BitBang3

Entrepreneurship and services

Yrjö Neuvo & Sami Ylönen (eds.)

MULTIDISCIPLINARY INSTITUTE OF DIGITALISATION AND ENERGY (MIDE)

Bit Bang III

Entrepreneurship and Services

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Foreword

Bit Bang – Entrepreneurship and Services is the third multidisciplinary post-graduate course for doctoral students at Aalto University. Altogether 24 students were selected from the three units of Aalto University: Helsinki University of Technology, Helsinki School of Economics, and the University of Art and Design Helsinki.

Bit Bang is a part of the MIDE (Multidisciplinary Institute of Digitalisation and Energy) research program, which the Helsinki University of Technology started as part of its centennial celebration of university education and research. Professor Yrjö Neuvo, MIDE program leader, Nokia's former Chief Technology Officer, is the force behind this course.

During the 2010–2011 semesters, the specific learning objectives of the Bit Bang course were entrepreneurship and service business. During the fall semester, the students produced reports on the following four topics: Infopreneur – from nomads to knowmads; Augmented entrepreneurship: Enhancing business by enhancing reality; Discovering opportunities for sustainable entrepreneurship; and Staying small is good for you: Scenarios for small companies in global niche markets. The textbooks for the fall semester were Bit Bang II – Energising Innovation, Innovating Energy by Yrjö Neuvo & Sami Ylönen, eds. (2010) and Entrepreneurship – Successfully Launching New Ventures by Bruce R. Barringer & R. Duane Ireland (2010). Distinguished guest lecturers from industry and academia complemented the textbook material. The course also had a five-week (five rounds) OnService business simulation game, which was designed to give students the opportunity to practice with the key success factors that are relevant to any service business in small and medium-size enterprise environments.

In the spring period, the focus was on the key characteristics of the service business. The spring team work topics were: What is service research? Present status and future directions; Attackers' advantage: Introducing discontinuous service innovations to the market; Service innovation based on Maslow's hierarchy of needs; and Dynamic service design in healthcare. The textbook for the spring semester was Service Innovation – How to Go from Customer Needs to Breakthrough Services by Lance A. Bettencourt (2010). In addition to the lectures and textbooks, the Bit Bang group made an intensive study tour of the Bangalore and Delhi areas.

The essential learning aims of the course were team working, multidisciplinary collaboration, global perspective, industry and business foresight, and scenario building. The passing the Bit Bang course required active attendance at the lectures and seminars as well as writing this joint publication based on the fall and spring group works. The texts were written by doctoral students presenting their views. We want to give our special thanks to Elina Karvonen for her devotion and hands-on support of this ambitious project.

We warmly wish you all pleasant and eye-opening moments with this book!

Yrjö Neuvo & Sami Ylönen

Reflections on Bit Bang 3 from the students

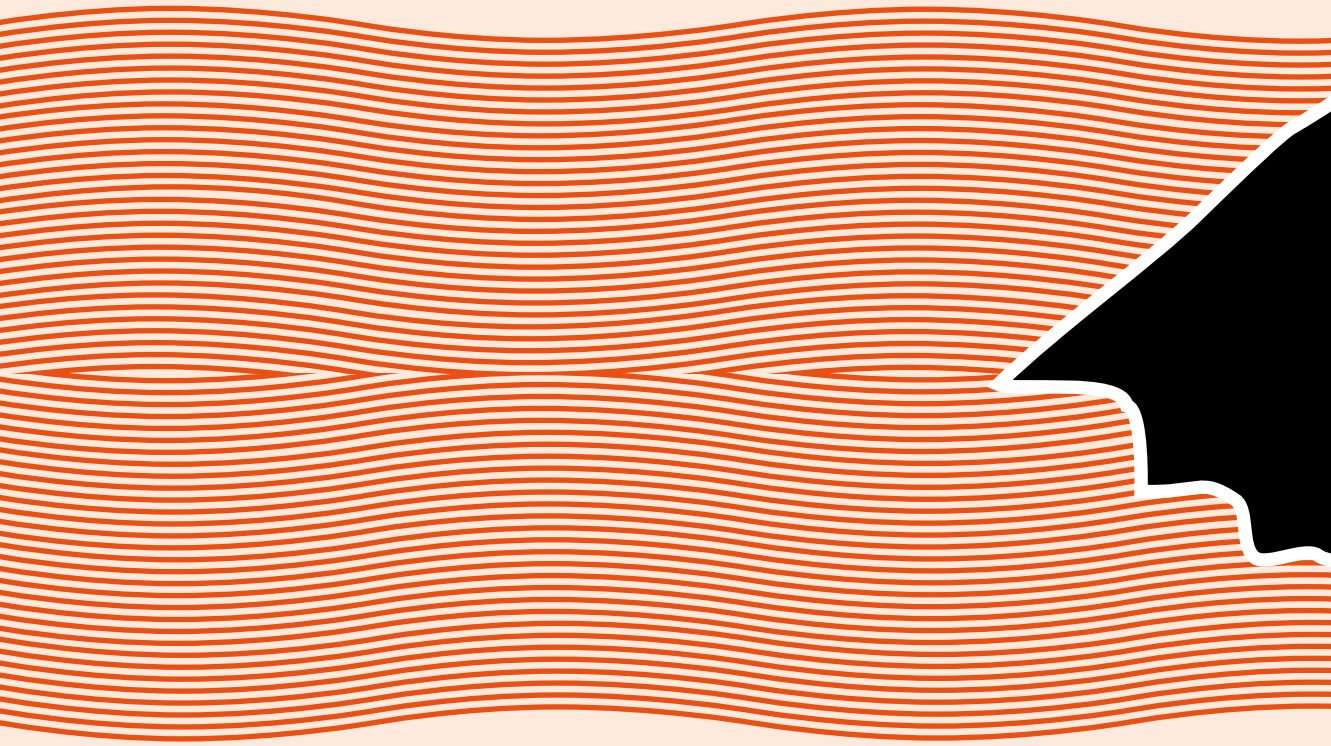
We knew this was going to be something different. Bit Bang 3 would bring together graduate students with an international background from all the Aalto schools. We would work in groups and deliver assignments. We would listen to leaders and experts and learn from their experience. And we would take a one week study tour abroad. These ingredients definitely promised an intriguing start.

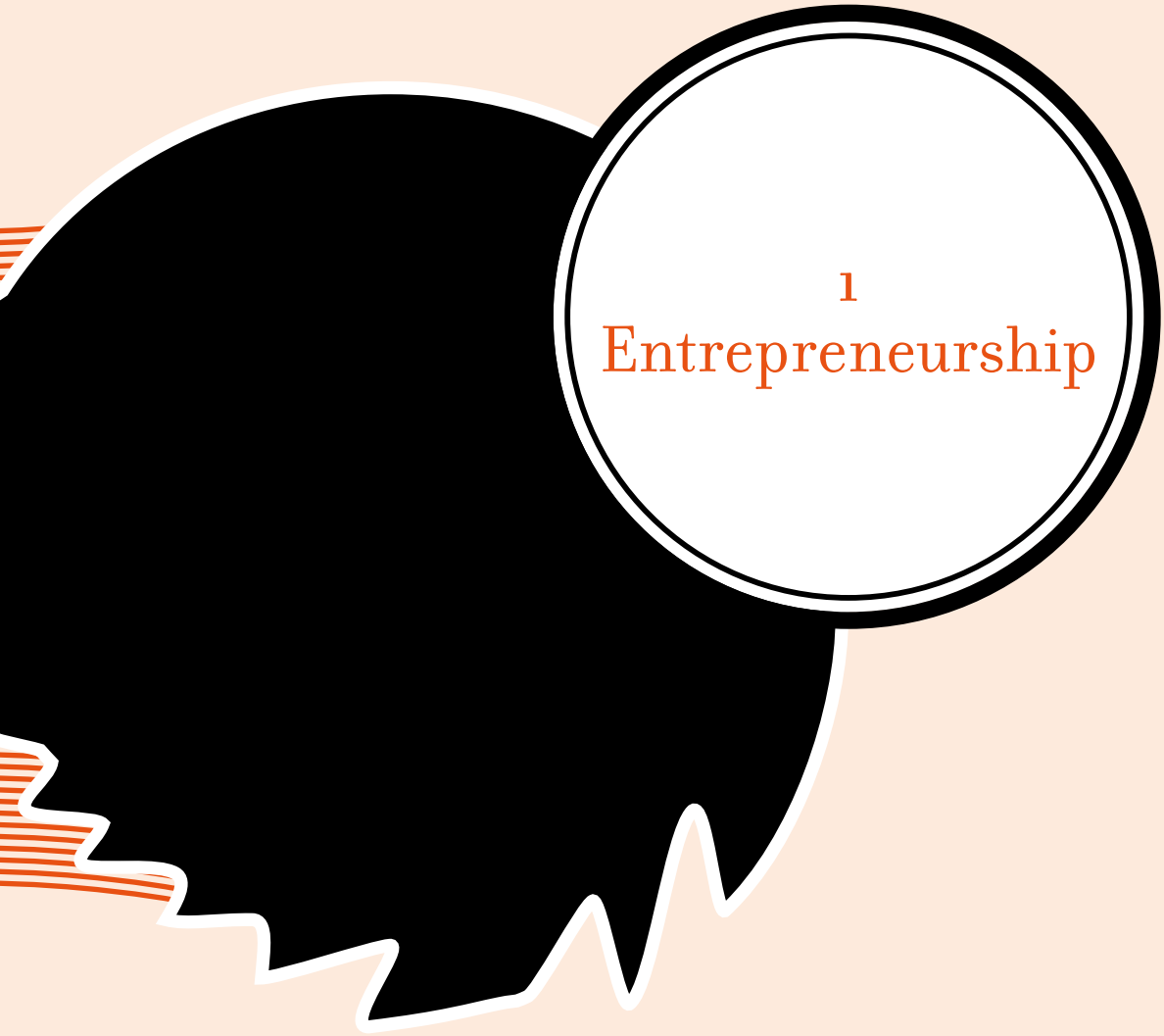
But all this became special as Yrjö and Sami welcomed us to share our thoughts, background and personality with each other from day one. In this way, we were invited to explore different perspectives of science, and practice our personal characteristics with an open mind. This brought each of us on the fringe of something new. For one, this was courage to pursue new goals, and for the other, it provided collegial support in the midst of academic pressures. In addition to these personal reflections, it made us challenge our beliefs, discover new ways of thinking, and enjoy our behavioural and cultural richness. So, what truly made the difference was this open, innovative and supportive spirit.

It has been a privilege to be part of this journey. Although our paths now continue in many different directions, we will hopefully be able to spread the same spirit around us wherever we go. By these words, we invite you to join in.

On behalf of the Bit Bang 3 students,

Leena Sivill





1
Entrepreneurship

1.1 Infopreneur - From Nomads to Knowmads

Parth Amin[1], Harri Heikkilä[2], Tapani Hyvämäki[3], Anna Korolyuk[4], Juuso Parkkinen[5], Zhe Zhang[6], tutor Cathy Nangini[7]

[1]Aalto University School of Electrical Engineering,
Department of Communications and Networking, PO Box 13000, FI-00076 Aalto, Finland

[2]Aalto University School of Art and Design,
Department of Media, PO Box 31000, FI-00076 Aalto, Finland

[3]Aalto University School of Electrical Engineering,
Department of Automation and Systems Technology, PO Box 15500, FI-00076 Aalto, Finland

[4]Aalto University School of Science,
Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[5]Aalto University School of Science,
Department of Information and Computer Science, PO Box 15400, FI-00076 Aalto, Finland

[6]Aalto University School of Engineering,
Department of Surveying, PO Box 11200, FI-00076 Aalto, Finland

[7]Aalto University School of Science,
Low Temperature Laboratory, PO Box 15100, FI-00076 Aalto, Finland

Abstract

The rapidly growing amount of available data and information has resulted in the need to process and filter relevant pieces of these data. This is exactly what an infopreneur does: she or he takes and combines existing data sources, adds value by refining the information into applicable knowledge, and presents it to the user in an understandable way. In this chapter, we cover important concepts related to an infopreneur, such as the information value chain and possible business models. We also

discuss related sources of innovation, such as data mining and information visualization, and present a few promising opportunities for an infopreneur.

Keywords: Infopreneurship, information value chain, information visualization.

1 Introduction

We live in an era of exciting new possibilities stemming from recent developments in information technologies, such as fast mobile Internet connections. As a result, however, we are facing an information overflow: it is practically impossible to comprehend all of the available information. The need to effectively filter and clearly convey information based on user interests has thus become evident, but current information products and services are far from satisfactory in this sense. This creates a promising opportunity for infopreneurs - a new form of entrepreneurs who create value by gradually refining data into information and knowledge relevant to the user.

As an example of a process in which large amounts of available information are gradually refined and made more relevant for the user, consider a person who wants to find an Asian restaurant in the Töölö area of Helsinki. Before the Internet, a typical approach would have been to browse a local company catalogue or a restaurant guide for restaurants located in Töölö or those with Asian cuisine. This involved a lot of manual work in browsing through existing lists and looking for relevant restaurants.

The development of the Internet, and especially Web 2.0 applications, has made this search process much easier. One can, for instance, search for "Asian restaurant Töölö" using Google, or use one of many restaurant services where the visible choices can be filtered based on the desired location and cuisine. The Internet has also made possible the delivery of related information, such as customer reviews and menus, which are all relevant for the user's restaurant choice. Mobile devices, especially those with an Internet connection, have made even better services for users possible. Customers can, for example, search for nearby restaurants based on their current location, reducing the need for planning beforehand. User Generated Content (UGC) is a pre-eminent expanding trend in information services.

In this article, we will investigate how information is extracted from data from an infopreneurship point of view; that is, how value is created from data and information. This includes the process of analysing and refining data into information, and further processing it into applicable knowledge, while taking customer interests into account. We will also cover possible business models for an infopreneur and other useful recommendations for a successful business in the field.

There is an interesting peculiarity in knowledge and information-related entrepreneurship in terms of how data analysis is used in an enterprise. One way is to use data to improve processes within an organization. A second is to turn information into

new kinds of products or services by refining it to be more valuable for customers. However, these two ways of using data analysis overlap with one another; for example, consultancy companies will both improve existing business processes in other companies and make new kinds of products.

