveyed;
- Google (81,9 percent) is the most frequently used non Slovak search tool, followed by Yahoo (44,63 percent), and AltaVista (43,2 percent);
- Zoznam.sk (79,36 percent) is the most frequently used Slovak search tool, followed by Superzoznam (39,62 percent), and ATLAS.sk (25,24 percent);
- The Internet is used primarily for education (78,16 percent), e-mail (69,45 percent), entertainment (62,41 percent), but also for business purposes;
- The most preferred format for information is still text(90.1 percent).

The survey shows that, while Internet users in Slovakia accept the Internet as a means of mass communication similar to TV, the Press or radio, there is still a problem with websites' content, with only 37 percent of the web users surveyed satisfied. Of those users surveyed, many do not know how to search effectively for the desired information; only 60 percent use Boolean operators in query formulating, and 90 percent of the users surveyed do not know any intelligent search technologies. The respondents consider the Internet as an important source for getting the information, with 40.63 percent of those surveyed spending more than one hour daily searching for information.

## **7.8 Conclusions**

The results from the survey show that internet is already well rooted also in Slovakia and is becoming the part of everyday life and important source of information as well. It is evident that people do not know the techniques and methods of accessing the information. Often, they search intuitively and they are usually satisfied with the large number of results. They do not know how to evaluate the results from the point of the view of precision and recall.

Slovak search tools do not meet the recommendations of the information architects for the design of the search engine's interface. None of the search tools offer the possibility to use a predefined form, and the help files are very poorly elaborated. It is necessary to improve the system of educating the users for searching and researching on Internet at all levels of education. It is very important, because the amount of information in digital form is growing, as is also the information overload of the users.

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## C. EXPERIENCES WITH CONTENT

### 8 Preliminary guidelines for the design of the mobile learning activities and materials

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#### 8.1 Abstract

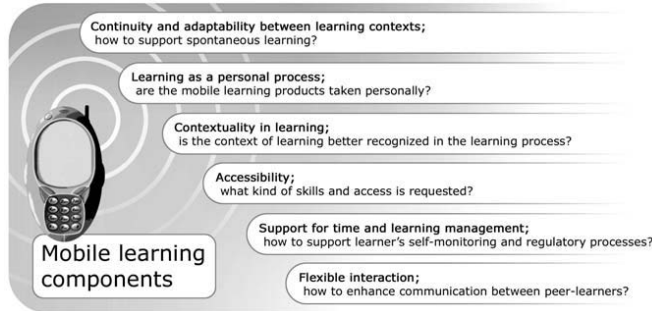
Churchill and Wakeford (2002) have analysed consumption of mobile devices with the model of “cultural circle” (du Gay et al. 1997, Hall 1997) and suggested the use of this model reflexively when designing mobile technologies. The idea is to take into account the broader cultural context of the technology use and to build on existing practices, as well as to develop innovative technologies that enable new, complementary practices (Churchill & Wakeford 2002). We suggest that our model of the mobile learning components (components) developed in the Digital Learning 2 project can be used likewise as a descriptive and analytic tool to track the learning practices in which mobile learning is supposed to embed. Moreover, it can be used as a heuristic model that supports the design of the actions and materials in the specific context of mobile learning. In this paper we describe the application of the model in primary school settings and discuss the consequences from the content production point of view.

#### 8.2 Introduction

Churchill and Wakeford (2002) have analysed consumption of mobile devices with the model of “cultural circle” (du Gay et al. 1997, Hall 1997) and suggested the use of this model reflexively when designing mobile technologies. The idea is to take into account the broader cultural context of the technology use and to build on existing practices, as well as to develop innovative technologies that enable new, complementary practices. (Churchill & Wakeford 2002.) In the Digital Learning 2 project’s mobile group we have developed a model of mobile learning components (mComponents) basing on earlier studies and pilots. (Jonassen 1995; Sharples 2000; Kynäslahti 2002; Leino, Turunen, Ahonen & Levonen 2002; Ahonen, Koponen, Syvänen & Turunen 2002; Rönkä & Sariola 2002; Ahonen, Pehkonen, Syvänen & Turunen 2003). The mComponents model depicts the elementary components of mobile learning that can be either weaknesses or strengths in their realisation. The model has been tested in the expert interviews and in the form of mobile learning questionnaire (MLQ) in our primary school pilots (see Turunen, Syvänen & Ahonen 2003; Syvänen, Pehkonen & Turunen



2003). We suggest that the mComponents model can be used likewise as a descriptive and analytic tool when designing learning actions and materials for mobile learning and tracking the learning practices in which mobile learning is supposed to embed.



**Figure 1. The general model of mComponents.**

Our main research subjects have been 11-12 years old 6th grade primary school pupils who have used mobile devices in communicating and working collaboratively with other pupils in Hämeenlinna, Kittilä, Pirkkala and Turenki. In Pirkkala, a 6th grade class (23 pupils) has used two Nokia 9210 Communicators, a laptop and a digital camera on their field trips, and processed the materials for the online publication with eight computers in the computer class. A small primary school of Raattama (18 pupils) in Kittilä has acted as a remote partner in the Communicator pilot in the years 2002-2003 with one communicator and two PCs. In Hämeenlinna (Normaalikoulu, a wireless future school), a 6th grade class (26 pupils) has had personal laptops with GPRS card and WLAN. This autumn (2003) we started a pilot with eight Pocket PCs (Hewlett Packard's iPAQs: four h3900s, four h5450s with the GPRS cards, four keyboards and four additional cameras) that have circulated between 6th grade classes in Pirkkala and Turenki.

The starting point in our studies has been to find out what kind of learning tasks can be best supported by the mobile devices and what kind of learning activities apply in mobile learning. In the present operational environment we see the pervasiveness of mobile devices as a potential advantage. Thus our primary school pilot's hypothesis of mobile learning argues that bringing this pervasiveness of mobile devices to the primary school would help in making learning more meaningful by combining the different situations of school work, studying and leisure (Ahonen, Joyce, Leino, Turunen 2003, Ahonen et al. 2003; Turunen et al. 2003; Syvänen et al. 2003).

Mobile learning is not supposed to replace the existing practices in classroom, but rather complement them. Therefore, mobile learning has been approached from the

viewpoints of flexible (Collis & Moonen 2001) and lifelong learning (Sharples 2002, 2000) and the development focuses also on informal learning situations outside the classroom.

The teachers have been interviewed on their experiences with mobile learning. Qualitative data have also been acquired in observing the field experiments and interviewing the pupils. The findings and the mobile learning components (mComponents) will be reflected from the mobile learning activities and materials point of view. Due to the lack of accessible mobile learning materials and environments for primary school level, we have also produced some mobile learning materials together with the teachers for our experiments. The learning content production has provoked observations and research on the accessibility and usability of mobile learning materials. Based on the experiences from the pilots we have been developing preliminary guidelines for the design of the mobile learning activities and materials.

## 8.3 Theoretical backgrounds

### 8.3.1 On design practices

“... in academia there is much talk, little action. In industry, there is much action, little thought.” (Donald A. Norman)

In the context of technology design, users have been noted in the area of ergonomics (or human factors), human-computer interaction (HCI) and usability engineering. User interfaces and their usability have been recognised critical for the productivity in the knowledge based work, for the perceived quality of working life, and for the competitive strength of the technology products (Kuutti 2000).

Traditionally usability has been associated with the five usability attributes: learnability (easy to learn), efficiency, memorability (easy to remember) and consistency (few errors) of the system, as well as satisfaction (pleasantness) of use (Nielsen 1993, 24-37). Iterative development has been managed according to explicit and measurable objectives, called “usability specifications” (Carroll 1997). During the 1990’s it was accepted that users must be involved into the design processes to gain good usability (Kuutti 2000).

In “participatory design” users are involved in setting design goals and planning prototypes, instead of becoming involved only after initial prototyping. Also field-study approaches of “contextual design” and “ethnographically informed design” have emerged to characterising the users’ real needs and circumstances (Carroll 1997). The principles of the iterative user-centred design process have been described in the ISO 13407 standard in 1999 (Kuutti 2000). In the case of mobile learning the application of user-centred design means not only planning the learning goals and learning actions but

also specifying different contexts of use, and requirements of different actors (teachers, pupils, parents, students, tutors) using the system.

However, in the industry field the cost of user studies became a central issue. Many proposals have been made for usability inspections, checklist and script-oriented approaches to supplement or even replace direct user testing (Carroll 1997). According to Carroll the term "usability engineering" connotes a practice that is broader and more systematic than is currently the case.

Norman (2001) states that to do design requires an approximate science, a way of doing quick but effective computations: guidelines that are useful for synthesis and design. In the time pressures of the industry, this translates into application of the different usability heuristics as rules of a thumb in design processes and usability tests as something that verifies the design solutions (Bannon 1991, Kuutti 2000, Norman 2001).

When designing new learning applications for mobile devices it seems evident to broaden the focus from the traditional usability attributes and laboratory tests to the context of use and the user experience. Bannon (1991) suggests using the term "human actors" instead of human factors and shifting from a product to a process orientation in both research and development of systems. In design the emphasis is placed on the person as an autonomous agent that has the capacity to regulate and coordinate his or her behaviour, rather than simply being a passive element in a human-machine system. Understanding users as the actors in situations, with a set of skills and shared practices based on work experience with others, requires new ways of understanding the relationship between people, technology, work requirements and organisational constraints. Also the underlying values of the people involved and their motivation in the work settings should be taken into account (Bannon 1991.)

When the use of a system has been traditionally seen as bound to the workplace, mobile learning insists on a new user paradigm as well as a new approach to design. Taking into account the nature of the media and its use, the user must be seen more as an actor, who uses a device in different actions of communicating, producing, learning, amusing and playing. When considering mobile devices, the use of which is not bound to certain place or context, the need to take the contextual factors into account is even more salient and the testing in the real situation a necessity (Lindroth & Nilsson 2001). Preece, Rogers & Sharp (2002) note that the emergence of the new computing technologies – e.g. multimedia, virtual reality, networking, mobile computing – have offered new possibilities to support all the people in their everyday lives in diversity of application areas. This requires also diversity of disciplines involved in design and sets other concerns than focusing primarily on improving efficiency and productivity at work. In "interaction design" (or experience design) main focus is in creating user experiences that enhance and extend the way people work, communicate and interact.