The two related concepts described above can be referred to as knowledge entrepreneurship and infopreneurship, respectively. In light of the work by L. Harvey and P. Knight on *Transforming higher education* [1], the knowledge entrepreneur does not aim at the realization of monetary profit per se, but focuses on opportunities with the goal of improving the production and throughput of knowledge. The Infopreneur, in turn, is an entrepreneur who turns information into income [2]. In other words, the knowledge entrepreneur seeks ways to use knowledge to improve the processes of a particular company, while the infopreneur creates new products or services where information is the key content. In this chapter, we will focus on infopreneur-based products and services targeted at the end customer segment and not on the business-to-business segment.

We will identify and discuss key factors behind an innovative and successful infopreneur. One such factor is the ability to combine data from various data sources in innovative ways and, thus, create innovative products and services, as the above example shows. Another key factor is information visualization, which can solve the problem of how to convey large amounts of complex information to a user in an efficient and understandable way. We will also discuss other sources of innovation for an infopreneur, as well as important practical matters, such as patenting.

This chapter can be useful for entrepreneurs who want to start a business in the new area of infopreneurship, as well as for scientists or engineers who have found a brilliant idea from their work and want to create a business out of it.

The structure of the chapter is as follows: in Section 2, we cover related background concepts and the relevant literature, starting from the information value chain and data analysis in Section 2.1 and business models in 2.2; Section 2.4 deals with information visualization and, especially, how it can help to create products or services from information; and, finally, in Section 3, we highlight some new opportunities for an infopreneur and give a specific example of one such opportunity.

2 Background

2.1 Information Value Chain

To become a successful infopreneur, one must understand how relevant information is extracted from raw data, how multiple data sources can be combined, and how the resulting information and knowledge can be processed and analyzed further. At the core of this process is the value chain of information [3], which is illustrated in Figure 1. The value chain describes the process of gradually refining raw data into

information and, eventually, knowledge. At each step, value is added with increased understanding and applicability for the studied objects.

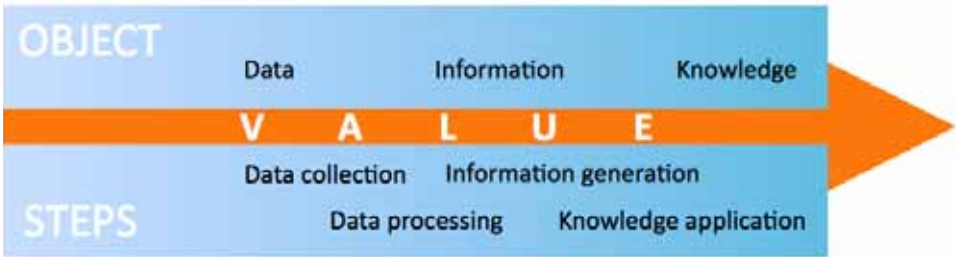


Fig. 1. The information value chain

The terms forming the information value chain have various definitions and meanings, depending on the context. In this chapter, we use the term "data" to describe any raw material in digital format [4]. Information is a relationship between data [5] objects, and information becomes knowledge when the user interprets it and gives it meaning in relation to a particular context [6]. In practice, it is impossible to always draw a line between information and knowledge, and, thus, in this article we will also use these terms interchangeably.

According to Elias Bizannes [3], there are four key value-adding steps in the information value chain, as shown in Figure 1. In data collection, value is added by effective storage, and in data processing the value comes from effectively manipulating the data to obtain more meaningful information. Information generation refers to bringing together data from diverse sources, and, finally, the information becomes knowledge when it is applied in a unique way. Next, we will describe in more detail important concepts related to these value-adding steps from the infopreneurship point of view.

2.1.1 Data Structure and Data Sources

Data comprise representations of measurements or observations, such as numbers, text, figures, images, or speech, in a form that is convenient to store, move and process. Data are always recorded on media that nowadays is most commonly in digital format, for example optical or magnetic memory. The most important division between types of data is quantitative and qualitative. Quantitative data are always represented by numbers, while qualitative data include, for example, text or class labels. These data types allow very different kinds of methods to be used in data analysis. An important subtlety is that data values themselves do not have a meaning - the meaning comes from processing and interpreting the relationships between data.

The process of *collecting data* usually determines how well data are structured and organized. Collecting data can be done actively or passively. Active data collection of-

ten involves *experimental design*, where the entire process, from variables to measured data, is designed carefully to satisfy the requirements of the performed survey. Passive data collection is closer to merely observing or gathering data and the process is not designed so carefully. Instead, the target is to gather all the data that are available and already collected: consider, for example, a web-page visitor counter or the daily sales information of a shop. The active collection of data usually leads to well-structured data, which means that there is a well-determined *data model* that contains plenty of details about the relations between the parts of the data.

Well-structured and organized data are often stored in databases, which in turn is the starting point for traditional data analysis methods. Passive data collection often leads to more extensive pre-processing to produce data that is well structured and organized. Passive data collection can also result in unstructured data if the structure of the data is more difficult to find. Conceptually, unstructured data covers all of the data that are not considered as structured data. Common examples of unstructured data are web pages, word processing documents, emails and photos. Such data items may contain plenty of useful information, but searching for and retrieving it can be difficult. It is estimated that unstructured data can comprise as much as 80% of data within organizations [7]. The analysis of unstructured data is much more challenging than the analysis of structured data.

The infopreneur inevitably faces the problem of finding reliable and comprehensive sources of data. Since the early days of computer data storage, almost all data were the private property of, for example, companies or government institutions. This was due to the high costs of processing and storage hardware as well as undeveloped standards for storing and transferring data. The good news is that in the age of the Internet, the amount of public data has increased exponentially and numerous web technologies have enabled data to be accessed more efficiently. The gathering and distribution of data have also become more centralized and, thus, have provided a breeding ground for data-oriented technologies to develop on a large scale. The bad news is that access to the most interesting data, which are usually also well structured, is still commonly restricted to the very few.

Recent developments have initiated the opening of data sources to the public and have given rise to the concept of *open data*. Experts anticipate that open data will be the most valuable sources of data that produce plenty of future opportunities for an infopreneur. They also predict that open data will be a key factor in developing web-based services in the public sector in next few years [6]. We will discuss in more detail the importance of open data from the infopreneurship point of view in Section 3.

2.1.2 Data Analysis

There are different levels to the depth of analysis needed for an information product or service. If the necessary information is already processed and stored in a structured database, all it takes is to query the database with the correct criteria and retrieve

the result. For example, in the restaurant service www.eat.fi, the restaurant database can be queried based on location and the type of cuisine, and the system shows the filtered list of restaurants for the user.

Many services have been built which combine information from several databases with different types of information. For example, services like http://www.ebookers.com/ and http://www.supersaver.fi/ can combine information about airline tickets, hotel reservations, and car rentals in such a way that the customer can plan and reserve the entire trip at once, without even knowing where the actual information comes from.

Most existing information products and services use well-structured databases for finding the relevant information. However, there are limited opportunities for an infopreneur to create totally novel products based on existing databases. A more interesting approach is to use less structured data from different sources and use advanced data analysis techniques to process the data and extract relevant, novel information. We believe that this approach has a huge potential for generating totally new markets for innovative products and services.

Next, we will briefly describe the basics of computational data analysis. Data analysis is the process of inspecting, cleaning, transforming, and modelling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision-making. Computational tools have been developed for analyzing large amounts of data, which would be, in practice, impossible to analyze manually. Many method genres have emerged in the broad field of computational data analysis, such as data mining and machine learning, but their differences are not significant for the scope of this chapter. Here, we will simply use the term "computational data analysis" to cover all of the related concepts.

One goal in computational data analysis is knowledge discovery - the process of automatically searching large volumes of data for interesting patterns or structures. An example of a typical computational data analysis task is classification, where the goal is to assign pieces of input data to one of the given classes based on existing training data. A familiar example of classification is spam filtering, where emails are assigned to either "spam" or "non-spam" classes. Another common task is clustering, where there are no known assignments, and, instead, the assignments need to be learned from the data by finding groups of data points that are similar in some sense. An example of a commercial clustering application is customer segmentation, where a company has collected various data about its customers and wants to discover sensible groups of individuals based on, for example, similar interests or spending habits, and use these for marketing purposes. The knowledge obtained through the process may become additional data that can be employed for further usage and discovery, sometimes by combining it with data from other sources.

The development in data mining and related fields is mostly driven by academic research, but more and more commercial applications are also being developed. There are many examples of successful commercial applications that use advanced data min-

ing techniques, such as the above-mentioned spam filtering. The ACM SIGKDD Conference on Knowledge Discovery and Data Mining (http://www.sigkdd.org/), one of the main scientific conferences in the field, has a separate industrial track for presenting commercial applications only. Examples from the 2010 conference include tropical cyclone prediction [8], stroke prediction [9] and a system for preventing errors in health insurance claims [10].

It is interesting to note that, for example, Google, which has one of the world's largest collections of user data, is also highly active in data mining and machine learning research. Recent examples of Google's research include large-scale image annotation [11] and large-scale online learning of image similarity [12]. Many of Google's popular products are based on state-of-the-art research results, such as the world-renowned PageRank algorithm [13], which runs behind Google's search engine. However, most companies and public organizations have not yet realized the value hidden in their databases, and there are, thus, plenty of opportunities for open-minded infopreneurs to create new products and services.

The value of data analysis has also been recognized outside pure application products. An increasing number of organizations are struggling to overcome "information paralysis" - there is so much data available that it is difficult to understand what is relevant. Organizational Data Mining (ODM) is defined as leveraging data mining tools and technologies to enhance the decision-making process by transforming data into valuable and actionable knowledge for competitive advantage [14].

2.2 Business Models for Infopreneurs

The recent development of information and communication tools such as the Internet gave rise to not only infopreneurs, but also to new business models which were different from those used by traditional labour-intensive organizations. The early stage of Web applications was mainly related to read-only services on the Internet. As the Web incorporated a two-way and interactive mechanism to enable Internet users to contribute knowledge content to shared domains [15], the technologies and approaches were characterized as "Web 2.0," which has created social networks that allow individual users or entire communities to contribute content and relevant knowledge to be exchanged and retrieved on the Internet [16].

2.2.1 Existing Business Models

Infopreneurship resulted in new business models [17] that were not present in traditional labour-intensive organizations. These include *Aggregator*, *Organizer*, *Collaborator*, *Liberator*, and *Exchanger*, as shown in Figure 2.

Fig. 2. Business models for infopreneurs

Aggregator: an infopreneur that offers a storage platform to store or share private or public information over the Internet in a systematized way. An aggregator is mainly responsible for Web flow aggregation; Youtube, Facebook and Flickr are examples of this type of Web flow aggregation. The revenue model for an Aggregator infopreneur is based on online advertisements. Advertisement payment depends on the number of loyal users and the amount of flow or exchange of information on the specific platform.

Organizer: an infopreneur that offers a platform to organize public information on the Web from diverse sources, like customers, publishers, or other web sources, and the knowledge content is owned by everyone. Platforms also offer a systematized way to store huge amounts of information, and users can store and share their information, search for answers by themselves, or even post their own questions and wait for replies. Anyone can also add their own comments or add more information if they think someone's answer is not good enough. Examples include Wikipedia and Yahoo Answers. The revenue model for an Organizer infopreneur is mainly based on online advertisements and public donations.

Collaborator: an infopreneur that offers a software platform to people and companies so that they can develop application programs for themselves and share these applications with others. Anyone can also publish their user experience or create a new application if they think someone's creation is not good enough. Users need not be involved in the application development if they just adopt someone's creation, but they can also write their own applications and upload them to the Web site to share with others. Such a platform may be offered totally free, like Yahoo Widget, or

for a charge, as with Salesforce. The platform offers systematized ways to store and maintain a vast number of creations. For sharing purposes, application developers are requested to follow standard development protocols and make sure that their applications function under different environments. It is possible to utilize many applications under a framework like Yahoo Widget Engine, and none of them will interfere with the others. Collaborative platforms are also very common for mobile applications as well, such as Google Android, the Apple iPhone Applications Store, and the Nokia Ovi Store. Revenue models for the Collaborator infopreneur include selling the platform to develop applications, renting applications developed by companies/individual users, offering professional and maintenance services, or even selling customer behaviour patterns collected via the application framework.

Liberator: an infopreneur that offers open-source platforms that allow users to download free software, which they can then modify to meet their operational needs. Such an infopreneur focuses on opening their source code to upgrade the quality of products rather than withholding it in order to make a profit. Users can share the applications they download, as well as revise and update them on the open-source community's website. Anyone can also publish their user experience, revise a new version, or even create a new application if they can offer a better solution. In the open-source spirit, the creations are not for commercial purposes, which means that there is no income - the functionality is offered just for sharing purposes. In order to make the open-source system more popular, a Liberator infopreneur offers a certification mechanism to ensure the application's reliability: for example, Linux, MySQL, Mozilla foundation, WordPress, CentOS and PrestaShop. Revenue models for the Liberator infopreneur include licensing for commercial purposes and web-based advertisements and providing support and professional services, such as training, consulting, customized development and post-sales support.

Exchanger: an infopreneur that offers an exchange platform for exchanging information between users. Such an exchanger-based business model is useful for the infopreneur since it provides value for customers by connecting the right people together and also facilitates the exchange of relevant information between the users. Skype and Microsoft MSN are popular examples of exchanger applications. Revenue models for an Exchanger infopreneur include online advertisements and voice transfer fee.

Even though infopreneurship has existed for a couple of decades, only a limited number of revenue models, such as those described above, have been developed so far. There are few alternatives to major revenue models that rely on web-based advertisements, premium user charges, professional service offerings and public donations. The revenues generated by such a limited number of revenue models, mainly advertisements, are not enough for some of the infopreneur-based companies. For example, Youtube is one of the most successful examples of infopreneurship with mil-

lions of active users, and although it was acquired by Google in 2006 for 1.6 billion USD [18], it has yet to see profits, despite its large user base. Credit Suisse estimated that Google lost approximately 470 million USD in 2009 [19]. Most of the Youtube revenue comes from advertisements and premium content providers, whereas its expenses come from the cost of bandwidth, content licensing, hardware storage, sales and marketing, and other expenses. Similarly, Facebook is also one of the most successful Infopreneurship companies with 500 million active users [20]. Facebook was founded in 2004 and was not reported as profit-making until last year (2009) [21]. Based on these observations, we predict that there will be more innovation around revenue models for infopreneur-based companies in the near future.