Especially in designing the kinds of products which people have a choice of whether to buy or use and of how to interact with them, we need to consider also emotional issues of appeal, fun, aesthetics, taste, ritual, image, lifestyle – the entire range of personal, social and cultural practices. Experience is a dynamic, complex and subjective phenomenon that depends upon multiple attributes of design that are interpreted through filters of personal, social and cultural significance. (Fulton Suri 2002, 162-163.)

Therefore, the user experience goals are concerned with making products enjoyable, entertaining, fun, motivating, supportive of creativity and aesthetically pleasing. These goals are separated from the specific usability goals. The design is informed by the quality of the user experience e.g. how users experience an interactive product from their perspective. This involves explicating the nature of the user experience in subjective terms. The interaction design process begins with defining user needs and goals and specifying the functional, data, environmental, user and usability requirements. The process follows the iterative process of user centred design in other respects too. (Preece et al. 2002.) In this paper we aim at feeding the design of meaningful mobile learning experiences by taking into account both learner's internal and external factors in different mobile learning situations and the cultural context in which the mobile learning actions are taking place.

The cultural studies approach is not only aiming at depicting broader cultural context of technology use but also the articulation of a number of distinct processes. Representation is seen as a central element in signifying processes through which cultural meanings are produced and communicated. Representation intertwines into processes of identity, production, consumption and regulation. Their articulation is seen as a linkage whose conditions of existence or emergence need to be located in the contingencies of circumstance. (du Gay 1997.) Guided by the idea of cultural context determining partly the conditions of technology use in the classroom, we draw from our pilot findings and aim at depicting the preliminary guidelines for the design of successful mobile learning activities and materials. Success is defined here as product that gains users by helping in their daily practices, more specifically in learning activities.

Since the design of the materials has not been the main focus in our project, we do not cover the whole design process of a product or value chain of the content production. Instead, we reflect our experiences from the real life situations according to the mComponents model in order to enhance more culturally aware design of mobile learning actions and materials, and after iterative design process products that might also gain users.

### **8.3.2 Our approach to meaningful mobile learning**

One of the main goals in our research work is to explore what are the best mobile learning practices and activities that can help and support the learning to become a more meaningful process and at the best to happen at least partly outside the classroom.

Another goal of the mobile learning research group is to explore from a pedagogical perspective innovative future learning practices, which are related to mobility and the new forms of both studying and working. We see mobility as mobility of the terminal and relative non-alignment of activities from time and place. The research work is aiming to facilitate both the development/integration of mobility in the whole learning process and also the evaluation of this process. For these purposes we have developed the components of mobile learning by using both quantitative and qualitative methods. The overall objective of the Digital Learning 2 project is to develop an evaluating tool (eValuator) for the digital learning materials and environments. The work of the mobile learning research group supports this development with the operationalisation of the mComponents.

The theoretical background of the research is constructed from many different viewpoints, the common nominator of which is constructivist approach to learning. From the viewpoint of pedagogical design our approach emphasises socio-cultural factors in learning whereas the Mobile Learning Questionnaire complements the picture from the cognitive point of view. In the primary school pilot we examine the mobile learning process from the informal learning perspective basing partly on earlier pilots and studies together with the perspective of David Jonassen's characteristics of meaningful learning. According to Jonassen (1995) learning environments should emphasize the following characteristics: active, constructive, collaborative, conversational, complex, contextualised, reflective, intentional, and technology should be used to complete these qualities. In our research work we have used these characteristics as one supporting model, which has guided the work done in the primary school pilots.

However, the characteristics are not the only theoretical basis supporting our work. According to Jonassen learning is meaningful e.g. when learners actively participate in it and are responsible for their own learning. Learners have to have skills and possibilities to construct new experiences and knowledge in a broader world of experience. Drawing from the pilots we see the collaborative quality of meaningful learning clearly as the strength of mobile devices. The interaction with the help of mobile devices cannot be compared to face-to-face situations but the mobile device can provide the possibility to interact with each other no matter how far learners are from each other. A meaningful learning process requires also intentional action from the learner. With the help of mobile devices the learning process can also be contextual and situational and these

elements support the intentional learning process. A major strength in learning with the help of mobile devices is also the aspect of contextuality. (Ahonen & al. 2003.)

Next we introduce a more specific version of the mComponents model presented in the introduction the meaning of which is to give a more detailed explanation about the research focus in the primary school pilot. With e.g. adult learners the components would be emphasized differently.

*Continuity and adaptability* between learning contexts; how to support spontaneous learning? By the component of continuity and adaptability we mean both integrating different disciplines in projects when a learner processes intelligible entities through her/his own knowledge construction and integrating cognition into learner's personal, social world.

*Learning as a personal process*; are the mobile learning products taken personally? By the component of personal process we mean acting on individual needs and learning challenges e.g. with inquiry learning method.

*Contextuality in learning*; is the context of learning better recognised in learning process? By the component of contextuality we mean both integrating knowledge acquiring and applying in authentic problem solving situations and concretising the different stages of the learning process.

*Accessibility*; what kind of skills and access is requested? By the component of accessibility we mean e.g. offering easy access to different sources of information and abilities to act on them.

*Support for time and learning management*; how to support learner's self-monitoring and regulatory processes? By this component we mean offering tools for active and intentional, self-guided learning.

*Flexible interaction*; how to enhance communication between peer-learners? By the component of flexible interaction we mean offering tools for collaborative knowledge construction. (Jonassen 1995; Leino, Turunen, Ahonen, Levonen 2002; Turunen, Syvänen, Ahonen 2003; Syvänen, Pehkonen, Turunen 2003.)

## **8.4 Notions on mobile learning activities and materials**

Certain best practices and guidelines have arisen from the pilot research and its results. The activities done with the pilot schools have given us perspective to consider what kind of materials and learning processes actually succeed in a mobile situation with primary school pupils. What are the learning activities and the learning materials like when we successfully go through a meaningful mobile learning process? At this point we also confront questions about usability.

In our primary school pilots the curriculum of the school has been used as an instructional manual that has at least partly directed our work. The idea has been that all of the mobile learning activities could and should be done according to the goals presented in the curriculum. The learning exercises were designed in a way that some parts of the totality were carried out in the mobile situations outside the classroom and some parts in the classroom, the school library or the computer class. Usually the first phase of the mobile exercise included observation and making notes of a particular phenomenon. After the mobile working the second phase included expanding the notes and deepening the examination of the subject. This normally happened in the classroom yet there were situations where the access to e.g. Internet was needed and created in the mobile situation. The findings in mobile learning pilots will be next reflected according to the mComponents.

With the mComponent of **Continuity and Adaptability** we study a flexible transformation between different learning situations with the aid of a mobile device. In practice, the mobile devices can help e.g. in documenting the ideas as soon as they appear (Ahonen et al. 2003). Spontaneous learning though requires abilities of applying and reflecting one's knowledge. Basing on the teachers' interviews, the mComponent of Continuity and Adaptability proves an essential aspect in mobile learning, because the crossover between different contexts has been difficult to reach in the Communicator pilot. Children have had difficulties in understanding that they can learn everywhere and they can utilise the knowledge acquired in contexts other than school as well. (Syvänen et al. 2003; Turunen et al. 2003.) Here mobile learning seems to intertwine with cultural issues: children should be encouraged to appreciate the knowledge they gained from their hobbies and everyday activities.

What kind of mobile learning activities and materials could support the crossover between the different learning situations? According to the teacher, learning has to be seen as a **personal process**, which happens in different situations and learner brings also his/her own personal experiences to the classroom situations. In mobile learning the pupils individual learning process can be supported e.g. by choosing inquiry learning methods and by processing, presenting and publishing online the learning outcomes. In the primary school context the teacher is still in a central role in making the pupils understand how using the mobile devices can really help in the learning processes. This requires also acting on individual needs and learning challenges. The difficulties in continuity and progress in individual learning process depends also on the maturity of the children both as individuals and as a group. The group dynamics may e.g. hinder the differentiation, which was the case in the Communicator pilot. The children jealously watched over the same possibilities to use the devices or demanded teacher's attention at the same time. (Syvänen et al. 2003; Turunen et al. 2003.)

The classroom culture and different user cultures set clashing expectations towards mobility and mobile learning. As the children used their personal mobile phones basically for fun, they also wanted to use the Communicators mainly for the entertainment purposes (Syvänen et al. 2003; Turunen et al. 2003). According to Oksman and Rautiainen's study of the mobile communication of children and young people (2001) the parents start to consider acquiring mobile phones for their children when the children's living environment reaches out of home. As the school starts, also the importance of friends and activities outside home grows. However, in the children's life mobile communication is not as central aspect as it is among teenagers. Therefore mobile phone is perceived more as a gadget for playing. Spontaneous interest towards mobile communication develops in the age 10-12 and personal patterns of the use of it start to develop. Special characteristics that separate young peoples mobile communication from the older users' habits are the heavy use of SMS's, peaks (one ring calls) and playing as well as personalisation of a device with e.g. logos, ringing tones and covers. Building and maintaining of the social network and the personal space of one's own is also emphasised. (Oksman & Rautiainen 2001.) From the viewpoint of designing mobile learning activities we have to react to the emergence of different user cultures and needs. From the user cultures point of view, an edutainment element might be used as a motivating feature when designing materials for mobile learning. Teachers however stress, that the earlier the children gets the utilisation model of the devices, the better they get into the advanced methods of learning: cross-disciplinary project work and the process writing method.

The most motivating and fascinating feature with iPAQs was undoubtedly the access to the Internet. Both browsing on the web pages and reading and sending e-mails were common actions among the children, but when one boy downloaded games from the Internet the whole class got excited. Connections to the outside world and different sources of information may also cause chaos in the classroom and require change in institutional, learning and teaching practices (Sharples 2002, Mifsud 2002). The interviewed teachers agreed, that e.g. copying from the Internet is a growing problem due to the Internet access. Therefore it is emphasised in the primary school pilots that the use of mobile devices and accessibility to several different sources of information requires flexible conception of knowledge. By the component of **contextuality** we mean both acquiring and applying knowledge in authentic problem solving situations and concretising the different stages of the learning process. In the pilot the inquiry learning method that engages the pupils to reflect on their own thoughts and actions, has been used. With this method the pupil learns to criticise certain facts and his/her understanding develops within collaborative group work.

The teachers of the Communicator pilot also pointed out that it is crucial to the success of the whole mobile learning process that the pupils do not lift their informative



goals too high. During the pilot the children often thought that the facts they observe have to be either entertaining or really complex ones. Rubin and Kaivo-oja (2000) state that as the flow of information becomes increasingly fragmented and uncontrolled, also real time and simultaneous, there is a danger that established ways for managing information do not suffice. The selection of relevant information becomes a random affair, and choices are made based on what appears to be fun, entertaining or useful at the moment, which increases social disempowerment. Therefore in designing mobile learning materials one goal would be in guiding pupils to recognise different sources and structures of knowledge.

Is the learners experience also so fragmented in today's information society that he/she does not understand to process it or does not have time to process it properly? If the learner does not have time to enough process the information it will not become a part of his/her knowledge. Therefore, more attention should be paid on cultural and media literacy, pupil's ability to distinguish different types of knowledge, and ability to evaluate different kinds of information sources (e.g. Rubin & Kaivooja 2000). The teaching of media literacy requires new types of knowledge and skills from the teachers too, and for many teachers there is not enough time or easy tools at hand to take over the issues of media literacy, information search and Internet publishing. Supplementary education on the topic is required, as well as easy tools and learning materials! (Syvänen et al. 2003.)

Based on our pilot findings the **accessibility**, sufficient skill levels and desirably possession of a device, crucially affects the possibilities of mobile learning. The interviewed teachers estimate that pupils of the 5th and 6th class possess the required skill level for learning activities typical of mobile learning, and at the age of 11-12, pupils have an interest and need for it too. Still, it will not be easy to start mediated learning with mobile devices unless there is previous experience with computers. E.g. pupils with already good computer skills got further with the Communicator, while poorer ones got tired of trying to figure out the complicated logic and user interface of the device. (Syvänen et al. 2003.) With IPAQs the user interface was more familiar (Windows for Pocket PC) from the computer class, and pupils learned quickly the basic use of the device. Since the user interface was available in English only, it limited the pupils' ability to fully use the different functionalities of the device and e.g. interpretation of the error messages was impossible.

The Communicator pilot did not reach the goals of the mobile learning regarding contents. In comparison with the personal laptops the active content production increased and pupils having difficulties with it clearly improved their skills. The differences with pupils who did not have computers at home diminished as well. Personal laptops were perceived as rousing throughout the year, whereas eagerness to the scattered use of Communicators diminished after the enthusiastic beginning.

Therefore, basing on the interviews and observations, sufficient personal possession of the device is requested to gain routine in using a device and be able to focus on learning contents. As a future vision it would be useful to provide equal possibilities for mediated learning to all the pupils to really get into learning part of mobile learning. (Sylvänen et al. 2003.)

To support the mobile learning situations we had a web-based learning environment in use. The environment implementation was not heavy-weighted but still the access to it was sometimes difficult. In addition to the web-based environment some extra material was searched from the web pages. However, we had repeatedly problems accessing the Internet with the PDAs. This was sometimes due to bad network connections and sometimes due to the technical problems in the device itself. The biggest problem in the network connections was probably that the behaviour of both the device and the GPRS were unpredictable and the user could not figure out what exactly was the problem. Here we would like to point serious usability flaws in design of the device and the functionality of its GPRS-application. The system status "not connected" was visible but the users were not helped to diagnose and recover from errors. The instructions of recovering could not always be found in user manuals either. The beginners or casual users cannot be expected to have advanced troubleshooting and configuring abilities. We feel that the web-based environment was very suitable for the collaborative working processes but the access to it was too difficult.

The instability of the overall system led even to more serious drawbacks in the pilot. When running out of power, the system empties all the files, configurations and settings from the device's memory. Although the back up copying of the system was taught to the teachers, the confidence towards the devices functionality had gone. E.g. in one observation situation the pupils were instructed to work very impractically: they had written their texts first to the notebooks from where they were requested to copy them to iPAQs. When maintenance of the functionality of the devices requires much knowledge and "care" it is not likely that mobile learning will flower.

In observation tasks also flash-card cameras and foldable keyboards were used. Pupils were able to take photos and videos with the cameras, but "browse and add" functionality had been disabled from the Pocket PC browser. Adding the pictures to the web-based learning environment required transferring the files to the PC. Most of the pupils preferred using the keyboard to the stylus when writing their notes and refreshing the texts. It was perceived as minor obstacle that the keyboard did not have the Scandinavian letters and those had to be found from the on-screen keyboard with the stylus.

When offering tools for active and intentional, self-guided learning (**time and learning management**) we see that mobile technology can be well utilised in supporting differentiation because it is a rather flexible and motivating medium. Since pupils'

technical and learning skills vary, the teacher has a lot of work in tailoring lessons to meet everybody's needs. Still the teachers do not believe in ready-made learning content for mobile learning but they see that materials are produced in mobile learning. For the more self-guided pupil directions for independent learning tasks might work. (Syvänen et al. 2003.)

According to some earlier research reports (e.g. Regan 2000), in intentional, formal learning situations mobile devices have been especially used in contexts where the learning content can easily be divided into small meaningful pieces such that when one part is learned the learner can easily connect it to a part of the whole learning content. Those contents can be, for example, learning different languages or the grammar of a certain language. Mobile devices can help the learner to revise the facts that have been taught. With the laptops the intended mobile use of this kind of web-based learning modules was not possible due to "heavyweight" multimedia content. Obviously, if mobile learning is anticipated, more attention should be paid in scalability of the web-based learning contents and materials to the mobile devices that have limited memory and processing power, slow and unstable Internet connections and small sized displays.

From the viewpoint of user cultures, young people use mobile phones mainly in maintaining social contacts and in organising their everyday life. Features like alarm clock and calendar support short-term time and learning management. (Oksman & Rautiainen 2001.) Although maintaining several time management systems, e.g. paper and mobile calendars cannot be seen as an advantage (Ahonen et al. 2003). Therefore, at least compatibility and updating facilities become also central issues from the viewpoint of mobile time and learning management.

From the viewpoint of flexible interaction the lack or inoperability of GPRS connections became crucial. In the Communicator pilot, the data transfer connections were not available. The pupils from Pirkkala communicated with their peers in Kittilä (Raattama's school) by calling and sending SMSs. With the laptops WLAN worked fine in the school area, but due to the weak GPRS connections pupils were only able to browse single web pages or read their emails outside the school. Still, mobile devices enabled meaningful learning tasks for small groups and working in pairs. When the PDAs with GPRS-facility were introduced, the possibilities of mediated communication expanded. The pupils used willingly e-mail and chat with other school's pupils and it was found a motivating way to interact and also commit some learning activities.

Mobile learning and observations tasks gave in our pilots the richest experience to the group that was outdoor, doing an observation task. But the co-operation between the observation group and the group in the class was not yet very complex. The demands for the observation group became very high because they should in fact act as teachers who through writing and talking can deliver an observed phenomenon to

another group. Also working with mobile devices can be a nightmare to a shy pupil and the device itself will not necessarily make the process easier.

## **8.5 A brief case study on process writing tool for mobile learning**

The tasks the children performed required many times reporting skills from them. This made the working sometimes difficult. The teacher of the class argues that even for the adults it can be demanding to make a report on a certain issue in the on-the-go situation. Some mobile learning environments could possibly bring help to these problems. For instance an environment that supports the reporting work could be developed.

Although the teachers did not show interest in ready-made mobile learning materials, we decided to test the idea of mobile learning material that would develop the requested media literacy and process writing skills. According to Bannon (1991) users need to have the experience of being in the future use situation, or at least an approximation of it, in order to be able to give comments on the proposed system. So, some form of mock-up or prototype needs to be built in order to let users know what the future use situation might be like. An inoperative prototype of "the report generator" was coded with HTML to fit the PDA screen. The idea of the generator was to acquaint the pupils with the different phases of writing process, to encourage them to find and recognise different information sources, and to encourage them in reflecting their own opinions and knowledge.

Although the idea was welcomed among the teachers, the first version of the tool was not a huge success. When the learning module was concretised on the PDA screen it was easier both for the teachers and the researchers (designers) to evaluate its suitability for the pupils and mobile learning purposes. One weakness from the viewpoint of our research was that although the generator could be used outside the classroom it did not necessarily require mobile situation. Secondly the teacher pointed out that figuring out the whole writing process would be too demanding a task for the 6th grade class pupils. Therefore, the learning tasks should be reduced into smaller independent units and the writing process should be downsized. Some sort of compromise between the constructivist and more formal approach of drills should be reached.

If not providing very advanced guidelines for the design of mobile learning materials, this brief case study advocates the usefulness of quick prototyping, iteration and participatory design when testing the design ideas and sharpening the user experience requirements with real users.

## **8.6 Discussion and conclusions**

Based on our pilot work we emphasize the fact that it is the mobile learning process itself and the activities that guide the knowledge construction. When talking about mobile learning we cannot bypass the matter that these two sides are closely linked to each other. Learners build their knowledge and views about the matter during the process. However, in the pilot research there was a lack of a proper material that could have been loaded to the mobile devices and used as a material supporting the activities. In our pilot we used different devices and different media in order to perform a learning task of a certain subject.

When reflecting the pilot findings according to the mobile components we can draft some preliminary guidelines for the design of mobile learning practices and materials concerning the primary school setting. Considering the overall success of mobile learning processes the usability and accessibility rise as central themes. Moreover, the problems in applying flexible interaction imply the importance of good connections and networks but also need for accessible web-based learning materials and environments. The usability of a device would be of great help in adopting mobile learning practices, actually the instability of the systems and connections at the moment hinder the meaningful mobile learning process. The goals concerning the learning content were difficult to reach also due to short period of use. The skills acquired with PC helped in getting into mobile learning. Still, the sufficient possession and use of the device is required to enable transformation to routine use when a learner is able to concentrate in learning contents. The sufficient time to process the learning contents is also required for the knowledge construction.