2.2.2 Organizational Issues for Infopreneurs

The rise of the Global Knowledge Economy has brought various challenges to today's infopreneurship-based, hi-tech organizations, such as knowledge management, the loss of knowledge due to high attrition rates, highly competitive environments in which there is no room to fail and, lastly, the challenge of being at the forefront of innovation in order to ensure that an organization continually learns, innovates and executes. While the 20th century was a commodity-driven economy, the 21st century can be seen as a Global Knowledge Economy. Information is the key to success in the 21st century [22]. Opportunity lies in tapping the information-based gold mine, which is either unused or underutilized, to create an enterprise in which learning and innovation occur at the same pace as, or even faster than, the speed of change in the market.

The challenges facing organizations today and in the future are different than those faced by traditional organizations. Organizations need to identify knowledge that is critical for success, share that knowledge, use it effectively by sustaining high performance for revenue generation, and grow it by filling in the gaps for future revenues. This systematic and consistent approach makes an organization sustainable, high-performing and a market leader in an extremely competitive economy. The rise of a global community of knowmads is radically changing the way we live, work and learn. We need to focus on all three organizational principles mentioned below in order to meet tomorrow's challenges and also learn and share continuously throughout life.

The organizational principles for infopreneur-based enterprises are as follows: move from traditional hierarchies to social and value networks, which promotes information-sharing, monetary transactions, and exchanges of ideas and opinions; make the cultural shift from silos and knowledge-hoarding to openness and knowledge sharing; shift performance focus from profits to value creation.

An organization can transform itself into a high-performance knowledge organization through strategic knowledge management processes, like identifying the most critical knowledge, modelling how top performers make decisions and, finally,

streamlining and improving its own decision processes. For example, the McKinsey Knowledge Centre is being continuously created, maintained and improved by its corporate parent McKinsey Consulting.

As emphasized earlier, in addition to understanding the information refinement process, the infopreneur must be able to properly manage the growing amounts of information and knowledge in the company or organization. The infopreneur should be constantly ready to improve the processes used for the products and services by learning from the ongoing business and also by following the development of related methods. This kind of learning and storing of information can be described in terms of knowledge management.

Organizational knowledge management is a broad and multi-faceted topic involving socio-cultural, organizational, behavioural and technical dimensions. Organizations are continuously engaged in the creation, accumulation and application of knowledge, which creates a need for knowledge management. Efficient knowledge management involves a combination of technological and behavioural elements [23]. Knowledge management is especially important in companies with information-based products and services.

A central division in knowledge management is that of explicit and tacit knowledge: explicit knowledge as, for example, a process for reporting an invention, can be codified, stored and shared easily with ICT tools. In contrast, tacit knowledge as, for example, a means for choosing one specific business strategy out of many possible strategies, is more difficult to share with another person. The concept of tacit knowledge was introduced by Nonaka in 1991 [24]. According to Georg von Krogh [25], recognizing the value of tacit knowledge has become a key challenge for knowledge management in many organizations.

The concept of explicit and tacit knowledge is highly relevant for the infopreneur. Most knowledge obtained from the information value chain is explicit and, thus, easy to convey to the users. However, if the infopreneur is able to refine the knowledge further and turn it into tacit knowledge, it would have more value for the customer and, thus, more revenue for the infopreneur. On the other hand, this makes delivering the knowledge to the customer more challenging.

2.2.3 Differentiation of Companies: Examples

A company can use different business models, but, additionally, the models can differ according to what their place is in the data analysis chain. From the raw data to the final report, information passes through a few steps (see Section 2.1): *Data collection - Data processing (analysis) - Information generation (visualisation).* A company can either specialise in a single step or make a full-cycle product. Here we present a few examples of companies that occupy different niches. Each of these companies mostly follows business models discussed in Section 2.2. [41]

Table 1. Infopreneurs in different market niches

Data Collection: Zokem **http://www.zokem.com/ (organizer)**	Zokem provides service in mobile analytics. The company arranges data on consumer behaviour and mobile usage. For example, it can identify the top-performing Android games in the U.S., analyse mobile search engines in Europe, carry out technical measurements such as network coverage and signal strength, or send real-time questionnaires to the audience through mobile pop-ups.
Data processing: SAP BusinessObjects **http://www.sap.com/solutions/sapbusinessobjects/ (organizer)**	SAP BusinessObjects offers tools and applications for the optimization of business performance. For example, their analytic application software tackles industry-specific issues, including finance, sales, risk management, operations, patient care, strategic planning, customer retention and military planning.
Information generation and visualization: VISup **http://www.visup.it/ (aggregator)**	VISup claims: "We take the information and make its fruition more simple, more intuitive and easier to understand." For example, the company is currently working on the service Visualsport.com, which allows access to and analysis of football statistics, the visualization of trends or a comparison of players' performances.
Full cycle: Gallup **http://www.gallup.com (organiser)**	Gallup provides research and consultancy services in the area of human behaviour. The company collects information using, for example, face-to-face sociological surveys, it identifies current trends and provides recommendations to society leaders. Additionally, Gallup operates its own university.

2.3 Infopreneurship in Practice

This section provides practical advice for enterprises focused on infopreneurship based on the experience of BaseN, a company that works with data analysis of communication flows and energy consumption. Considering BaseN as an illustration of infopreneurship, we will show typical problems that an infopreneur may face.

BaseN (https://www.basen.net/) monitors, measures, analyses and forecasts data flows. In simpler words, the company receives massive amounts of data from their customers (telecom operators, energy companies), processes the data and presents the results to the clients. During its work, the company must deal with a few typical challenges, which we will now consider [42].

Advice: Think strategically - care about your capability to analyse

One of the common delusions that enters into an infopreneur's mind is the dream: "I have invented such a good algorithm, and I will surely be successful." But this approach is a bit naive. If the company has only one standard algorithm, without constant updates and improvements the business will fail. As time passes, data will become more complicated and an old algorithm will no longer be fast or accurate enough, or competitors might get a hold of a copy of the algorithm and develop a better version. The company can *start* from one genius algorithm, but after that constant work is necessary. All infopreneurs, ranging from the giants like Google and Facebook

to the small consultancy firms, are continuously improving their capability to analyse. So, first, the company should put effort into constantly moving ahead; Pasi Hurri, CEO of BaseN, says it is important for the company "to develop as fast as possible".

Advice: Protect your work

Second, the company should protect its work. There are a few ways a company can protect its achievements. No single method is enough; even all of them together cannot guarantee success. But, when the methods are used together with constant development, the company will increase the probability of prosperity.

Patents and licenses. In the world of increasing information sharing, it is necessary to record who was the inventor. While preventing the inventor from possible difficulties in future, the act of obtaining patents also allows for the protection of internal private achievements.

Building infrastructure. A resulting file, which contains analysed and visualised data, is not the only item involved in making a product. During product creation, many other components were involved - people, software, hardware, networks. The more key points the company controls, the more stability and power it has at its disposal. Building infrastructure can include creating communities (organizing workshops, competitions, educational programs), owning resources (servers, qualified staff), and creating networks.

Leadership in technology. Last, but not least, it is important to create real value that is stable under the pressure of competition. For example, science researchers can collaborate with businesses.

Challenge: Scalability

One of the important challenges specific to infopreneurship is scale. Due to the lower transportation costs for information as compared to traditional goods, it is easy to go global. The infopreneur will, however, have to make sure that the product can be scaled up in terms of, for example, speed, data storage, and number of clients.

Challenge: Privacy

Privacy is a growing challenge for everyone working with information. Sometimes, raw data from companies, as well as their results, may be of commercial interest and, therefore, should be kept secret. One way to ensure privacy is to use encryption, so that even the personnel of the company are not able to connect the results to individual customers.

2.4 Visualization Design

2.4.1 Information Visualization

In the infopreneur business, information or raw data are collected, and visual analytic tools and techniques are used to synthesize information and derive knowledge from

massive datasets. Knowledge is gained after the analysis process and after the data is presented to the customer. Therefore, information visualization will play an important role in the process of turning raw data into knowledge.

A good visualization allows users to see, explore and understand large amounts of information at a glance [26]. Card et al. [27] define information visualization as "… the use of computer-supported, interactive, visualization methods of abstract data to amplify cognition". There are four basic stages in the process of information visualization [28]. At the beginning, data has to be collected and stored in the information system. After that, data must be transformed into something that humans can understand. As result, information is displayed as an image, often a graph, on a screen (for example, computer, mobile phone) produced by algorithms or methods, which enables the user to perceive the image. Tufte [29] defined the excellence graph as a tool that gives the viewer the greatest number of ideas in the shortest time, with the least ink in the smallest space.

GIS (Geographic Information Science) production is one example related to information visualization. In GIS applications, computer-based systems are used to collect, manage, analyse, model and visualize the data as an image or a map. Nowadays, more and more GIS specialists have paid attention to information visualization. Good information visualization (or information geo-visualization) allows a user to perceive spatial patterns. For instance, Figure 3 shows two examples of choropleth maps [30] for the voting distribution of an American politician, Henry Perot. In a choropleth map, the areas are shaded or patterned in proportion to the value of the statistical variable being displayed on the map. Map A uses illogically ordered hues, while map B uses logically ordered shades of a single hue. Map A may allow the reader to easily discern the voting situation between individual states, but it does not allow the user to perceive the overall spatial pattern as rapidly as map B. That is, the viewer can easily associate darker shades with more votes.

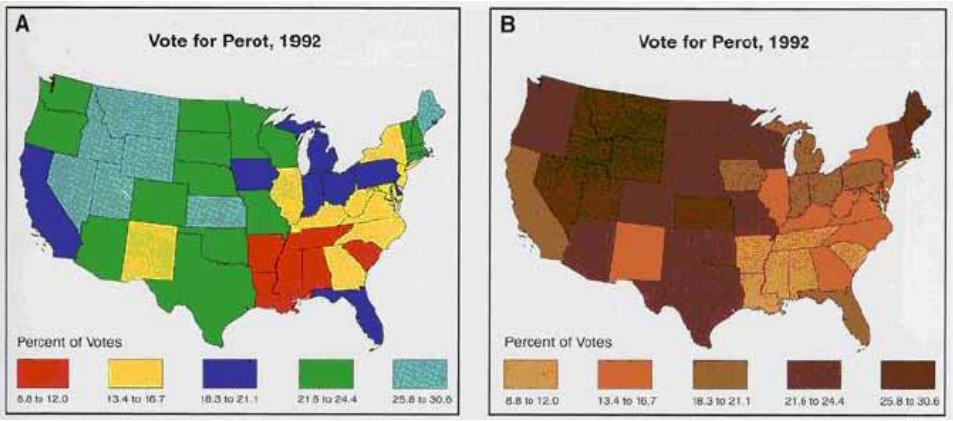


Fig. 3. Example of a choropleth map [30]

Tyner and Judith [31] introduce the basic principles of map design. These principles are used in most GIS applications, which often produce maps as end products. They pointed out that excellent map design should avoid overload (to achieve clarity), display the data logically (order), consider the visual weights (balance), be perceptible with good visual hierarchy (contrast), and display only the interrelated elements [31]. In addition to these principles, the age and cultural background of the map user should also be considered in the map design process. For instance, maps for children should be made differently than adult maps. A map for children should be designed so that it is easy to read and understand. Figure 4 shows one example of a map that helps children learn about different animals. It has a large size (136 x 96 cm) and beautifully drawn charts and clear colour illustrations showing realistic images.

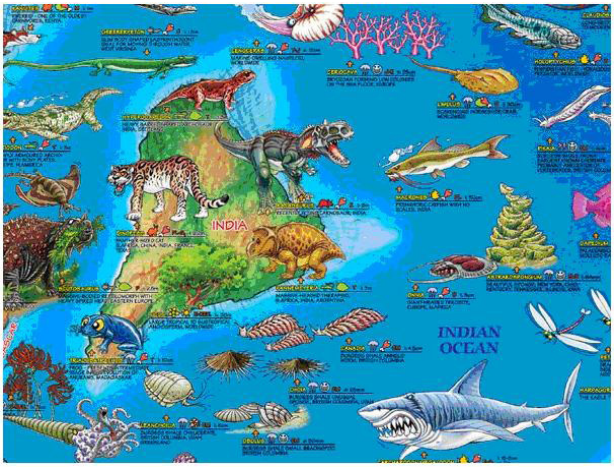


Fig. 4. ***Example of a map for children [32]***

2.4.2 Knowledge Visualization

A similar topic related to information visualization is knowledge visualization. In Knowledge Visualization, visual representations are used to improve the creation and transfer of knowledge between at least two people. Therefore, knowledge visualization can be used to construct and transfer complex insights, such as experiences, values, attitudes, expectations, perspectives, opinions and predictions, in order to enable someone else to remember, re-construct and apply these insights correctly [33]. Robert E. Horn defines knowledge visualization as the art and science of preparing information so that human beings can use it efficiently [34].

In the inforpreneur business, knowledge visualization is used to transfer the knowledge that technical experts have gained from information visualization to the sales team and, finally, to the customer. Therefore, knowledge visualization is one of the key processes in attracting customers.

2.4.3 User-Centred Visualization

Excellent visualization creates great opportunities for business. In addition to knowledge visualization, visualization that takes into account different user needs, wants

and limitations is even better. The global market creates possibilities for infopreneurship, but it also introduces great challenges because of the diversity involved; for example, people from different backgrounds decode information differently. We see this challenge as an opportunity. Good visualization imposes order on a chaotic reality. We know that the concept of ordered reality varies from culture to culture [35]. For example, we know that attractive colour schemes are culturally dependent: there is no visual universalism (for example, eastern cultures prefer much brighter colours and more playful graphics in mobile interfaces than do cultures in the west). Therefore, it is possible to form some kind of culturally conscious visual anthropology or ethno-semiotics as a field of research, and consultation entrepreneurship could create customized application interfaces, especially in mobile devices. According to Aaron (2009) [36], one major trend in future information design is that users will be able to customize their user interfaces more extensively, enabling them to better fit information systems to their personal preferences and circumstances [36]. Marcus [36] stresses that integrated information systems, which draw information from various sources and are accessed by their user interfaces, are also, in turn, "artefacts of metaphors, mental models, navigation, interaction and presentation techniques" [36, 28]. The information designer is the professional who can design the usability and appeal for such devices. Katherine McCoy [37] stresses the same point: mass communication and visualization are moving from modernistic one-design-fits-all paradigms to "user-centered systems with tailored products, tailored communication, and targeted channels".

Therefore, we claim that it would be commercially valid to study whether visualization should be localized in the same way as language, thereby creating visualizations that are optimal from the viewpoint of different users. In addition to the need for intercultural interfaces, Marcus [36] points out the need to include gender- and age-specific interface designs as well as designs for people with disabilities. Programs that offer different user-interface themes for different groups have a greater chance of becoming commercially successful.