The classroom culture and different user cultures set clashing expectations towards mobility and mobile learning. From the wider cultural perspective the access to different sources of information requires new approaches towards knowledge building and learning among both teachers and pupils. Basing on our pilot findings, the teachers do not believe in ready-made learning contents, but they see that materials are rather produced in mobile learning. The earlier the children learn to use the devices as tools, the more flexibly they get into the advanced methods of learning: cross-disciplinary project work and the process writing method. More attention should be paid on cultural and media literacy, children's ability to distinguish different types of knowledge and information sources. The learning tools for information searching, content processing and Internet publishing can therefore be presumed to be very useful. As mobile learning suits well for small groups and working in pairs and communicative dimension has been found motivating, the obvious potential of mobile learning lies in supporting social contacts and collaborative learning.

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## 9 “It is time to play a game” or Innovative Learning Approaches' *Maja Pivec, Austria*

### 9.1 Game-based Learning

Although games are part of children grow up and formal education, digital game-based learning is a novel approach in the area of Universities and Lifelong learning. In search for new positioning of the universities in the changing setting of lifelong learning, gaming is becoming a new form of interactive content, worthy of exploration. One of the European Projects, exploring this topic is Minerva project UniGame: Game-based Learning in Universities and Lifelong Learning. Goals of the UniGame project were as follows: to promote digital game-based learning in Europe, to test different educational games within different subjects in various European countries and to focus on social game forms that include virtual communities and collaborative learning.

Digital game-based learning can be applied as additional option to classroom lecturing. Intention of digital game-based learning is to address new and ICT based didactical approaches to learning and at the same time to provide learners the possibility to acquire skills and competencies later required in the business world. By means of educational games learners should be able to apply factual knowledge, learn on demand, gain experiences in the virtual world that can later shape their behavioural patterns and directly influence their reflection, etc. More details on aspects on game-based learning and educational games are provided in [Dondi et al. 03], [Pivec et al. 03], [Prensky 01].

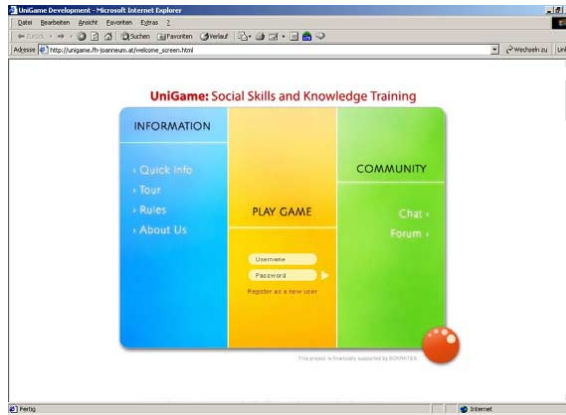
### 9.2 UNIGAME: Social Skills and Knowledge Training

“UniGame: Social Skills and Knowledge Training” [UniGame] [Figure1] is a framework that provides a possibility for every interested teacher to apply game-based learning for his/her classes. “UniGame: Social Skills and Knowledge Training” is a game where teachers can define various topics, thus modifying the game for their own purposes.

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<sup>1</sup> Acknowledgements: UniGame: Game-based Learning in Universities and Lifelong Learning. is a Minerva Project: 101288-CP-1-2002-1-AT-MINERVA-M. Many thanks to everyone involved in the project for their contributions, fruitful discussions and excellent work that contributed to the progress of the project.





**Figure1. Welcome screen "UniGame: Social Skills and Knowledge Training" public game domain.**

It can be classified as a role-play game, that fosters participation in problem-solving, effective communication, teamwork, project management, as well as other soft skills such as responsibility, creativity, micro-entrepreneurship, corporate culture, etc. The game is based on constructivist learning approach and collaborative learning. It should be used additionally to regular face-to-face or online classes.

The game is accessible through a website, giving the opportunity to users to join from different places. It is a multi-player game. The players form four teams, which can have up to six players. It is moderated by the teacher (the game is designed to be used as supplement to normal in-class teaching, but it is not impossible to be used independently from a class course). The aim of the players is to comprehend their specific role inside their team and have argumentation with players of other teams over a specific subject, which is specified by the theme of the game. The players gain knowledge over this subject by searching for information and using it in the discussions that follow with other teams' members. The website offers several means for communication to its users: Users can communicate using private or public forums, text chat modules and voice chat modules. The game ends when all the specified sub-parts of the selected subjects have been discussed. In each discussion the goal of the players is to reach a consensus with the other teams. If they reach a consensus they gain some points (chips). The amount of points they can win from each discussion has been specified by them before the beginning of the discussions, when the 'chip allocation procedure' takes place. In 'chip allocation' each team allocates 100 points in total to three of the six available sub-parts of the subject that will be discussed. The team which has the most points when the game ends is the winner.

### 9.3 Scenario of the game

In this section parts of the "UniGame: Social Skills and Knowledge Training" scenario are outlined briefly<sup>2</sup>. The game starts by the teacher, who has to define the 'Game Theme', i.e. assignments and subjects to be discussed by the students. The students will use the game website to communicate or to search for information about the theme. The play time of the game can fluctuate from several days to few weeks depending on the difficulty of the theme and the basic skills of the students. The game flow and its various stages are presented in Figure2. The basic stages can be distinguished as follows:

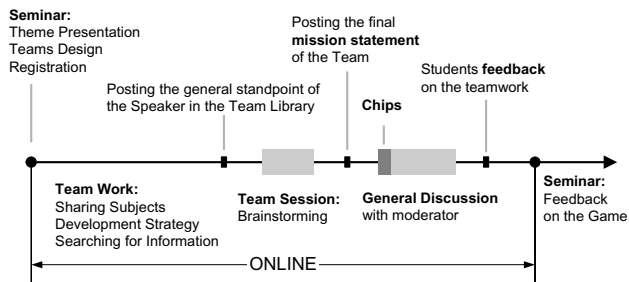


Figure 2: Time plan of the Game

**Introductory seminar:** In this seminar the teacher explains the theme to the students. The teacher provides information about the theme, the particular subjects (interest areas) of the subjects that are available for discussion, the teams that will be formed, and the roles within each team. The teacher discusses with the students about the theme and provides more information if requested. Finally, the teacher and the students reach an agreement about how the teams will be formed.

**Team work and team preparation:** In order to play the game, the students form four teams, which have different roles in the discussion that will follow. For example, in a theme about environment protection, the teams could be 'Government', 'Heavy Industries', 'Environmental Groups' and 'Labour Unions'. Each student has to select a particular role within a team. After that, the team members have to connect to the 'map of the Subjects' which are relevant for future discussions. In this screen each member of the team has to select a subject for which he/she will be responsible for. Each team has to create a strategy for the general discussion that will take place with the members of the other teams as well as with the teacher (moderator) of the game.

During the team work, the players develop a game strategy, collect and select valuable information and prepare for argumentation. Teams communicate and exchange information in the 'Team Space', which consists of several screens that

<sup>2</sup> See [Dziabenko et al., 03] for more detailed information.

allow synchronous or asynchronous communication of the members of a team (Forum, Virtual Conference, Library [Figure3], Member List and Profile[Figure4]).

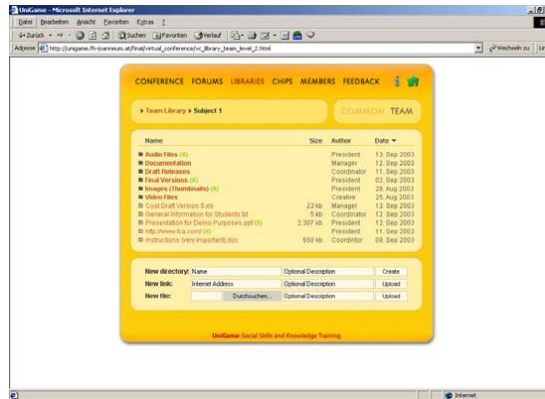


Figure 3. Team Library – to upload and share important information with other team members

Each team member uploads all relevant collected information about the subject he/she is responsible for, in the Library of the Team Space.

When search for information is finished, the team has to organize a 'Team Session'. This session enables students to discuss all problems of the subjects and all information that can be used in the argumentation with the other teams. At the end of the team preparation time, the teams have to present a final mission statement within the game platform where they will outline their general standpoint.



Figure 4. Profile makes it possible to display also personal information

**Chip allocation:** Following the team work and preparation, the teams have to allocate chips (points) to the available subjects. Each team has to decide which subjects are more important for them. The team members can select up to three subjects for discussion. They have a maximum number of 100 chips that they must allocate to the three subjects they selected. This has to be done within 30 minutes.

During the game the chips allocated to the subjects can be seen by the team in the screen. However, teams don't see chip allocation of other teams. The teacher has all information about allocated chips of all teams.

**General discussion:** During the general discussion, all teams meet in the 'Virtual Conference' [Figure 5] screen to discuss the subjects of the theme. The discussions are moderated by the teacher. The aim of each discussion is to reach a consensus. The role of the moderator is to formalize the reached consensus. If the moderator decides that the teams reached a consensus during the discussion about a subject, all the teams that had allocated chips in this subject win these points, which are added to their total score. The team that has the most points when all subjects have been discussed is the game winner.

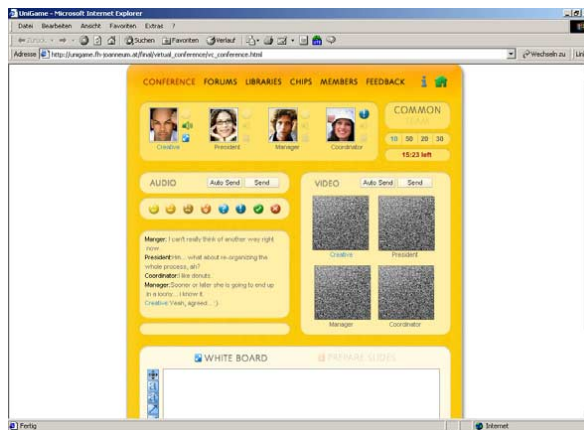


Figure 5. General Discussion - Virtual conference

As depicted in Figure 5, players see all participants in the general discussion virtual conference. The upper right corner of the screen provides some additional information of the game e.g. the timer that indicates how much time is left for the discussion and how much points the team has achieved.

Provided set of emoticons and standard symbols like question mark, exclamation mark, etc., can facilitate the written conversation and give more detailed and emotional feedback of other players. The white board enables players to work and elaborate together facts and data related and relevant to the topic discussed.

**Student feedback and discussion of the game in a seminar:** The general discussion is followed by detailed feedback of all the players who participated in the game and debriefing carried out in a seminar.

## 9.4 Possible use cases

To illustrate possible application of the proposed UniGame framework, we present two examples of the game usage. A teacher that wants his/her students to

reflect actively upon interdisciplinary consequences and ethical behavior of engineers, defines a game-theme called *Tunnel building*. The aim of the game is that 4 teams are competing to make the best offer and technical solution to build a tunnel on the defined location. The solution should consider different parameters like financial frame, time deadlines, technology applied, ecological acceptance, etc. During the game teams can "buy" knowledge from other experts. Teams are also expected to be able to react on unexpected new conditions e.g. new emission law, or the law regarding an area near the tunnel location, that was declared for natural park, etc. Teams use the preparation time of the game to elaborate their solution. During general discussion different important subjects should be discussed and a consensus on which solution is the most appropriate should be achieved.

To experience *Multicultural differences* another game-theme could be defined. In this game students worldwide can form teams. There are various possibilities: multinational teams or each nationality builds own team. Teams should work on the same task e.g. to design a multicultural website. Within the team session teams should work on their proposition, research similar web-pages in different cultural environments. Teams should publish their ideas and propositions about functionality and design of a page. Within the general discussion teams have to discuss the subjects and to reach a consensus (e.g. about features of a web page, which design would be the best, which parameters should be considered for cultural adaptation, etc.).

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## **10 Post Disney experience paradigm? Some implications for the development of content to mobile tourist services**

*Lars Bojen Nielsen, Denmark*

### **10.1 Abstract**

This paper presents and discusses a conceptual framework for a location based mobile ICT system for a visitor destination in the near future. The issues presented originate from ideas and intentions in a specific Danish tourism project "Mobile Digital City and Nature Walks - development of content and software for a mobile tourism device". The article gives an introduction to the background and intentions in the project, where focus is on content and sustainable tourism. And to outline how mobile ICT services can add value to the tourism experience and to the visitor destinations in the proposed project, the article present first a user scenario and then some implications for the development of content for mobile tourist services regarding: a) the good tourism experience according to the industry and b) experiences from qualitative studies of tourism. Finally the paper outlines main challenges in the project in terms of content development, technology and tourism industry. The contours of a new experience paradigm, when convergent and pervasive technologies have been implemented in 5-10 years, is also presented.

### **10.2 Introduction**

For example South Funen Island – At the village of Steenstrup – There is a small hill . It is called Gallows Hill ( Galgebakken ). In it self it is nothing . Nobody will stop by it. But if it was visualized, how it looked in old days. With gallows and chopping-block. Then you would stop by and feel the past. We can also tell stories about it . The last execution hit the butcher in the village and his mistress. They had forsaken the holy promise of marriage and were sentenced to death. The whole village was there to watch the scenery. When the mistress laid her head on the block, she shouted according to many witnesses: "Now there is blood sausage to everyone! " Kim Gørlitz – Creative manager – Grey Denmark As this quote indicates there are many stories from the past hidden in landscapes, and thereby it is interesting from a tourism industry point of view. If the past and maybe also the present and future could come "alive" many destinations could add more value to visitor experiences. Current research in the quality of visitor experiences also confirms, that the traditional supply marketing orientation has to be transferred to a demand based orientation in order to add value. Thus an increasingly number of tourists demand and expect that the visitor destinations offer and confirm the

stories or mythologies, the same destinations often use in their marketing<sup>1</sup>. But the problem in the Danish tourist industry for the moment is that the structure of the industry does not seem to support a visitor demand orientation very much. The "Disney" experience paradigm has a strong hold in the sense that focus of the service providers in the business often is limited to confined attractions, where visitors will go and have an experience. However many studies (Morgan,2002)(Gyimóthy,2000) show, that tourists don't think so much in country, county, city and attraction borders, when deciding which destination or attraction to visit, but often look for experiences that goes beyond these borders. And hence the present structure often limits the modern tourist behaviour, where consumers now are asking themselves "how do we want to feel on our holiday or short break ? " and not so much "where are you going this year ? ". Consumers want more out of their holidays and tend to choose destinations, that not only meet their core requirements but also with which they feel an affinity. To meet such demands destination branding is then becoming important as a marketing strategy. In that sense the concept of experience economy (see figure below) appears as a useful framework for understanding and studying the lifestyles and consumer behaviour of various tourist segments (KKS, 2003)(MCD,2003)

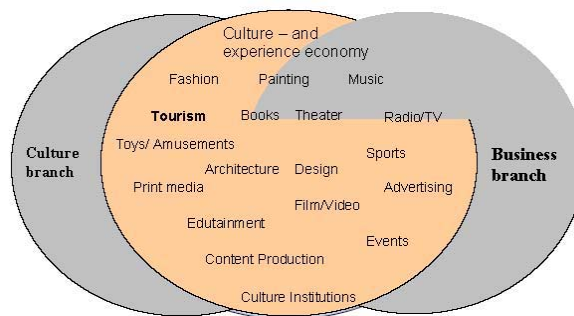


Figure 1: Culture and experience economy<sup>3</sup>

I suggest that the integration of tourism and mobile technology services implicate a new experience paradigm that could be named the "Post Disney Experience". The Disneyland Experience is characterized by "a completely constructed environment and

<sup>1</sup> "The Quality of Visitor Experience. A Case Study in Peripheral Areas of Europe" by Szilvia Gyimóthy - Unit of Tourism Research Centre of Bornholm. 2000. ISBN 87-90881-38-9 . This 3 year study confirms the big role of mythologies in tourism marketing.

<sup>2</sup> Here I am inspired by Roger Prides(2002) article "Brand Wales: " Natural Revival" in Destination branding : creating the unique destination proposition / edited Morgan, Pritchard and Pride. Oxford; Boston : Butterworth-Heinemann, 2002.

<sup>3</sup> Source : Report "Denmark in the culture- and experience economy - 5 steps on the road" (MCD, 2003)

a fundamentally prescribed visitor experience" (Borrie, 1999). It has a long history and strong cultural impact starting with the amusement park 'Bakken', north of Copenhagen, in 1583 and given modern form by Disney at Anaheim, California in 1955. The "Disneyism" or "Post-Fordism" paradigms (Amin, 1994) represents manufacturing and service paradigms that is more focused at the components of the output than understanding customer processing operations. Thus a Post Disney Experience can be viewed in connection to the stance of a "neo-service paradigm" (Gyimothy, 2000) and the vision of Ambient Intelligence 3 (ISTAG, 2001) concentrating on human interaction within service encounters (personalized ubiquitous adaptive integrated offerings), which is assumed to add value to the customer's experience<sup>4</sup>.

If the vision of Ambient Intelligence (AmI) as proposed by leading researchers in Europe (ISTAG,2001) is realized, there will be new ways for offering holistic tourist experiences, that might alter the way we define holidays and visitor destinations . Then the experiences might not be confined by the borders of specific visitor attractions – as we see it today – where you fix go to Disneyland and stay there for some limited time – as it is suggested in this project whole city- and landscapes and rural areas has the possibility to benefit from this development providing new and possible authentic experience stages for the demanding tourist segments. But it requires that the tourist industry works together in coordinating and providing transcendent experiences based on user centric methodological frameworks. For the moment the Danish tourist industry faces problems concerning marketing and product innovation - in the fact that there is no coherent integrated data and information about the tourist consumer behaviour in terms of both quantitative and qualitative dimensions. The consequences are that the actors in the industry don't know enough about, what actually are the needs of consumers and how they perceive the tourist destinations during a holiday. And that's a problem in a competitive market situation. During the last 5 years Denmark has experienced a challenge in maintaining its competitive situation on the near markets – especially Germany and Sweden. Realising, that over 40% of the total tourist turn over in Denmark comes from the near markets, the government in DK is now financing several projects with the intention keeping Tourist Denmark competitive<sup>5</sup>.

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<sup>4</sup> AmI stems from the convergence of three key technologies: Ubiquitous Computing, Ubiquitous Communication, and Intelligent User Friendly Interfaces. (ISTAG, 2001:13) AmI is characterized by that humans will be surrounded by intelligent interfaces supported by computing and networking technology which is everywhere, embedded in everyday objects as furniture, clothes, vehicles, roads and smart materials . It is aware of the specific characteristics of human presence and personalities, take care of the needs and are capable of responding intelligently to spoken or gestured indications of desire, and even can engage in intelligent dialog.

<sup>5</sup> The turnover was 49.1 billions DKK in 2001. It also creates jobs to approx. 71,000 persons. Some of tourist project descriptions can be found at Danish Tourist Board webportal [www.danskturisme.dk](http://www.danskturisme.dk) - Most in Danish. Recently the Danish government launched an initiative called "Denmark in the culture- and experience economy – 5 steps on the road": report at [www.kum.dk/sw6537.asp](http://www.kum.dk/sw6537.asp)



### 10.3 Project introduction

On that background a group of companies, universities, educational institutions and organisations in Jutland and Funen in Denmark earlier this year established a project consortium (where this author is a member) with the main objective to create relevant mobile ICT based content solutions. The working title of the project is “*Mobile Digital City and Nature walks - development of content and software for a mobile tourism device*”. For the moment (Oct. 2003) the project consortium is initiating the project by applying the Danish Tourist Board for resources that can fund a half year pre-project starting January 2004. In this pre-project the aims are to clarify the project idea and also to research and identify potential international partners. The basic idea of the project is, with a focus on product innovation, marketing and sustainable development<sup>6</sup>, to develop content, software and tourism products for city and nature walks with the use of mobile media. The main working areas will be user/content, tourist industry and technology (See figure). Most technological based projects tend to focus on the hardware. And yes the hardware as a result of mobile convergence may be there already in a few years. The contours of a new device appear : The Personal Travel Assistant (PTA) which is a realistic vision (I:FAO 2002) – a combination of a handheld personal digital assistant (PDA), mobile telephone and notebook, which is always connected to the Internet via fast data services such as GPRS or UMTS .