3 *New Opportunities for Infopreneurs*

So far in this chapter we have covered the background relevant for an infopreneur. In this final section, we identify several opportunities for an infopreneur. In particular, we use the *PEST-framework* as a tool to identify and analyse new business possibilities for infopreneurs. PEST stands for (P)olitical, (E)conomic, (S)ocial, and (T)echnological analysis, and it is used for understanding and tracking changes in the market, for evaluating potential and for determining the direction of operations. The components of the PEST-framework are explained below.

Political: What is happening politically in the environment in which we operate?

What is the political direction? What are the services that the government provides or wants to provide? How and to what degree does the government intervene in the economy? What are the tax and labour laws, and so forth? Also, governments have a great influence on health and education, and on the entire infrastructure of a nation.

Economic: What has happened and is happening within the economy? What are the trends? What are the interest rates, exchange rates and inflation rates, wage rates, minimum wage, working hours, unemployment credit availability and the cost of living?

Social: What is occurring socially within the markets in relevant environments? What are the cultural norms and expectations, level of health consciousness, population growth rate, age distribution, career attitudes and level of safety?

Technological: What is happening technology-wise which can impact us? As new technologies are continually developed, there are also changes in entry barriers in given markets, and changes in financial decisions, such as those regarding outsourcing and in-sourcing.

The results of our brainstorming about relevant changes and trends from the infopreneurship point of view are as follows:

Political: More public raw data than ever before is being published on the Internet for free download. This trend is likely to continue. The principles of open government are widely accepted as ideal, although in many eastern countries, adopting the openness of public information is a new development. But also in the West, the trend is that public data is going to become more public. Wider adaptation to various open government principles and initiatives will mean that in the future, there will be not only more data, but data of a higher quality as well: the data will be more timely, that is to say, made available as quickly as possible to preserve the value of the data; it will be more accessible, that is to say, available to the widest range of users for the widest range of purposes; and, lastly, it will be more easy to process, that is to say, reasonably structured to allow automated processing.

Economic: More people can afford smartphones and tablets. This sector is growing globally despite the recent economic gloom. The mobile Internet software market has been booming since the introduction of the iPhone in 2007 and it is expected to grow even more in the future.

Social: Sharing is a virtue in the new IT culture. People are willing to share information and even produce it. In traditional media, user-generated content (UGC) is a new genre that originated with social media. This is a quite new phenomenon. We now have a culture of sharing that did not exist in the pre-Facebook era.

Technological: More and more location-enabled smart mobile devices and tablets with larger, high-resolution touch-displays and graphic user interfaces are entering the market. These phones are especially suitable for information visualization. According to the ICT analysis company Canalys, the smartphone market has grown 67% annually worldwide in Q2 2010 and it is likely to continue growing: U.S. shipments of the Android smartphone alone grew 886% in Q2 2010 compared to Q2 of

the previous year. The majority of smartphones now have touch-screens (http://www.canalys.com/pr/archive_r.html). Also, the mobile application business is expected to grow rapidly in the following years, as illustrated in Figure 5.

Taken together, the factors listed above create possibilities for using available data to create new services that people have not even imagined yet: in particular, mobile applications related to location information, combined with UCG, seems to be a lucrative direction. Good examples can already be found, but they are just the start of what is to come in the next few years.

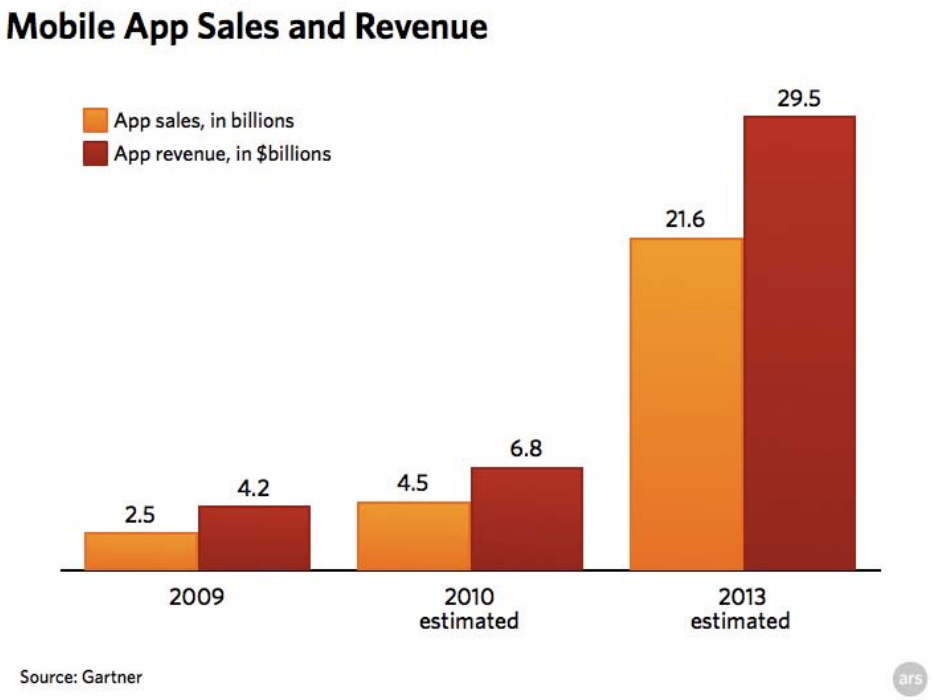


Fig. 5. Mobile application sales and revenue from 2009 to 2013 [38]

3.1 Open Data

Along the lines of open-source and open-access concepts, a related movement has emerged that promotes the opening of data sources, in other words, open data. Open data is a philosophy and practice requiring that certain data be freely available to everyone, without restrictions from copyright, patents or other mechanisms of control. Open data can be seen as a partly political movement, and the governments of several countries have taken a pioneering role in making large public data sources open to everyone. For example, Washington D.C. has an open data catalogue (http://data.octo.dc.gov/) of high-quality data ranging from real-time traffic data to school comparisons. Recently, the British (http://data.gov.uk/) and Finnish (http://opengov.fi/)

governments have made it their mission to open public databases.

The core value of open data lies in the fact that the owner or provider of the data no longer needs to develop applications for their data by themselves. Instead, every citizen is a potential developer, and often the best and most innovative ideas come from outside the data provider. Here it is important to note the differences between open and public data. Open data refers to data which is as easy to access as possible, whereas public data is published according to publicity laws [6]. Most of the applications using open data are non-profit public services, such as Finnish cultural services (http://www.museosuomi.fi), or they are used as a visualization tool for the Finnish budget and tax data (http://www.slideshare.net/ptatters/tax-tree). However, there are also several interesting examples of commercial services built on top of open data, such as ASBOromoter, a mobile application that measures levels of anti-social behaviour at a particular location (http://www.asborometer.com/). Some companies have also created a business around services that make it easier for other people to share their data, such as Infochimps (http://infochimps.com/datasets).

There are several organizations that are promoting open data. They have started a number of projects that make it easier to access open data from different sources. Such organizations include the *Open Knowledge Foundation (OKF)* and the *Open Geospatial Consortium (OGC)*. Another approach to promoting open data which has been proven very effective is the organizing of competitions for ideas using open data. For example, in Washington D.C., it was not enough to just open the public databases. It took the Apps for Democracy idea-generation competition to really get the concept off the ground [6]. A similar competition has been organized in Finland in the past two years (http://www.verkkodemokratia.fi/apps4finland), resulting in, among other things, several services that make the work of the Parliament of Finland easily understandable for citizens (for example, an interface for visualizing the voting behaviour of the representatives, http://www.biomi.org/eduskunta/eduskunta.html, by the winner of the Implementation Indie category of the competition).

A related concept that aims specifically at making the combination of several data sources as easy as possible is *linked open data (LOD)*. Linked data is about using the Web to connect related data that were not previously linked, or using the Web to lower the barriers to linking data that are currently linked via other methods (see http://linkeddata.org/), and it is closely related to the Semantic Web. LOD is, then, simply open data sets connected to each other following the linked data standards. In addition to the data sets, the key components of the LOD concept include the metadata schemas used for representing the data, the ontologies (vocabularies) used in annotating the data, and the services for creating, publishing, and maintaining these data resources (http://www.seco.tkk.fi/linkeddata/).

Just because a specific data set is listed as open does not necessarily mean that it is freely available for commercial use. There are many reasons to restrict access to data, such as confidentiality, privacy or economic interests. As the whole concept of open data is so new, the licensing practices are just taking shape. It is, thus, important to

carefully study the legal details whenever planning to use a specific data source for commercial purposes.

The examples mentioned above are just a tiny part of the immense potential of open data for infopreneurs. It is now possible to create totally new kinds of products and services with wide applicability in the everyday life of people. Especially when combined with efficient mobile devices, the distribution of information can be taken to a whole new level.

3.2 New Opportunities in Data Analysis

The future of data analysis is in developing tools for aiding human decision making, not in building tools that make decisions for humans. These tools have to be real-time and more aware of the changes in the environment of the user. Using these principles as a guideline in designing new information- and knowledge-based products and services can partially help people to deal with the exhaustive overflow of information.

The majority of the advantages offered by current data-mining and data analysis methods can only be utilized if the data are well structured. Usually, the data are historical or constant (in time), for example statistics, public transport timetables or geospatial data. Data, however, can also be of short-term relevance with rapid changes, for example weather data or stock data. Mining unstructured data can provide numerous new opportunities for infopreneurs to generate new information products and services. The methods that utilize such data still require development.

The advanced tools for aiding human decision-making can take into account, for example, the user's personal preferences and location by using user-specific information and GPS. Data analysis methods can utilize this extra information to provide more precise and relevant answers. The answers can have relatively short-term relevance: for example, a plan to go to the beach in the evening can change if the weather report shows that there will be heavy rain at that time. In mobile applications, the results can change even more rapidly, due to changes in time and the location of the user as well as the actions and changes in the locations of other users.

The development of data analysis and decision-making tools can be seen as a step towards *augmented reality*, where the surroundings of the user are extended via additional interactive audiovisual content. Consider, for example, shopping in a large mall, where the user chooses a product and is immediately (via some device) able to see the entire production cycle of the product with its environmental impacts. The information is naturally provided by both the producer and some impartial parties. The main challenge for an infopreneur in this case is to find a way to separate the relevant information from the information that is useless for that specific user. It might be that some user is not interested in the production cycle at all, but, rather, in the experiences of other users. In this example, the visualization of the data is crucial because that is the way to capture the user's attention and even make the user

interested in some information that he/she would not have noticed if it had been presented in some other form.

Different kinds of challenges that are partially or fully unmet are, for example, recognition of exceptional situations or emergency situations. People recognize such situations quite easily and, therefore, will undertake subsequent measures as well. Automatic recognition has been almost impossible due to very distributed data sources and the differing standards of data organization. If these exceptional situations can be recognized or predicted automatically, the reactions to them might also occur, in part, automatically. For example, if there is a concert by some world-famous artist at a downtown stadium or if there is a parade or a demonstration near the main street in the afternoon, then the journey planner or the GPS navigator should suggest an alternative route to avoid traffic or congestion. Other examples include natural catastrophes or large accidents where a huge number of people can be in danger. In such cases, the primary sources of raw data are often the databases of public-safety response services. The secondary sources of raw data are news that is nowadays published with a very short time delay, for example as RSS feeds. The automatic recognition of patterns in these data sources would give a great advantage in protecting people and objects against risks and further damage.

Google Flu Trends [39] is an example of a service that takes a step closer to an almost real-time service. It provides frequently updated information about flu activity around the world. The information is based on the search keyword data used in Google searches. Such information can be useful, for example, for health care authorities seeking to prevent epidemia from spreading to risk groups.

3.3 Example of a New Infopreneur Product: ParkGuard

As an example of a potential product derived from our group's brainstorming with the PEST-model, we present the concept of ParkGuard. ParkGuard is a fictitious mobile application that helps motorists to find safe parking zones when they are in unfamiliar environments, graphically showing the history of undesirable actions in the area. ParkGuard takes advantage of the Political factor, including open data from, for example, parking tickets that have been issued and the damage done to cars, combines them with the Social factor, that is to say, a user's willingness to share their own observations of crime in particular areas, and presents them in relation to the user's position. ParkGuard uses new devices where cartographic information can be displayed in soon-to-be-ubiquitous mobile screens, thus utilizing the Technological factor and the Economic factor.

Since ParkGuard is a mobile application, the map displayed in the mobile device will be designed differently compared to normal paper or digital format maps. The key concepts in mobile cartography are as follows: user, information, context, visualization, and technology [40]. Mobile map design should be user-centred, so we need to consider the user´s knowledge, culture, age, gender and perceptual ability. The

map should display only relevant information with a suitable scale and generalization since the mobile device has a limited screen size. The presentation of symbols or photos should be designed so that they are easy to read and understand without a complicated legend.

According to the above-mentioned mobile map design principles, the ParkGuard map is designed as shown in Figure 6. The tiny blue dot on the map is the user's current position. The user is a motorist who desires an appropriate parking location for their car or motorcycle in an unfamiliar environment. The red circles represent car fires, break-ins or other damages taken from a registry of an insurance company, which is also supporting the development of ParkGuard. The blue circles represent parking tickets that have been issued in the area, obtained from a public and openly available register. The green circles represent user-generated data, indicating various damages that users have registered via ParkGuard servers. Different types of circles are represented by using different colours, so that the user can identify different types of risk zones according to his/her own need. To keep information current, ParkGuard fades out the circles. In the course of one year, the mapped circles will vanish.

Fig. 6. ***User interface of the ParkGuard application***

4 Conclusions

Infopreneurship is a promising and exciting new opportunity for doing business. It has specific characteristics that come from the properties of information. The infopreneur needs to solve not only pure business tasks, such as sales and the organization of work, but must also be aware of specific problems, such as data analysis and information visualization. On the other hand, the starting costs for a new business are very low — all you need is a computer with Internet access, thus making infopreneurship possible for everyone. As examples like Facebook and Google show, there is no upper limit to the possibilities for the growth of new and innovative information products and services.

In this chapter, we have covered many important concepts that an infopreneur must know or possess in order to compete successfully. Infopreneurship is a new concept and it is, therefore, impossible to cover all of the relevant aspects related to it. Nevertheless, we have highlighted the basics and hope to encourage engineers to think of the huge potential in commercializing their research, as well as to encourage experienced entrepreneurs to engage in new information-related businesses.

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1.2 Augmented Entrepreneurship: Enhancing Business by Enhancing Reality

Andrea Buda[1], Kristi Grišakov[2], Pia Ojanen[3], José Luis Peralta[4], Simas Rackauskas[5], Timo Rinne[6], tutor Pavan Ramkumar[7]

[1] Aalto University School of Science and Technology, Department of Engineering Design and Production, PO Box 14100, FI-00076 Aalto, Finland

[2] Aalto University School of Science and Technology, Center for Urban and Regional Studies, PO Box 12200, FI-00076 Aalto, Finland

[3] Aalto University School of Science and Technology, Department of Media Technology, PO Box 14400, FI-00076 Aalto, Finland

[4] Aalto University School of Science and Technology, Department of Automation and Systems Technology, PO Box 15500, FI-00076 Aalto, Finland

[5] Aalto University School of Science and Technology, Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[6] Aalto University School of Economics, Department of Marketing and Management PO Box 21230, FI-00076 Aalto, Finland

[7] Aalto University School of Science and Technology, Brain Research Unit, Low Temperature Laboratory, PO Box 15100, FI-00076 Aalto, Finland

Abstract

Augmented Reality (AR) devices and applications have been advancing rapidly during the last decade due to the popularity of camera-phones and smart-phones. It is easy to imagine a future with displays in various sizes, fully integrated with our everyday lives, supplementing the world we live in. This chapter explores the current state of research and development of AR systems as well as the many entrepreneurial

opportunities it provides. The second part of the chapter will explore the wider concept of Augmented Spaces, looking into the future trends that might alter the way the physical world and cyberspace will interact in the future.

Keywords: Augmented Reality, Augmented Spaces, Entrepreneurship, Services

1 Introduction

During the past few decades, we have witnessed a rapid development towards a well-integrated information society. Twenty years ago technology made a great leap in this direction with the advent of the World Wide Web [1]. The Web indeed represents the technological revolution of our era and parallels have been drawn between it and the Industrial Revolution. It has been claimed that the Web can do the same for the information society as steam did for industrial society. The Web allows anyone to publish and distribute words, images, videos and software globally, instantly and virtually for free. It has been held up as the catalyst for the great levelling of humanity, as it gives people equal access, voice and potential, becoming, in the process, the ultimate empowering tool.

During the past years, this new way of communicating and interacting has changed the world as we once knew it. It has created unimaginable wealth and yet inspired people to work for nothing (e.g. Wikipedia). It has challenged authority, yet it has also allowed regimes to spy on and censor its citizens as never before. It has been blamed for creating a generation of web addicts, but, at the same time, it has opened up new realms of knowledge for everyone.

Our evolving information society is driven forward by emerging new technologies that feed technologically deterministic evangelists. The 1990s were about the virtual, the escape to cyberspace, the fascination with another virtual phenomenon – dot-coms [2]. However, the technological evolution drives us to constantly search for the new "big" thing that will change the way we live and perceive the world around us.

Augmented Reality (AR) systems, and the wider concept of Augmented Spaces (AS), could be the next frontier for this advance in the information revolution, and, for that reason, it could benefit and suffer from the same advantages and drawbacks that are linked to the use of the Web - the levelling and shifting of power, culture and values affecting politics, privacy, established business models and even our mindset. However, there will also be new ways to construct and interact with content as well as other people.

1.1 What is Augmented Reality?

The concept of AR is perhaps most familiar to us from movies, many of which are now popular culture icons. "Blade Runner", the "Star Wars" trilogy and "Minority

Report" (Figure 1) are examples of movies that have successfully envisioned a future where augmentation is enabled by various high-resolution displays, ranging from tiny hand-held devices to large screens built into walls or floors, which are fully integrated into people's everyday lives. The popularity of envisioning AR as part of our future in popular culture is definitely accelerating our interest in AR and has perhaps made us more prone to accept it.

Fig 1. Use of AR systems in the movie "Minority Report"

AR can be defined as referring to cases in which an otherwise real environment is *augmented* by means of virtual objects [3]. This can be achieved by various techniques. The defining characteristics of AR are that: 1) it combines real and virtual images so that both can be seen at the same time; 2) it is interactive in real-time, so the user can interact with the virtual content; 3) it is registered in 3D, so virtual objects appear in fixed space. It is important to emphasize the difference between AR and virtual reality (VR) because both include a computer-generated part of the environment. Whereas virtual reality aims to replace the real world, AR supplements it – it is the opposite of virtual reality [4]. With a typical VR system, all the work is done in a virtual space; the physical becomes unnecessary and its vision is completely blocked. In contrast, an AR system helps the user to do the work in a physical space by augmenting this space with additional information [2].

1.2 Possibilities for Augmented Futures

Aside from "Star Wars", we could envision some of the practical uses of AR which will make our everyday lives in the future more convenient. Many AR applications, as is evident from the history of AR, have emerged from military use, such as Heads-Up

displays for fighters. However, as technology develops, there are more opportunities to use AR, for instance, in assembly work, maintenance and construction, design and modelling, medical applications and surgeries, military training and warfare, location-specific instant information and various forms of entertainment. For example, a repair person viewing a broken piece of equipment would be able to see instructions highlighting the parts that need to be inspected. A surgeon would be able to assess an x-ray by observing live ultrasound scans of internal organs overlaid on the patient's body. Firefighters would be able to see the layout of a burning building to avoid hazards. Soldiers would be able to see the positions of enemy snipers or find their way through unknown terrain. An architect would be able to demonstrate a building project in its actual location, giving a better overview of its relationship to the surrounding landscape as well as its internal layout. Restaurant reviews or menus could be seen by glancing down the street. There are endless possibilities for AR applications, but the key in all of them is getting the right information at the right time and in the right place. With AR, information is no longer presented on a separate display; rather, it is integrated with the user's perceptions. According to Feiner [6], this kind of interface can minimize the mental effort that a user has to expend when switching attention back and forth between real-world tasks and a computer screen.

Our possible future with implemented AR systems seems to offer a multitude of options for making our lives easier. It is quite possible that future decades will not be about the virtual world, but about the delicate relationship between the real and the virtual – an augmented space. It is quite evident that the computer and network technologies appear to be more and more actively entering into our real physical spaces. This development could reveal exciting opportunities, as well as dangerous thresholds to be avoided. This chapter aims to explore the answers to a multitude of questions related to AR and AS. What is the current state of research and development on AR? What opportunities do AR systems provide for the masses, especially entrepreneurs? When will we witness the emergence of AS and what kinds of changes does this mean for our current information society?

This chapter is structured as follows. First, we will explore the research and development of AR by reviewing the history of AR as well as types of AR and AR technologies. Second, we will further discuss the types of AR entrepreneurial opportunities. After this, we will explain the concept of AS and contemplate future economical, social/cultural, political/regulatory and technological trends. Finally, we will critically discuss some of the more problematic aspects of AR systems. We end the chapter with our conclusions, answering the questions presented above.

2 Augmented Reality - Past, Present and Future

In this section, we will dig further into the past of AR systems. The idea of AR has been here for a long time, as is also demonstrated by many science fiction classics. It has not been a lack of imagination that has been slowing down the evolution of AR, but, rather, the lack of technological advances. It is not quite possible to seamlessly integrate AR into our everyday lives; however, our examples will demonstrate a very promising start. As technology is the main AR trigger, the last subsection describes the technological advances and problems of AR systems.

2.1 The Past

The idea of enhancing the perception of reality dates back to the 13th century, when Roger Bacon made the first recorded comment about using lenses for optical purposes. In 1665, an experimental scientist named Robert Hooke introduced the idea of augmented senses in his book *Micrographia*. Ever since, fiction writers, the military industry and, lately, academic and commercial researchers have paved the way for augmented reality with increasing effort [5].

Various AR systems have been built by researchers for more than three decades now. The first AR system was developed in the 1960s by computer graphics pioneer Ivan Sutherland and his students at Harvard University and the University of Utah. The 1970s and 1980s saw a small number of researchers studying AR at institutions such as the U.S Air Force's Armstrong laboratory, the NASA Ames Research Center and the University of North Carolina at Chapel Hill. However, it was not until the 1990s that the term "augmented reality" was coined by scientists at Boeing who were developing an experimental AR system to help workers assemble wiring harnesses [6]. Despite the tremendous changes in information technology since the 1960s, the key components needed to build an AR system have remained the same: displays, trackers, and graphics computers and software. However, the performance of all of these components has improved significantly in recent years, making it possible to design experimental systems that may soon be developed into commercial products.

When writing about the history of AR, it is not only the past researchers and their research fields that are important, but also the history of AR technology has to be briefly discussed. Scholars have studied the evolution of AR hardware [32]; in doing so, they have proposed a simplified view spanning three generations:

The Past: Generation "Kit Bag"	The Present: Generation "Hand Bag"	The Future: Generation "No Bag"
		
Took place over the last 10+ years	Started in 2005	Hopefully within the next 3-15 years
Custom-built backpack with laptop and accessories	Mass production: banking on the ubiquity of mobile devices	Eye-ware: glasses or even contact lenses
Head-mounted display	Aspiring for larger screens with more powerful devices	
Used exclusively in research	Easy to carry, ergonomic, affordable	Easy to carry, lightweight
Heavy, complex, expensive	Occupies hands, limits immersion	Hands free, immersive

2.2 Augmented Reality Types

There are two approaches for organizing various AR applications as a means of providing a comprehensive overview of the various types of AR. The first approach is to group them according to the field in which they are used. This division was done first by Azuma [3] already in 1997 to describe the work with AR that was done in each area. He divided AR work into the following six classes: medical, manufacturing and repair, annotation and visualization, robot path planning, entertainment and military aircraft.

Although these categories are still quite valid today, in this report we apply the second approach: a categorization based on devices and systems commonly used for AR and the five technical types of AR that derive from these devices. Such a categorization is suggested by Hayes[7], who explores various AR business models and evaluates AR applications based on their commercial values versus adoption. Hayes defines AR as information, 3D models or live action blended with and/or overlaid onto the physical world around us and physically manipulated or filtered in real time. To view the combination of the real world and metadata, or rich media, a camera and an attached screen is used. Devices or systems commonly used for AR include:

- Mobile devices with inbuilt cameras
- A head-mounted display, HMDs (glasses or futuristic contact lenses attached to a wearable networked computer)

- A PC or Mac with a webcam
- A tablet such as Samsung Galaxy or an iPad
- A games console with camera accessory
- A large TV screen with an advanced Set Top box and Web cam
- Others in development

The five technical types of AR, with some application examples, are as follows:
1. Surface or Haptic. The most understandable form of *augmented reality* would include screens, floors and walls that respond to human touch, providing people with virtual real time information or collaboration.

This type of AR application uses projectors and screens to insert objects into the real environment, for example enhancing the experience we get from visiting an exhibition in a museum. The difference between it and a simple TV screen is that these objects are related to the environment that the screen or display is located in, and they are often interactive as well. An example of a surface type of AR could be *immersive digital projections* that transform buildings into canvases, making them disintegrate or peeling away the facades to reveal other realms [8].

Fig. 2. AR on buildings - Ralph Lauren 4D Show in London [9]

2. Pattern, Image or Marker. The AR system performs a simple pattern recognition on a shape, marker (usually on a framed card in a real world scene) or face and replaces it with a static or moving element, for example a 3D model, information, audio, a video stream or a loop. The *items* appear to be in the same scene with the user.

This type of AR is one of the most commonly existing applications and is widely used for commercial purposes, like adding extra value to a printed newspaper. It al-

lows the reader to access special extra material on the web by showing a marker on the printed paper which the reader can see through the webcam. A wide range of applications using this type of AR exists for smart phones, where a marker is placed on price tags at the stores or on the product itself. With the help of the device, it is possible to extract more information about the materials that the product is made of and places where the products can be bought, or even to get some discount coupons.

A new way of online shopping can serve as an illustrative example. With the help of a special marker, you can not only see and order clothes, but also try them on, choose different colours, take snapshots of them and share the photos with your friends. The same can be done with accessories such as watches and eyeglasses. It is also possible to download sample furniture and to view how it would look in a precise location before ordering it. Pattern applications open lots of promising new opportunities in the gaming industry. A card game with different patterned cards looks more alive, and a simple game gets a new twist.

Fig. 3. Zugara Social Shopper (on the left) [10] and Tissot AR (on the right)

3. Outline or Recognition. The hand, eye or body outline is picked up and seamlessly *merged* with the virtual elements. The user is able to pick up a 3D object because the system is tracking the outline of the hand and its movement.

Using *outline* recognition allows users to be virtually *hands-on* with complex equipment in difficult-to-practice work scenarios. Bomb disposal, surgery and flight simulation are only several possible examples of how this type of AR can be used.

Fig. 4. BMW training and Xbox 360 video game platform with emotional AR

A controller-free gaming and entertainment experience is another example of this type of AR. It enables users to control and interact with the game without needing to touch a controller, such as through body gestures or spoken commands. The sensor features an RGB camera, depth sensor, multi-array microphone and custom processor running proprietary software, all of which combine to provide full-body 3D motion capture, facial recognition and voice recognition capabilities.

4. Location, Wayfinding, Geo-Location. Based on detailed GPS or triangulation location and position, and the view of the camera or device, the AR system can overlay information precisely over buildings or people as you move through real space.

In the case of Malaysia Airlines, the AR application displays the airline's cheapest deals from the user's nearest airport to destinations further afield. Passengers can also use features related to their booking. For example, a user will be able to switch on the AR function at an airport and find where the check-in desk is located or the direction of the departure gate, lounge, baggage claim and other services.

Fig. 5. Malaysia Airlines the AR application

Another example is the Layar Reality Browser, which shows your surroundings by displaying real-time digital information on top of the real world, as seen through the camera of your mobile phone. The idea is simple - Layar works by using a combination of the mobile phone's camera, compass and GPS data to identify the user's location and field of view, retrieve data based on those geographical coordinates and overlay the data over the camera's view.

Fig. 6. Layar platform on Samsung Galaxy

5. Hologram. Using 'smoke & spinning mirrors', literally in some cases, virtual or real items are *projected* into the physical space you are in and can be interacted with. These devices are based on cameras tracking real world impulses, for example hand gestures or audio signals.

This type of AR includes virtual elements appearing *naturally* in real space. Holograms will be appearing more and more in controlled situations. Japan is leading the way here, with a virtual anime character called Hatsune Miku performing 34 songs to a sold out concert.