In this project the intention is to focus at *content* -i.e. information, products and services that can be offered tourists on a mobile platform, typically mobile phones or PDA’s giving the users extra utility value and the tourist industry value growth. It is essential that the solutions will be interactive, quality and dialog oriented based on the needs of the customers and the tourist operators. To be precisely the intention is to develop appealing interactive<sup>7</sup> content in relevant categories such as entertainment (games), education, documentary, advertisement and art (MCD, 2002). For example the project consortium propose that the system will be able to dialog communicate with the tourist utilizing research in the Natural Interactivity field<sup>8</sup>. Also it is the intention to put “quality filters” to the offered products and services ensuring the sustainability dimension. The project wants to offer output and products from peripheral areas, thus products from resource weak areas and destinations is guaranteed the same relatively

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<sup>6</sup> The attention to the concept of sustainability in tourism is growing and is an EC priority . It has been examined in several studies - for example “Tourism, recreation and sustainability - Linking Culture and the Environment” McCool and Moisey(eds); Univ. of Montana, CABI Publi.2001

<sup>7</sup> Interactivity – I understand the concept here in line with others (MCD.2002) as: the user engages in the narrative in a participatory and active manner. So the user thereby can navigate and make decisions that influence the course of the story.

<sup>8</sup> For more info read “What is natural Interactivity?” by Bernsen (2000) <http://www.nis.sdu.dk/~nob/publications/LREC-NIS-12.5.pdf>

exposure as destinations with strong resources. Products and information will come from existing systems and companies, fix the national tourist portal [www.visitdenmark.dk](http://www.visitdenmark.dk) , local websites, attractions and so on. To ensure an optimal presentation of products and services for mobile platforms this project goes for a multidisciplinary approach, where knowledge and experiences from various business and research areas like marketing, branding, storytelling, media convergence, Natural Interactivity, Human-Human-System Interaction (HHSI), e- & m-business, e-learning, games research, to name a few, is utilized. As a part of the content development the idea is to accomplish and utilize analytical data about tourist behaviour. Existing data and research will be used, but it is obvious that the reality of new mobile technologies and the increasing tourist demands to the providers in the tourist industry implies, that new methods for analyzing consumer behaviour has to be developed . To summarize the primary aims of the project on a macro-level is for the time being:

To give the tourists enhanced accessibility to information chosen by themselves and promotions and offers regarding attractions, experiences, overnights, accommodation etc.

To digitalize and mobilize the offers from the tourist service providers using attractive content – to the customer in the rented house, at the car or at the beach etc..

To attract more tourists and ensure revisits through the quality and utility value the tourist will experience through those services.

To develop tourist industries in peripheral areas and rural districts, and of course also in cities.

To ensure better product launching and –availability and there by contribute to a local product sale for the tourist service providers.

To give the tourist industry valid information about the guest´ travels and behaviour ensuring better data for marketing, product innovation and sales.

To participate in a socio-cultural, environmental and economical sustainable development of the tourism by making products and services that follows the principles of sustainability more visible.

To create cooperation between the tourism sector and its research institutions as well as technology, media- and communication sectors nationally, internationally, both in commercial and public areas.

On a more specific level the expected results of the project are defined to be:

- *To develop customized tourist services based on a pilot project*, which can fulfil individual needs based on quality and sustainability and at the same time create increased revenue in the tourist industry in rural areas. And thereby enhancing the traditional and the digital value chain in the business.

- *To develop prototypes of following services:*

- personalized (occasioned) map
- location based content (entertainment (games), education, documentary, advertisement and art)
- guided tours ( theme based )
- information search

- booking/ shopping services ( tickets, souvenirs )
- communication/community services ( travel avatar , Tourist2Tourist)

- *To develop knowledge about tourist related content* formats and their mix based on the interaction between user needs and relevant content and form.

- *To create increased know-how about mobile network technologies.* Knowledge can be reused or developed further in other fields, as the project is a pilot project with space for innovation.

- *To enhance existing data-mining practice in the tourist industry* To improve and futurise marketing techniques and -tools as well as soft visitor management with a basis in relevant XML standards and typologies.

- *To develop Experience design methodology for mobile devices content.* Thereby create more knowledge about appropriate design of content for mobile devices in conjunction with branding techniques and 1-to-1 marketing approaches.

To visualize the ideas and intentions in the project and make them more specific, there have been made scenarios that show examples on content and the use of the mobile system for relevant tourist segments in relation to pre-visit, visit and post-visit activities. In the following a user scenario for a German family with 2 children is presented for illustrating some of the project intentions. Implications from qualitative studies mentioned further on in this article has been included in the scenario .

### 3. User scenario

**At home in Germany - 20:00 after dinner** German family Mann with 2 children in the Hamburg area log on the portal [www.visitdenmark.com](http://www.visitdenmark.com) via Internet and discover a link to *Mobile city and Nature walks* . They also got Internet access in their auto camper. Immediately they are interested, because one of the sons discovers an attractive avatar in the "corner of the dynamic banner ad , which reminds him of one the actors in one of his Playstation games. The avatar responds to mouse touches "come closer and discover a new area with me – You will get a new sight of the hidden Denmark, where you have never been before. Full of hidden adventures or legends from a ancient age med noble knights and princesses." Here they get access to a good offer on a delighted summer house 10 km from the beach. Also they accept an offer to hire a Personal Travel Assistant ( PTA) with modem, camera, video, mikes etc. According to the portal the PTA gives access to information, communication, transaction, community facilities. They can get access to relevant info about the tourist destination, booking opportunities in the area, hotels, events and attractions. Furthermore they discover an exciting community, with a lot exiting games related to the destination plus offers about improvised tours with local Viking guides. And yes through the Meeting service they also can find other families with children. Hr. Mann hesitates a little, but then thinks of the last holiday, where the kids and he included really were bored in an isolated mountain resort in Bavaria. Yes, we will book this holiday – (and he fills out a registration scheme generating a personal profile in the system).

**At the destination - Travel planning - Before Breakfast 8:00 Hr.** Mann log on the PTA and find local maps .- and ask for “occasional maps” because he wants to find relevant integrated Tour offerings matching the families interest in Medieval Age and Vikings . He makes his own suggested tour, with a lunch at a local Medieval Inn. Its possible to pay with Euro (Euro is not yet used in DK).

**Use navigation guide for attractions After breakfast 9:00** Mr. Mann don't precisely know the road to a local castle ruin near by the village, but the speech interactive map guide in the PTA helps. The family find it funny that the avatar from the website, now appears in the PTA in a new disguise (Medieval costume) The oldest son is a bit bored, because they have to drive approx. 1 hour to the attraction . He asks the PTA avatar about some games. The avatar suggests they play a medieval game based on a real “ghost” event at the local castle. The son plays the multiplayer game together with other players from the whole region. Luckily there is a video chat possibility and the son discusses game tricks and hints with a boy from Norway. The avatar chat appears again and suggests that the son can do some video documentation of the visit to the castle ruin, then the avatar later on will help get it visualized in 3D!

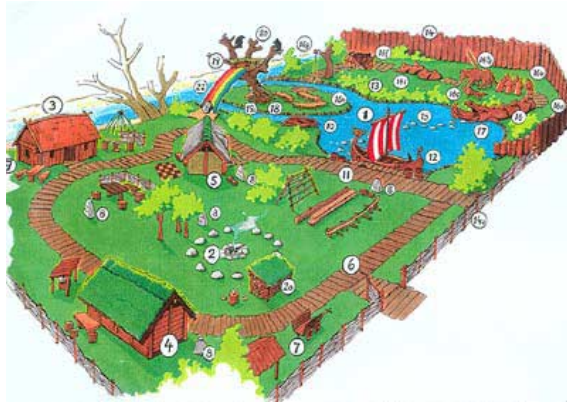
**At the castle ruin 10:30** The family also find and watch interesting multimedia stories about the castle before the arrival. The maps are easily printed on the mobile printer. At the same time the family also get informed about opening hours and offers in local stores and farm shops, selling medieval inspired food that Mrs. Mann loves. After shooting a lot video footages with the PTA they decide to go to the nearest shop and buy some fresh food. But Mrs. Mann is curious and checks out if there is some stores in the area matching her taste. She logs on the PTA and after a moment of search it occurs that 3 shops are selling the kind of clothes she likes. They go there and Mrs. Mann buy a medieval suite, pays easily with the PTA. Also Mr. Mann thinks her friend in Hamburg should see the dress and she makes a fast catwalk while Herr Mann is filming with the PTA and send a mail to the friend that the families TravelBlog has been updated. Driving along to the lunch they get a message on the PTA that a Norwegian family, Gunnarsons whose son earlier played games with the Mann's son, would like to invite to an interactive open-air Viking theatre game, “Midgard – touch and feel the vikings “, later this afternoon ( info at [www.ribevikingecenter.dk](http://www.ribevikingecenter.dk) ) The family accept the offer and replies through the video messenger and Mrs Mann have a lovely chat with Mrs. Gunnarson, before buying tickets guided by the shopping avatar that also reminds them, that their map has been updated with a new route. After lunch they have to drive 120 km to the theatre. First Mrs Mann check the weather forecast for the destination and she now knows the children wont freeze - Also the PTA avatar offers her video clips from the Theatre game - they will watch the scenery and get very interested in Viking history. They are so interested that they buy a dual book consisting of hard copy and a huge web encyclopaedia about the subject for only 30 Euro. 30 min.

before the family arrives, they get a message that they should prepare themselves for the interactive theatre game by doing some explorations of the virtual Midgard. The children access the virtual environment through the PTA and get a lot of funny exercises that gives them a picture about Viking mythology as they would get from the Virtual Midgaard ( part of [www.ribevikingecenter.dk](http://www.ribevikingecenter.dk) situated in a peripheral area in Southern Jutland ).