Augmented virtual meetings are another example of what can be done using this type of AR technology. We are all familiar with video conferencing, a few have even dabbled in 3D virtual world get-togethers, but AR meetings are a game changer. The potential here, using *discrete* personal screens, is to have the inevitable remote meeting, with live feeds of your colleagues, blended into your room.

Fig. 7. Hatsune Miku (anime) concert in Japan (on the left) [11], and augmented virtual meeting (on the right)

2.3 AR Technology

When it comes to understanding AR, it is crucial that there is always a device involved. In this subsection, we will describe the world of AR from the perspective of the technology necessary to implement it. We do not want to focus on the technical details of AR so much as we want to discuss and categorize the hardware and the software of the AR field.

According to Marshall McLuhan's [12] legendary formulation, "the medium is the message", the form of a medium embeds itself in the message, thereby creating a symbiotic relationship by which the medium influences how the message is perceived. Thus, the device used to access the information and services in the data layer plays a fundamental role in how successful a new device might be. The same rule also applies for AR. Most of the technologies under development (described in Figure 8) are far from being ready for the masses. The most promising and affordable technology for building a successful business with augmented reality is represented by various smartphones. The total mobile AR market is expected to grow from $2million in 2010 to $732million in 2014 [13]. According to the Gartner Hype Cyle [14], the peak of inflated expectations for AR is expected in 5-10 years, so AR is still years away from being mainstream. The increasing popularity of these mobile devices has also opened the market of the wireless Internet over the 3G networks. The possibility of accessing the data layer anytime and from anywhere has fundamentally influenced which kinds of AR applications will be further developed.

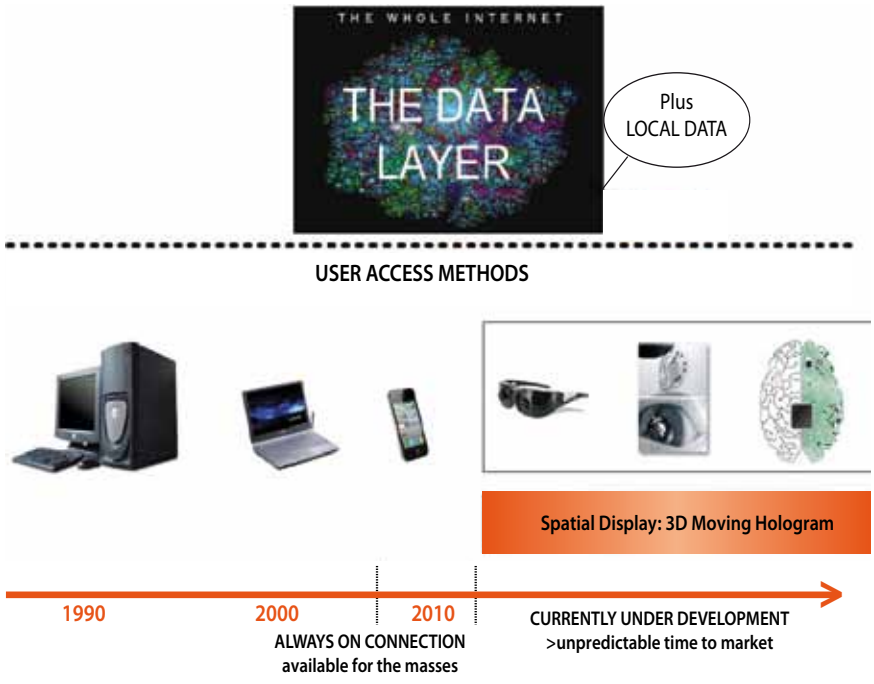

Fig. 8. Technology Evolution

Augmented reality can be seen as a branch of the fast-paced and expanding ICT (Information and Communication Technology) world. Subsequently, crucial systems for AR implementation are briefly discussed: types of displays and the importance of tracking and software.

Hand-held Displays	Spatial Displays	Head-mounted Displays
		
A small computing device with a display that fits in the user's hand	Digital projections for displaying graphical information onto physical objects.	Places images of both the physical world and registered virtual graphical objects over the user's view of the world.
Video see-through techniques to overlay the graphical information onto the physical world	A projector-based display system can incorporate more projectors to expand the display area. It can be displayed on any number of surfaces of an indoor setting at once. [33]	The HMD's are either optical see-through or video see-through in nature.
Sensors such as digital compasses and GPS units for its six degrees of freedom tracking sensors. Currently fiducial marker systems are used, such as the ARToolkit for tracking.	Scales up naturally to groups of users, thus allowing for collocated collaboration between users. The tangible nature supports both a graphical visualization and passive haptic sensation (people are able to touch physical objects).	The HMD must be tracked with a six degree of freedom sensor. This type of tracking allows the computing system to register and send the virtual information to the physical world
Hand-held display ARs promise to be the first commercial success for AR technologies.	Advertisements / shows. New type of architecture that can also provide a collaborative user environment	Easy to carry, lightweight
Portable nature of the devices and ubiquitous nature of the camera phones	No need to carry equipment or wear the display over their eyes.	Hands-free, immersive experience for the user.

However, in addition to the development of AR displays, much of the design is also focused on trackers and the software infrastructure. Tracking is crucial in order to correctly match the overlaid graphics with the user's view of the surrounding world. An AR system must accurately track the position and orientation of the user's head or various moving objects and deploy this information so that the graphics can be properly rendered. AR software is important, since it updates the overlaid graphics as the user and the visible objects move from one place to another [6]. One of the biggest advantages of AR applications is that they require relatively little graphics power. For

example, in a system designed for equipment repair, just one simple arrow or highlight box is enough to show the next step in a complicated maintenance procedure. However, for mobile AR to become practical, computers and their power supplies must become small enough to be worn comfortably. In any case, the overlaid information of AR systems could become a part of what we expect to see at work and play. When computer user interfaces are potentially everywhere we look, this pervasive mixture of reality and virtuality may become the primary medium for a new generation of artists, designers and storytellers who will craft the future. In the next section, we will explore further what a future with AR systems could provide for entrepreneurs.

3 Types of Entrepreneurial Opportunities

AR systems could offer new opportunities for entrepreneurs in creating new products and services or in making a firm's processes more efficient. In this chapter, we define what entrepreneurial opportunities might be available and what characteristics these opportunities may have, and, finally, we introduce a model for analyzing entrepreneurial opportunities within the AR systems.

3.1 Creation and Indication of Entrepreneurial Opportunities

Entrepreneurship requires action. Entrepreneurship is not only the creation of new innovations and opportunities. The entrepreneurial process involves all of the functions, activities and actions associated with the perception of opportunities and the creation of organizations during the process of exploiting identified opportunities. Entrepreneurial opportunity has no meaning if there is no one to develop it further and turn the opportunity into a profitable business [15,16].

The entrepreneurial process begins with an opportunity. Entrepreneurs are individuals who actively take advantage of profit opportunities available in the everyday economy. According to Ardichvili [17], entrepreneurs can find new opportunities with the help of their personal characteristics and skills; these personal characteristics and skills include *optimistic and creative thinking, entrepreneurial alertness, prior experience and social networks.*

Personal characteristics and skills help entrepreneurs identify and find opportunities, but personal activity in and of itself is not enough. Radical changes in the business environment have an important role in the creation of opportunities and how easy it is to exploit identified opportunities. Barringer and Ireland [18] categorize environmental changes according to four trends: economic, social, technological and political/regulatory.

3.2 Types of Entrepreneurial Opportunities

Entrepreneurial opportunities differ from other business-driven opportunities. They focus on discovering new ways of implementing new products and services – so-called means-ends relationships – while other business opportunities focus mainly on optimization within existing product-service frameworks [19]. The purpose of entrepreneurial opportunity is, therefore, to create room for new entrepreneurs to implement new and profitable businesses.

Entrepreneurial opportunities occur as a result of changes in a variety of aspects of the value chain in the entrepreneurial process. Typically, opportunities are considered as innovations for *new products or services*. These products or services can be based, for example, on new technical innovations. Schumpeter has suggested four other types of entrepreneurial opportunities, which he calls "new combinations" [20].

Entrepreneurial opportunity can exist as the possibility of conquering new *geographical markets*. For example, the development of the Internet has made it possible to enter into markets which could not have been reached by traditional marketing and sales channels. The discovery of *new raw materials* or *supply chains* may introduce new possibilities. *Process innovations* are an important part of the entrepreneurial opportunity concept. The development of more efficient production or service processes can reduce the firm's operating costs significantly. *New ways of organizing* the work is closely related to processes. Organizations can communicate and work efficiently with the help of IT technologies without all of the employees being in the same physical place.

Eckhart et al. [21] have extended Schumpeter's theories by pointing out other areas where entrepreneurial opportunities may exist. Opportunities can exist both on the *demand or the supply side*. Typically, opportunities are understood to exist on the supply side as new products or services or as more efficient processes. However, opportunities can also exist on the demand side. Customer preferences may change due to exogenous shifts or events in culture, taste or perceptions. Substantial opportunities exist especially after quick and unexpected events which create a demand for certain products or services.

The different types of entrepreneurial opportunities that are created through AR and AS concepts from the synthesis of personal capabilities and environmental trends are presented in Figure 9.

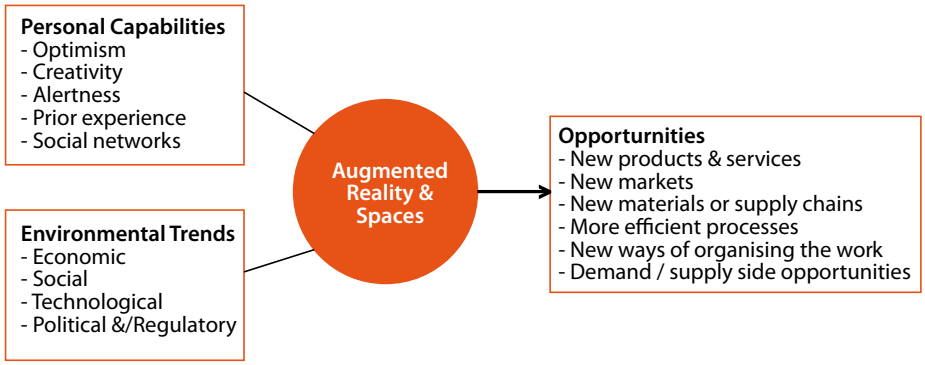

Fig. 9. Input factors for opportunity creation through AR and AS and the resulting types of opportunities

3.3 Types of Entrepreneurial Opportunities in AR

As discussed in section 2.2, we can identify five different types of Augmented Reality: *Surface, Pattern, Outline, Location and Hologram*. Even though this categorization is based on technologies that exist behind the concept of AR, it serves quite well as a framework for the identification of different types of entrepreneurial opportunities.

Our purpose was to analyze what type of opportunities are available for firms which have an entrepreneurial mindset and want to implement AR concepts in order to improve their internal operations or the products and services offered to their customers. This analysis was done by using available examples and the companies and solutions used as case studies in chapter 2. On the other hand, new technologies, in this case AR, also offer opportunities for new firms who specialize in developing and implementing AR-based concepts and solutions. The limited number of firms who are using AR-based solutions have built them with their own IT resources; however, they have also used an external supplier's services for these challenging projects.

AR concepts based on using *Surfaces* provide opportunities mainly as an extension of a personalized advertising channel. The intelligent use of electronic surfaces, such as screens and walls, creates the potential to deliver topical, timely and relevant ads or branding onto the scene. With this concept, it is easy and cost-efficient to organize personalized marketing activities and, in this way, reach totally new market segments or even geographically new marketing areas.

Also, educational services in culturally interesting places like museums can be based on using *Surfaces* for delivering more extensive information about the object. A visitor can touch an interesting point on the screen and, in this way, get multimedia information about the topic. The museum guide is not needed anymore, which creates the possibility to organize the service in a new way and with a lower cost for providing the service (Figure 10).

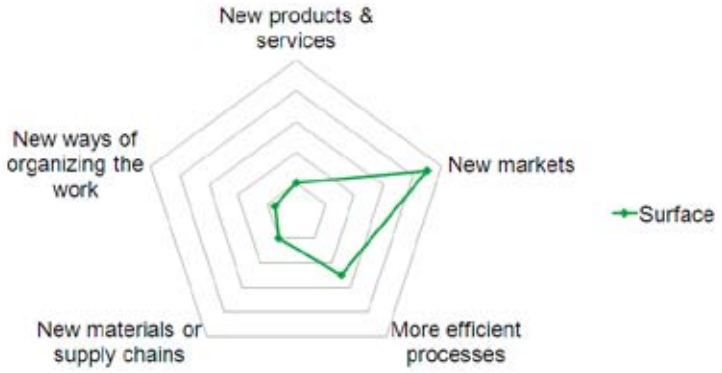

Fig. 10. Potential for different types of entrepreneurial opportunities with Surface-based AR concepts

Personalized shopping is not a new product or service as such, but it is a rich source for other types of opportunities. With this type of tool, it is possible to offer "electronically tailored" services, enabling the AR concept to provide tailor-made products to customers and minimize the stock of clothes in a shop. There is no need to keep large quantities of clothes in stock in different colours, sizes and materials because all products can be produced based on the customer's purchasing decisions. It is also possible to reach new markets with personalized shopping. The service can be implemented practically anywhere with the screen and necessary IT system and it is much more cost-efficient than establishing a physical shop (Figure 11).

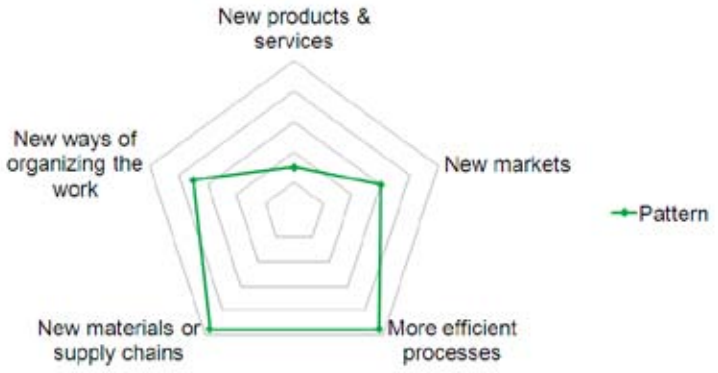

Fig. 11. Potential for different types of entrepreneurial opportunities with Pattern-based AR concepts

The *Outline* concepts allow us to be virtually "hands-on" with complex equipment in difficult-to-practice work scenarios. *Outline* concepts can be used, for example, in training services. BMW and Toyota have implemented 3D training systems for their technicians by using simulator systems based on the *Outline* concept. This solution makes the training of engineers more cost-effective than traditional face-to-face training. Technicians can be trained for even the most difficult and complex work practically anywhere without needing to send the training specialists to the other side of the world. Related opportunities can be found in the enhanced quality and effectiveness of production processes and new ways of organizing the assembly and maintenance work (Figure 12).