**At the viking attraction 15:00** Arriving at the attraction they meet the Norwegian family and agree to communicate in English. The children have one PTA and the adults have their own. Also they agree to split and follow their own route. Suddenly one of the Viking actors present the play in a dramatic voice: *The earth was like a large island, surrounded by sea. In the middle of the earth was the home of humans, called MIDGARD, protected by a fence made of the eyelashes and eyebrows of the giant Ymer. Beyond the fence, was the country known as UTGARD, and there, in the cold and mountainous land by the sea, lived the giants. Up above the clouds, ASGARD was the dwelling-place of the gods; from up there they could see the whole earth. And above them – its branches stretching across the world - stood the crown of an ash tree, YGGDRASIL.*

*“ Welcome to MIDGARD, the land of men. Here the Viking children are working hard grinding flour, fetching firewood, baking bread, making willow hedges and many other things besides. When work is over, people have fun playing, singing, competing in sports and games – or just sitting around the fire and telling stories. Dead Viking warriors would go to ASGARD, the world of the gods. If you are courageous, strong and careful, you can try to get through Asgard alive by following the path that leads across the sea ... But be careful! If you touch the ground, you will be easy prey for the World Serpent! “*

The children think it sounds exciting and follow the route where the PTA avatar gives multimedia based hints about obstacles. The PTA avatar as the online figure as in multiplayer online games like Everquest ( [www.everquest.com](http://www.everquest.com) ) also challenges them with location based quizzes and 3D Viking projections that might give them access to secret places in ASGARD, they explore. After 2 hours of interactive gaming and play the parents send a video message to the children proposing dinner at a nearby Viking Café. The children don't answer, but luckily the parents can position the children through the GPS based FriendFinder . At the dinner The children tell that a tour video footage has been placed on the Viking M-Blog, so the friends back home can help them in the Viking quest .



## 10.4 The good tourism experience

In the following some areas of interest for the content development will be presented. The perspective is user oriented – and tourist industry’s own assessment methods regarding the good experience will be discussed and related to user centric studies concerning the qualities of visitor experience. Tourism has changed a lot in the last decades with a shift from mass industry to more customized tourism products characterized by global competition. The shift towards an experience driven economy (Pine & Gilmore, 1999) is fuelled by the need to differentiate products and services, not only on price and superior technology but also by offering quality, feelings, values, meaning, identity and aesthetics, the consumers are willing to pay more for ( see figure).

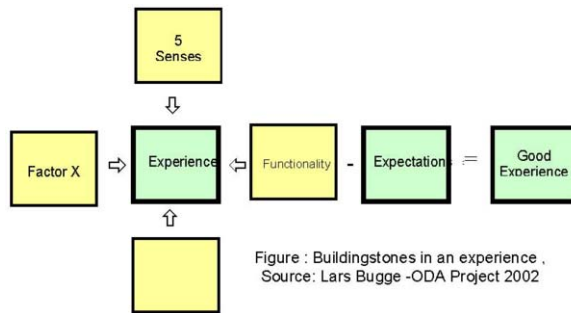
Some researchers has proposed that contemporary tourism is a matter of searching or and constructing personal identity<sup>9</sup>. Thus according to Bouchet all tourists searches for a “Place” (Exortism), your “Self” (Meaning) and the “Other” (Sociality). The marketing challenge for visitor destinations is then to target the various tourist segments and their expectations hence the conceptions and mythologies those segments associate to a specific destination. Bouchet does not define the good experience explicitly but suggest that the tourist destinations can use a value based method for estimating the nuances of the destination that is worth developing and selling to various target groups. In that perspective it is essential for destinations to offer those values and feelings that the guest is searching for in the quest for the Place, Self and Sociality. Other studies confirm this tendency (Gyimóthy, 2000).

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<sup>9</sup> Among others: Dominique Bouchet, professor in International Marketing at University of Southern Denmark. <http://www.sam.sdu.dk/~dom/priv/cvdom.htm>

In a recent Danish tourist project<sup>10</sup> the elements of a good experience was suggested to be constituted by the principle: *"If an experience is higher rated than the expectations, then it has been a good experience"*. In the study, the main building stones of a good experience at a visitor destination was identified as dependent on at least 5 factors ( See figure below) :

- **Functionality** - ("the hardware"-settings around the experiences like arrangement, interior design, information signs, Parking, food, toilets and so on)
- **Experience dimensions** (learning, entertainment, activity and interesting impressions - the mix and choice of experience elements)
- **Use of the 5 senses** - (variation, Complexity also the dissemination of information)
- **Factor X** - ( Totality, Synergy, Atmosphere, Mood, fantasy stimulation)
- **Expectations of the visitors** - (The mood of visitors when they arrive to destination)



In ODA, an on going competency project for Danish tourist providers, this analysis model is used to measure, create and evaluate experience profiles (EP) for selected visitor attractions in Denmark. Those profiles are based upon Pine and Gilmore's model and thereby the intension is to measure an EP a destination can use for innovation and marketing. The model at the right is an average measure for 3 types of visitor destinations based on interviews with the service providers at approx. 50 places and gives a picture of the experience dimensions, as the service providers see it. For the visitor attractions this tool can be of value for product development, if there is on going

<sup>10</sup> The study was a part of the project "the good experience" - a 2 year tourist research pre-project <http://www.dengodeoplevelse.dk/> (mangler mere beskrivelse) Now continued by the 4 year ODA project (Experience development in Danish attractions) including more than 40 attractions in DK -- material (in Danish) can be found at <http://www.danskturisme.dk/web/udvikling.nsf/oda>

surveys and evaluation of the experience dimensions. Here the "Factor X" has an increasing importance with keywords like "mood", "totality" and "atmosphere" - there will be a need for new players from the experience economy that can stage the attraction - like architects, actors, film, journalist, storytellers, dramaturgists, artists. Objective and quantitative indicators as "revisits", "splendid time", "visitor numbers", "Questionnaire evaluations" is often used, but the intention with ODA is to combine it with qualitative oriented methods like "experience image" (measured on remembered keywords) and the Pine and Gilmore inspired EP . The first conclusions from the project stated that the visitor destinations have many valuable experiences with "the good experience", but there is lack of a common methodical framework, that can be used for measure, describe and develop the good experience. And hence the EP will be the first steps. Another challenge in that process will be to get the product-development and the marketing of the various destinations integrated to the overall national branding strategies. But according to recent studies (Buhalis, 2003; Pride 2001) it is becoming more useful and profitable to use ICTs strategically for achieving competitive advantage. Pride (2001) propose a brand communication framework, a *Unique Destination Proposal* (UDP), as a guide for tourist marketers and content developers. The framework can function as a part of a road map for developing and evaluating which kind of content that on the one hand can meet the destination positioning demands and on the other hand the meet expectations of various tourist segments.

#### Key elements of the UDP framework:

>Domain (country) Brand: An agreed branding for the country as a whole. In Denmark it is Cosiness and unconventional, Design and intelligent, Oasis and Free13

>Tourism Brand: A motivating, credible and differentiating and deliverable position for the destination

>Entry Concepts: A communications idea tailored to the needs of the individual market segments identified through research

>Target segment: Groups of potential visitors, prioritized by scoring against their potential for the destination against an agreed set of criteria.

>Relevant Product: specific products offered within the destination portfolio based on needs of individual market segments again identified through research.

>Synergistic/integrated approach: Ensuring that in terms of style and tone of voice, all messages and communications are mutually supportive.

One could criticize the branding approach and the efforts to make *experience accounts* having too much focus on the single visitor attractions and their needs and therefore might miss the totality of a holiday trip. Hence there is danger that the visitors and their needs will be forgotten. Therefore this article suggest it will be valuable also to include qualitative user centric studies, that can grasp the experiential aspects of leisure and tourism that includes fun, feelings and fantasies. Hence addressing an



understanding of how visitors derive satisfaction from the “consumption” of a destination, the hope is, that content developers can benefit from those approaches.

## 10.5 Some implications from qualitative research

The contemporary qualitative studies of intelligent IT systems for tourism often lacks relevant and important user centric information with implications for the system design. Such as, how is the tourist behaviour, how does tourists organize their travel activities and how quality assessment and symbolic consumption works for various tourist segments. Many projects in Europe often seem more centred around technological potential and economical possibilities than offering user oriented content although the intentions from the European Community are there (Silva, 2003)(Ramboll, 2003)(IST, 2003)14. However, some qualitative studies show relevant and promising implications for the design of mobile tourist services. A CSCW oriented ethnographic study (Brown and Chalmers, 2003) on city tourism in Glasgow and Edinburgh imply that only little work has been done to really study tourist practices. Thus most tourism studies has focused on the effects of tourism, so “detailed knowledge of the basis of actual tourist behaviour is lacking” ( Fodness and Murry, 1997). Broad practice surveys and questionnaire based studies is at focus ( Riley and Love, 1999) rather than detailed qualitative description. This creates a lack of understanding of the methods tourists use for choosing and arranging various activities during their holidays. Brown and Chalmers organised their study in the 3 parts: problems, solutions and design implications. And they concluded following interesting implications for designing better tourist technologies:



### Experience dimensions

*Sharing the visit* - A handheld device could address this issue of coordinating activities and exchanging information - thus allowing tourist to communicate their position to each other and to make recommendations and share visits over the internet with other tourists and friends back home. This application could also address and meet the tourist’s need for sociality. Exchanging information in an online medium can also be a “ticket to talk” as it often appears in chat rooms and online communities.

*Electronic guides and maps* - Existing mobile systems has limitations often due to limited screen size. To be successful the electronic guidebooks (EGB) has to offer compelling advantages over their paper equivalents. One way could be that the EGB support both the "where" and the "what" of the locations. As the intro quotation in this article suggested thereby also "dead places" like city artefacts and nature places could come alive and thereby enhancing the visitors experience. EGB's integrated with GPS or "hot-Spots" based services using "context tags"<sup>11</sup> could be a way to offer PDA advantages. The study also showed that a 3D view on the PDA what the tourist see, could have a potential for not only navigation but also for augmenting reality and for appealing interactive content in relevant categories such as edutainment (games), education, documentary, advertisement and art (MCD, 2002).