Fig. 12. Potential for different types of entrepreneurial opportunities with Outline-based AR concepts

Location-based AR concepts have great potential for new opportunities. Several IT services are using location information already today, and it is easy to extend current location-based services with flavours from the world of AR. A booking application by Malaysian Airlines in section 2.2 is a good example of a totally new service concept as such. Location-based concepts also positively influence processes – like, in this example, a flight booking process – making them more efficient and faster and, this way, offering potential cost savings to the airline (Figure 13).

Fig. 13. Potential for different types of entrepreneurial opportunities with Location-based AR concepts

Hologram-based AR concepts – projecting 3D images or items into practically an empty space by using smoke or spinning mirrors – have similar possibilities to benefit entrepreneurs as do *Surface*-based concepts. Both concepts help in bringing new information into new places for customers who really need this information. With *Hologram*-based concepts, the technology offers a more futuristic approach by creating 3D visual information for practically any space, whereas *Surface*-based concepts always need some kind of existing physical platform for presenting the information. Opportunities therefore can be found mostly in new markets and in process efficiency. However, the hologram-based technique also has potential in the form of new products or services. This fairly new technology is still evolving and not all of its possibilities are yet known (Figure 14).

Fig. 14. Potential for different types of entrepreneurial opportunities with Hologram-based AR concepts

4 Towards Augmented Spaces: Extending the information layer on top of the physical world

After providing an overview of the history, types, technologies and entrepreneurial opportunities of AR, it is time to look towards the future of AR systems and the related ICT's in order to explore the even wider concept of AS. Therefore, this section analyses the current effects that the existing advances in the information technology have brought to our lives and the futurities related to the further development of AS.

4.1 Augmented Spaces

The concept of AS is a fairly new one; it was coined in 2004 by Lev Manovich [2]. He linked existing technologies with those still waiting to become mainstream in order to describe the poetics of AS and suggest some directions for the coming decades. According to Manovich [2], the current trend is the enthroning of technologies which deliver data to, or extract data from, physical space. This will also dramatically change the way we understand and perceive of the space around us. Some of these technologies are already widely employed, such as video surveillance, cellspace technologies and publicly located computer/video displays. These technologies are rarely discussed together because they belong to different industries (electronics, computers) and different markets (consumer, professional). However, they all seem to have a similar effect on our concept of space. They make physical space into dataspace: extracting data from it (surveillance) or augmenting it with data (cellspace, computer displays).

Some technologies that have yet to become mainstream [14] are Ubiquitous Computing, AR, Tangible Interfaces, Wearable Computers, Intelligent Buildings and Intelligent Spaces, Context-aware Computing, Smart Objects, Wireless Location Services, Sensor Networks and E-paper. While the technologies imagined by these research paradigms operate quite differently, the end result is again the same: they overlay data on top of physical space. AS refers to this new kind of space, where delivering information to users in space and extracting information about these users is closely connected – it is a monitored space. As such, AS is a broader concept than is AR. Augmentation, as such, is much more of a capillary and complex phenomenon, embracing the city as a whole and its components: these components include spaces at different scales, people and the economical and political climate.

In the following subsections, we analyze the future trends affecting the development and/or wider implementation of the concept of AS, and its smaller-scale component AR, through an analysis of economical, social, technological and political/regulatory trends, with some comparison to the evolution of the Web and its effects on those same trends.

4.2 Economical

New technologies almost always seem to encourage visions filled with optimism and bright new futures. However, past experiences have shown that not all technological advances are market viable or need tailored business models to suit them. As an example, within a new range of opportunities enabled by the Web, many common economical assumptions were challenged, leading eventually to a radical shift in the relationship between the main characters within this new financial market. The user has become the product and the advertising companies the major consumers in the information cyberspace. This fundamental shift is the basis for a commonly used business model nowadays, and it began with a major failure. This failure consisted of trying to apply traditional business models to the emergent Web market. In 1994, the U.S. Congress lifted the injunction on web commerce, attracting numerous entrepreneurs and investors looking for an opportunity to obtain massive profits. Between 1995 and 2000, more than 20 millions dotcoms were registered, but not all of the ideas, which in the beginning were valued in millions, were based on an effective business model for how to generate all the money that they promised. Eventually, this illusory "dotcom bubble" burst and, in the beginning of the year 2000, NASDAQ lost one-fourth of its value and half of the dotcom companies disappeared in the bankruptcy that followed.

However, the dotcom boom had attracted millions of new users to this new way of communicating, and the Web became very popular. Companies had to think about making a profit in this new "environment" as something more than just an online version of their business. For example, Google uses tailor-made advertisements that directly target the costumers that are more likely to buy a particular product based on the information that it gathers from its search engine or other "freely" distributed software. Therefore, Google uses its clients as commodities, in a virtual auction of their disclosed private likes and dislikes, to offer them goods. This is now the common modus operandi for a profitable business in this market.

The previous example gives an idea of what might be some of the future business trends in AS and AR as a possible new extension of the information contained within cyberspace. Advertisements overlaid in the physical world, shown to a potential buyer by behavioural targeting marketing, is a business model that has proven to work in similar markets. However, the Web is not the culmination of the digital revolution. Nowadays, the fraction of traffic directed to the Web across the Internet, which at the beginning of 2000 was more than 50%, has been decreasing (Figure 15.) This sustainable decrease is a part of another interesting shift - "the culture of free". Currently, specially made and reliable applications for mobile devices are flooding the market with new opportunities for businesses. Customers (previously known as anonymous users in the sea of free) are now more willing to pay for digital goods or for a reliable source of service in exchange for saving time. This new, more mature user within cyberspace allows the market to shift back to its "natural" form and, with

it, brings along the known problems and failings of this system, namely monopolies and oligopolies. Apple has taken the lead in mobile devices through its iPods, iPhones and iPads, aligning its interests with traditional content providers (songs, movies and others media copyrights). Nonetheless, Apple controls the look, the feel and the experience, and it even controls both the content-delivery system (iTunes) and the devices (iPods, iPhones, and iPads) through which that content is consumed, allowing no breach for third-party profits without its intervention.

The same tendency has been seen in the latest use of the Web, where Facebook has been playing a major role. With Facebook, a new cyberspace is created, which is a free but closed system where Google and others cannot search using their servers, thus removing one key degree of freedom from the service – the overall control. As with iTunes, games and software can be developed, but the particular company offering the service has the power and final control over the distribution.

Much as in the previous examples, the future business opportunities of AS and AR will need to strike a balance in the struggle between these two opposing viewpoints. If we suppose that information will also be freely available in AS, or at least through the AR devices, there is still a need for a browser or an application to activate this new dimension or space, and, therefore, AS can eventually behave as a barrier to the flow of information. Users could gather all of the needed information from the Web and restrict their own public information, as in a social network, leaving no breach for a foreign opportunist to profit from their system. The battle continues and is equally influencing social and political/regulatory trends.

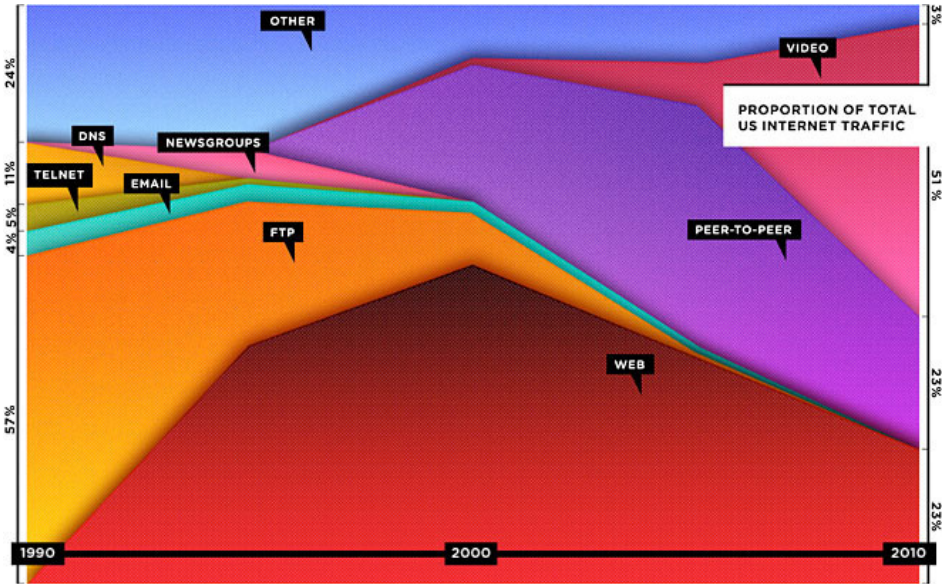

Fig. 15. Proportion of total U.S. Internet traffic

4.3 Social and Cultural

Social Network Services have become a popular means to connect and collaborate with people. These services introduce a new binary meaning for friendship and spread contact networks, which our brain is not programmed to handle [22]. However, recent research on social networks [23] shows that sites like Facebook actually preserve and fixate contacts. AR and AS will partly build on existing social practices emerging on the Web. Furthermore, the constant presence of electronic devices also changes the way we interact with others in physical space. For example, playing with your phone and having a real-life conversation at the same time equally efficiently is close to impossible.

Young people adapt easily to new practices. New habits are easy to embrace when growing up alongside and in connection with new ways of interacting. According to Medina [24], even texting may harm the ability of young people to understand nonverbal messages. However, new practices will also create opportunities for new types of interactive design methods and applications which might also aid in cognitive development. For seniors, it might be difficult to adjust to new practices and learn new interaction paradigms. They become less in control of their movements and might find applications that require small movements and greater levels of accuracy troublesome. AS could help to revolutionize the care of elderly people by providing better conditions through the use of sensors and ambient-assisted living spaces [25]. Assisting and enabling technology will be a major application area and could provide plenty of entrepreneurial opportunities.

Furthermore, game-like applications for work and social communications (Foursquare) have recently gained much attention and might be a huge business trend in the future. Evangelists claim that mundane activities, such as reporting working hours and meeting people, will become much more fun when game logics, augmentation and collaboration are added to the picture. Fusing the geospatial Web with locative media promises new opportunities in AR. New technologies enable you to map and mark the space you inhabit and to notice marks that others have left behind. This allows the place to also be socially recreated, by mixing virtual and geographical places [26]. The concepts of AR and AS will lead the way in the re-convergence of the network and the local and in reshaping the relationship between cyberspace and geographical spaces.

4.4 Political and Regulatory

Countries all over the world are trying to draft defining new regulations to harness the online world. However, the information cyberspace was deliberately structured in such a way that it resists authority. It has been designed to give all users equal access, with no permission needed in order to access content or create it. Within this cyberspace, there are no governments which generate rules and regulations; there is

no central authority which controls everything. Not surprisingly, this new information ecosystem has been clashing with the conventional notions of hierarchies and social order.

Several examples of this struggle for power between the state and people could be noted from very recent history. In June 2009, political discontent over the result of Iranian elections compelled citizens to protest. With the help of social networks, the struggle became organized and sharing information about the local events with the international media became easier, thereby bringing global awareness to Iran's conflict and the increased political tensions. Another strong example of the inability of governments to suppress the free availability of classified information is that of the latest Wikileaks cases, which represent the largest classified military leak in history and a diplomatic nightmare known as "Cablegate". In contrast, this powerful tool can also provide purpose and cohesion to dispersed groups, who can use it with malevolent intentions, such as to plan terrorist activities and attacks.

However, all of the information-sharing technologies can also be used by the state to know and control its citizens. An example is "The Great Firewall of China", where Internet censorship in the People's Republic of China is part of the government´s effort to neutralize critical online opinions, association and insurgence [27].

Recently, the European Union has demanded the right for people to forget what they have once published on the Internet. Currently, everything published on the Internet could be there forever. Intellectual Property Right laws are also being heatedly discussed, with the record and movie industries being talked about the most [28].

The prospect is that the world will continue to become more and more open and that information will reach greater depths. New layers in the distribution of information by AR systems may deliver precise information on the locations, recognition and identifications of subjects and places, possibly making it yet another tool to be used in the clash between power and authority [2]. This could eventually lead to laws and regulations that only allow for the use of statistical data and not individual data, which would greatly influence the entrepreneurial opportunities presented above.

4.5 Technological

In the beginning, researchers and companies were all building their own AR platforms to facilitate their own ideas and applications. Recently, several AR browsers have been published, which has led to the wider knowledge and popularity of the concept. Publicly available browsers will open the market for more developers, who would only have to create the user interface and interfaces to the data layer and some program logic on top of the browser software.

Browsers create the need for common standards. Current browsers are not built to support any one particular standard and, therefore, developers must create multiple applications for all browsers, or the user must install multiple browsers in order to be able to use information layers from different service providers. Furthermore, a

fully augmented information society also needs other browsers and interfaces than those already mentioned here. There could be browsers for facilitating augmentation in public displays and projections, which would make the development of basic information interfaces fairly quick and easy. By providing toolkits and libraries for tracking, image recognition, the information filtering available to developers and the effort and skills required to implement applications will diminish and opportunities to create new services will be available for a growing number of people.

5 The Critical Augmented Futures

The implementation of AR technologies, as well as the further development of AS, could soon enable things that we only saw in science fiction movies decades ago. There is a lot of positivism about AR systems; however, some notable threats should also be discussed. Just as every coin has two sides, it is good to keep in mind that there is always a possibility to turn a threat into an opportunity.

5.1 Information Overload

Currently, most people are constantly overwhelmed by the amount of information they are exposed to. People produce new content constantly and expect their imagined target audience to be constantly aware of this new content. Only a small portion of the flood of information is actually relevant or appealing to our individual interests. The net promotes new ways of reading and interacting with content, which favours multitasking, efficiency and immediacy [24]. Administrating information in AS will become a key discussion topic presenting new business possibilities.

Search engines, filters, recommendations and interaction patterns for facilitating the retrieval and discovery of relevant content, relevant data layers or applications will become a central part of efficient user experience in the augmented world of information. Natural language processing and semantic analysis will be increasingly used to evaluate tweets, status updates, likes, shares, and check-ins from all popular social services [29]. This information, when combined with the spatial and temporal dimension, can be used to create fully personalized user interfaces and content flows.