*Supporting pre- and post visiting* - The study found that tools for supporting pre- and post visiting could apply much value to the visitors. Users often uses maps and guides *before* visiting a place (pre-visiting) - and this implies limitations to many of the electronic tour guide systems, like the EU funded "m-toGuide" ([www.mtoguide.org](http://www.mtoguide.org)). Based around a "walk-up pop-up" model, so that information (voice, text) is pushed to the users at their current location, may have limited utility. Since being at the attraction the environment will contain richer sources of information, than those provided by a PDA. Also tours are not followed in a straightforward way by the users. Instead users likely build their own ad hoc plans based on the structures of the tours. Another thing a mobile system could support . This could be done by supporting "*occasioned maps*" - so to speak maps which are drawn for a particular purpose. Asking "Okay - where can I go shopping ecological food and clothes?", then the system could build an ecological shopping map highlighting streets and shops plus showing reviews.

Post-visiting is essential for many tourists, and mobile services that can provide support for a "travel-blog" system will address a need, the studies showed. Another study made from an empirical analysis on the Island Bornholm (Gyimothy, 2000) departed from a process oriented view of visitors' experiences and concentrated on a customer oriented quality assessment. Some of the findings in this study suggests clearly that to reach a "good quality" assessment then relevant destination and traveller mythologies<sup>12</sup> has to be addressed by the tourism and hospitality providers in the services provided as well as in the marketing. This study found that a visitor destination with all its chains of providers often plays a double role in order to be successful:

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<sup>11</sup> As proposed in the Ambiesense IST project, "Context tags" are wireless markers in various places like buildings, furniture, restaurants and vehicles. See: [www.ambiesense.com](http://www.ambiesense.com)

<sup>12</sup> A mythology is a second (meta-) language or system or interpretation underlying everyday language that people share in communication and perception (Barthes; 1994) . Some researchers suggest that mythological structures in visitor narratives may be appropriate finding indications of personal experiences and meanings of service offerings. See Johns and Tyas (1997)

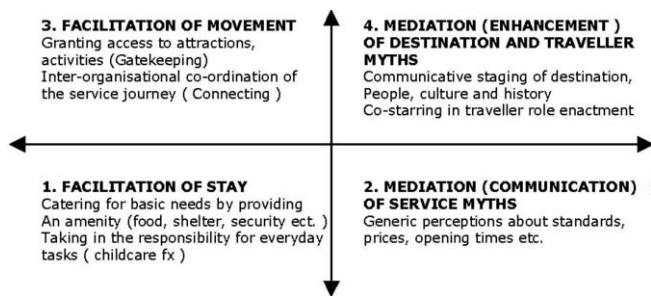
> in *mediating* tangible and intangible signs that visitors can connect to. The preconceptions of a destination (“Lost Eden” and Oasis” for Bornholm)

> in *facilitating* the visitors self inscription into various traveller roles using the fact that visitors ascribe various identities to themselves related to travelling, which enable them to fantasize and enact role sets different from everyday roles. Gyimothy suggests that there could be 4 different discourses or traveller mythologies: the Explorer, Vagabonds, Grand tourist and Colonist.

Traveller Mythologies	Identify themselves with ideal role sets of	Mission	Claiming rights to destination as	Expecting locals to act as
Great Explorer	Fearless, coping, pioneers, scout spirit	To discover and penetrate the unknown	Territory to explore	Helpers, assistants in the endeavour
Vagabond	Light-hearted tramps	To enact a “real life” drama	A stage to enact a road movie	Supporting character/co-stars
The Grand Tourist	Noble voyageur	To “learn” foreign cultures	Authentic object of unrestrained gaze	Actors in an authentic stage
The Colonist	Conquerors	To claim or reclaim foreign ground	Territory to access and possess freely	Caretakers of the conquered area

**Figure: Traveler mythologies - source Gyimóthy(2000)**

The visitor roles is interesting from a content provider perspective, in the sense that if the relevant roles can defined, this could form a good basis for developing relevant content services combined with the Pine and Gilmore inspired EP. Gyimothy then propose a customer oriented model of service provider assessment - so to speak a model that gives a picture about the benefits visitors gains from purchasing a tourist service.



The advantage of this model is that it addresses the multidimensionality of customer assessment - The study confirms that tourist experiences are too complex to be reduced to single encounters with individual tourist service providers. Also it is applicable both to individual and integrated service providers as well as entire destinations. Finally it can provide a more clear picture of what a tourist product or service is for the visitor. Addressing relevant destination and traveller mythologies based on relevant qualitative research could be a fruitful starting point and inspiration for content developers. So to ensure good tourist experiences mediated by content in mobile media, content developers must have a multidisciplinary approach. This could happen by combining branding strategies (UDP), quantitative (EP) as well as qualitative approaches from ethnographic studies, marketing and consumer studies like those mentioned earlier.

## 10.6 Some challenges to the proposed project

The project will face some demanding challenges in organizing the development of relevant content for the visitor destinations. Some of the challenges with an impact on content are listed here:

### **Tourist Industry related**

- To coordinate and manage both commercial as well as public tourist service providers with heterogenic interests and resources. Looks like an enormous task and development of competencies and new organization forms among the actors in the industry is necessary.

- To develop business models that combines commercial as well as sustainability requirements.

- To ensure that the service providers in the industry follow the objectives in UDP is a task that needs attention and surely demands coordination.

- The lack of qualitative information about tourist experiences will be a path to follow. And combining this with existing quantitative surveys can pave the way for a better marketing and sales. Ethical aspects about collecting customer data through mobile devices also has to be clarified.

### **Technology related**

- To identify, choose and maybe develop! relevant mature mobile technologies ( hardware device, mobile service and transmission technologies ), that disseminates content to tourist segments with different needs and media habits on the one hand and

on the other hand has a technological “edge” like Natural Interactivity with dialog possibilities etc.

- To identify a technological platform that is sufficiently mature for consumer use and has a fair price.

- To develop or have software developed for the device that can be utilized for handling the necessary information. It is assumed that the technologies exist, but adjustments might be necessary.

- To define and develop a platform that can feed the system with data.

#### **Content related**

- From an industry point of view the content in the mobile services has to be integrated in the existing marketing strategies of the country and the destination (UDP).

- To develop content for mobile services that is related to the UDP of the tourist area, and also is targeted the various segments, so the tourist will experience a flow and continuity in the services provided.

- The specific development of content at least has two dimensions with a lot of challenges

- Development of single formats. E.g. content for attractions, booking, maps, events that facilitate possibilities for contact, interaction, transaction and relations.

- Development of connections between the single formats and links to user-friendly and relevant databases and portals with tourist knowledge (like National ones like Guide Danmark and [www.visitdenmark.com](http://www.visitdenmark.com) and locals like [www.ribe.dk](http://www.ribe.dk) )

Both dimensions presupposes knowledge about design and formats, genres and narratology, thus that attractive interfaces can be developed with respect to content, visual design and functionality. As mentioned earlier qualitative based studies here has as potential.

- At this time a lot of existing tourism content is there on the Internet . However these data is spread all over the place, and therefore coordination will be one of the keywords in the proposed project .

- Interactive content on a mobile platform like infomercials and games appears as genres that can meet the customers’ expectations and hence contribute to the mediation of destination and traveller mythologies (Gyimothy, 2000). And many public and commercial visitor attractions already use this strategy (Marcussen, 2003). But if the service should add value to the tourist experience it is necessary with a close cooperation between content developers and tourist operators based on proper research as mentioned earlier.

## 10.7 Conclusion and final remarks

I described here the background for a coming Danish tourism project “Mobile Digital City and Nature Walks - development of content and software for a mobile tourism device”. The primary ideas, objectives and the challenges of the project were presented along with an illustrative user scenario. With a departure in the concept and practice of experience accounts mostly based on quantitative methods, it was suggested that qualitative approaches and studies could be of value in developing content for mobile tourism services, especially ethnographic studies with focus on tourist behaviour and qualitative based consumer studies with focus on customer assessment looks promising. It is likely that tourist destinations providing mobile services might add value and possibly extra quality to the tourist experience. But just “making life easier” for tourists by facilitating their journey and destination stay is not enough for visitor destinations in the future. Mobile services based on user centric methodical frameworks as suggested can be some of the means to make the visitor’s life *richer* in the future.

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## ACTeN – Anticipating Content Technology Needs

ACTeN has been a EU-funded project in the IST Programme of the 5<sup>th</sup> Frame Work Program of the European Commission. It brought the network of the European Academy of Digital Media (EADiM) to the preparation of FP 6 using the dissemination of results of FP 5 as trigger and incentive to an enlarged business and industry community in the area of multimedia technologies and e-content applications and tools.

EADiM has members and partners in 20 countries in the EU and the NAS and has developed around the evaluation of best practice of e-content creation through the EUROPRIX award jury process.

ACTeN used this network to anticipate the needs of the business community and the MM industry for innovation in tools, enabling technical environments and new product features. It provided an East-West collaboration and addresses especially the need of SMEs. It monitored the market developments, conducted business round tables, trend conference and scouting workshops. ACTeN facilitated the needs for new R&D based on an insight of the specific business context.

The consortium members of ACTeN were:

- MFG Agency for Media and IT Development Baden-Württemberg, Germany
- Electronic Media Reporting, Netherlands
- MindTrek Association, Finland
- International Centre for New Media (ICNM), Austria
- European Academy of Digital Media (EADiM), Netherlands
- Digital Dispatch, France
- The Hungarian Association for Content Industry, Hungary
- The Information Processing Centre, Poland
- Easy Learning and Teaching, Slovakia
- Technology Centre of the Academy of Sciences (TC), Czech Republic
- Institute for Computers, Rumania

For further information on the project ,please see: <http://www.acten.net>

For more information and the e-mail addresses of the participants, please see:

[http://www.acten.net/cgi-bin/WebGUI/www/index.pl/acten\\_consortium](http://www.acten.net/cgi-bin/WebGUI/www/index.pl/acten_consortium)

For further information on past and present IST programs and research, please see:

<http://cordis.europa.eu/ist/>

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