5.2 Privacy

As pointed out above, a life immersed in technology has brought with it a profound and perhaps troubling change in values for all of us. Although the benefit of a freely available source of information is phenomenal, we are paying for it with our loss of privacy. In an augmented world, this could mean a continuous flood of advertisements to our personal devices, or violations of our privacy in public spaces, if our personal data suddenly becomes publicly visible and traceable through mobile devices or projections.

Trust will be a central question in the information era. We have to evaluate our trust in technology, data and people. To whom can personal data be entrusted, and vice versa? How do you validate the reliability of an information source?

5.3 Values and Ethics in Augmented Society

When we design our future, we should remember that the picture painted by cinematographers or futurists is not set in stone. Human values are embedded in every product one way or another. In terms of the digital products, the values are embedded in the code [30]. Value-sensitive design methods and user-driven design methods have gained in popularity in recent years. These methods could be used to create augmented applications which would enhance our lives, but not take them over.

While the wildest visions paint the picture of people constantly wearing interactive goggles or contact lenses, or even brain implants, which would enhance our awareness and computing capacity, we should consider how this phenomena is going to be integrated within our society. New forms of physical abnormalities arise, which will prevent some people from accessing the system [31].

If the augmented spaces infrastructure is built on top of the databases and display technology, the vulnerability of the society will increase. The system must be resistant to malicious attacks, both in a virtual and physical dimension. Companies providing individual and societal privacy solutions will play a huge role in this development. This potential thread, however, can be an opportunity for new developers of AS and AR technologies, much in the same way as the protection of personal data on the Web, encryption devices, antivirus software and anti-spam and other special tools can be extended to shield ourselves from potential harm.

6 Conclusion

AR is slowly becoming available for laypeople, whereas it used to only be a playground for researchers in the universities. The further development of mobile devices can enable access to an electronically augmented world for a large number of people worldwide. AR systems are especially useful in making routine activities (repair work, medical procedures, and so forth) less time-consuming and more efficient, while also providing endless possibilities for entertainment, educational use and, of course, advertising. The key advantage of AR is in getting the right information at the right time and in the right place. The information itself would not be on a separate display anymore, but integrated with the user's perceptions.

Different types of AR applications offer a variety of different entrepreneurial opportunities, depending on the specific type of AR application and its application. Most opportunities that AR offers are related to a firm's internal operations, such as more efficient processes and new ways to organize work and manage the supply

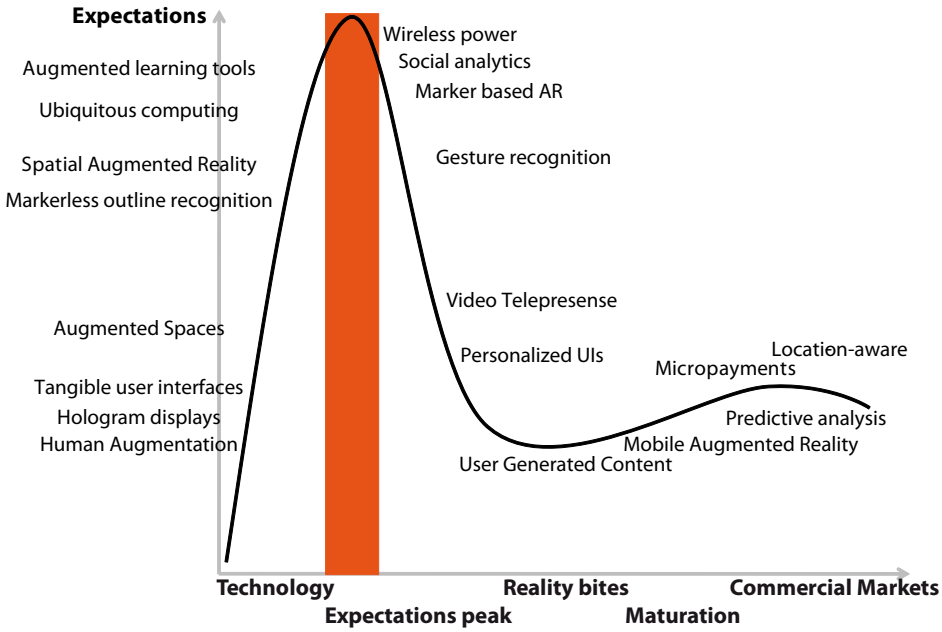

Fig. 16. Gartner Hype Cycle – Augmented Spaces

chain, and it also helps in conquering new markets.

Furthermore, the development towards a well-integrated information society is advancing rapidly. We can expect AR and AS technologies to soon be available as readily as other technologies that have gone through a similar evolution in the past. These expectations are illustrated by our custom Gartner Hype Cycle (Figure 16) [14]. The cycle shows the technological innovations that are already on their way to commercial markets. AR technologies, as well as the technologies that play a part in the development of AS, have still not reached the peak of expectations and are not ready for the mass market. However, this change could occur sooner than predicted in the mobile AR market, which is growing rapidly due to the availability of camera phones and the popularity of smartphones.

However, ubiquitous computing and mobile technologies are blurring the distinction between physical space and digital media, with the latter also being combined in complex ways, sometimes resulting in very physical, public and visible displays, while other times being barely visible and strictly personal. ICT in physical environments can, therefore, materialize into the very noticeable presence of big screens in prime civic locations, remain partially hidden in the mobile phones within people's pockets or simply exist as a non-physical, geo-referenced database of spatial tags [34]. It is difficult yet to say if this change will constitute a paradigm change as influential as the graphical browsers for the World Wide Web or the "dotcom boom" of the mid-1990s. The technology will evolve at its own pace; however, current economical, social, political/regulatory trends are already providing a hint about the direc-

tion we should focus on. AR technologies will most likely land on the battlefield of contemporary dualisms regarding information technologies: free versus paid content, freedom of the service versus overall control by the service provider, technological divide and deformation versus technological assistance and enlightenment. Overcoming these issues will constitute a mayor challenge, one which will determine the future direction of the information society. It should be emphasized that the true value of AR technologies and the concept of AS is in ensuring that geographical space and cyberspace will be intertwined in a completely new way for the first time. The popular culture examples of an augmented world could make us more receptive to this change. However, this requires us to re-evaluate the meaning of this emerging relationship, as well as our understanding and use of both of these spaces, whether we are entrepreneurs or simple consumers. Let the augmentation begin!

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1.3 Discovering Opportunities for Sustainable Entrepreneurship

François Christophe[1], Zagros Hatami[2], Tatu Lyytinen[3], Tuomo Raitio[4], Varun Singh[5], Leena Sivill[6], tutor Aditya Poudyal[7]

[1] Aalto University School of Engineering, Department of Engineering Design and Production, PO Box 14100, FI-00076 Aalto, Finland

[2] Aalto University School of Art and Design, Department of Design, PO Box 31000, FI-00076 Aalto, Finland

[3] Aalto University School of Economics, Department of Business Technology, PO Box 21220, FI-00076 Aalto, Finland

[4] Aalto University School of Electrical Engineering, Department of Signal Processing and Acoustics, PO Box 13000, FI-00076 Aalto, Finland

[5] Aalto University School of Electrical Engineering, Department of Communication and Networking, PO Box 13000, FI-00076 Aalto, Finland

[6] Aalto University School of Engineering, Department of Energy Technology, PO Box 14100, FI-00076 Aalto, Finland

[7] Aalto University School of Science, Department of Engineering Physics, PO Box 14100, FI-00076 Aalto, Finland

Abstract

Sustainable development has become a megatrend that concerns individuals and organizations at all levels. Entrepreneurs are one such group that are expected to transform the society towards a more sustainable future. This is based on the view that entrepreneurs are capable of introducing innovations to the markets that can completely change the status quo. This paper focuses on the understanding of the concept of entrepreneurship for sustainable development. This paper is specifically interested in how the discovery of opportunities differs in sustainable entrepreneurship compared to the purely for-profit entrepreneurship. After establishing the theoretical foundations

of this paper, similarities and differences are observed through interviews with three sustainable entrepreneurs. It appears from these interviews that being environmentally or socially oriented as an entrepreneur influences the discovery of opportunities.

Keywords: sustainable entrepreneurship, social entrepreneurship, environmental entrepreneurship, opportunities, motivation, stakeholder, value

1 Introduction

Sustainable development aims at the integration of three goals - economic, environmental and social - for the benefit of present and future generations (1). Great hopes are put on entrepreneurship as a means to achieve societal transformation towards sustainable development. This is triggered by introducing innovations to the market by an emerging group of entrepreneurs called *sustainable entrepreneurs*.

Entrepreneurship for sustainable development extends our understanding of for-profit entrepreneurship by bringing in two additional elements: the environmental and social aspects. Scholars and practitioners are now striving to form a complete picture of what these additional elements mean for entrepreneurship, the entrepreneurs as individuals, their stakeholders, the environment, and our society as a whole.

This paper focuses on the question of how sustainable entrepreneurship differs from the notion of for-profit entrepreneurship in the phase of discovering opportunities. Based on our research, we address three main issues in the paper: the personal motivational incentives, the role of stakeholders, and the creation and capture of value. We focus on two motivational incentives, namely the passionate and opportunistic, to understand what drives people to sustainable entrepreneurship. We then analyse the impact of entities that could affect or be affected by the enterprise: the stakeholders. Last, we discuss the way value is created and captured through this network of stakeholders in sustainable entrepreneurship. We provide insights into these factors of sustainable entrepreneurship by interviewing three entrepreneurs with experience in starting up a venture in the field of sustainable entrepreneurship. As a conclusion, we derive from these concepts our own perception of the main elements separating sustainable from for-profit entrepreneurship.

The paper is organized as follows. Section 2 introduces the theory behind the search for opportunities in sustainable development. Section 3 presents the methods used for analysing this theory. In Section 4, we analyse three case studies of sustainable entrepreneurship and relate the findings from the case studies to the theory. Section 5 concludes with our main findings illustrating the differences between the discovery of opportunities in sustainable and for-profit entrepreneurship.

2 Theory

Sustainable development is a multidimensional concept. One of the first mentions of the concept was in the report of the UN World Commission on Environment and Development entitled *Our Common Future*, also known as the *Brundtland Report*, in 1987 (1): *"In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations."*

Commonly referred to in literature as the *triple bottom line*, the economic, environmental, and social dimensions of sustainable development are considered as an integrated goal. There are two different scientific communities in research on entrepreneurship, focusing on either environmental or social dimensions. Recently, these two communities have begun to merge under the theme of sustainable entrepreneurship addressing both the social and environmental dimensions (2, 3, 4).

The concept of entrepreneurship for sustainable development, or *sustainable entrepreneurship*, is a recent concept among academics and is still emerging (2). It is rooted in Schumpeter's (5, 6) notion of entrepreneurship as an innovative process of creating market disequilibria (7, 2, 8). These market disequilibria are assumed to initiate a transformation towards a more environmentally and socially sustainable state. The business logic of sustainable entrepreneurs is to internalize the costs of causing environmental and social harm by asking their customers to pay a premium for socially and environmentally superior products (2). Hence, what sets the sustainable start-ups apart from other start-up companies is their value-based approach and their intention to affect social and environmental change in the society.

Today, there are no uniform criteria that can be used to define what is and what is not sustainable entrepreneurship. Instead, early literature on sustainable entrepreneurship has focused on different aspects of sustainable development in entrepreneurship, i.e., environmentally oriented entrepreneurship (8) or social entrepreneurship (10, 11), as shown in Table 1, depending on the reference (3).

Table 1. Typology of sustainable entrepreneurship

Class	Description	Source
Environmental entrepreneurship, ecopreneurship	1) Nature-oriented enterprises, e.g., wildlife habitat preservation, eco-tourism, and other concepts that utilise economic and human resources to improve the state of environment. 2) Producers of environmental technology for communities and enterprises to reduce environmental load.	Linnanen (12)

	3) Providers of environmental management services. 4) Producers of environmentally friendly products, i.e., products that have better environmental performance than conventional products over the product life cycle.	
Class	**Description**	**Source**
Social entrepreneurship	New ventures or existing organizations that exploit opportunities to enhance social wealth: 1) Social bricoleurs who perceive and act upon opportunities to address *local* social needs. 2) Social constructionists who build and operate alternative structures to provide goods and services addressing social needs that governments, agencies, and businesses cannot. 3) Social engineers who aim at the creation of newer, more effective social systems designed to replace existing ones that are ill-suited to address significant social needs.	Zahra *et al.* (13)

To summarize, we can derive two conclusions on the factors differentiating sustainable entrepreneurship from that of purely for-profit. The first relates to the position of values: the personal values of the entrepreneurs themselves and the values of stakeholders. These values reflect the extent to which the social and environmental concerns are given importance. The other major difference is that sustainable entrepreneurs must be able to transform these social and environmental concerns into a monetary value that a stakeholder is willing to pay for. This does not exclude non-profit activities where a stakeholder (for example, a non-governmental organization or a governmental agency) is willing to finance entrepreneurial activities for the well-being of end-users. These differentiating factors are discussed in more detail in the following section, which focuses on the phase of discovering opportunities for entrepreneurship.

2.1 Discovering Opportunities

Schumpeter (5) suggests that opportunities not only require large amounts of capital to exploit, but also the commitment to exploit them. More opportunities can be discovered if more resources are devoted to their discovery; but diminishing returns are liable to set in as more people join in the search. Therefore, the easiest opportunities are likely to be discovered first, and the costs associated with each additional

discovery lead to increased costs as more people join in the search and the stock of easily discovered opportunities is depleted (14).

One of the leading questions today is to understand how entrepreneurs discover and develop opportunities for sustainable entrepreneurship (8). According to Barringer and Ireland (15), the process of identifying opportunities for entrepreneurship entails three phases. First, the external trends form the available gaps. Second, the entrepreneur's personal characteristics determine the way these available gaps become recognized by the entrepreneur. Third, there must be a logic in the value creation that turns these recognized gaps into a business opportunity. Identifying gaps and turning them into concrete business opportunities involves innovation.

In entrepreneurship, the discovery of opportunities is the process of going from identifying a market gap to its evaluation as a potential business (15). Patzelt and Shepherd (4) have presented a model of factors that influence the recognition of sustainable development opportunities. These include three categories: knowledge of the natural/communal environment, personal motivation, and entrepreneurial knowledge. These factors can be integrated into the same process of identifying opportunities as for-profit entrepreneurship shown in Figure 1.

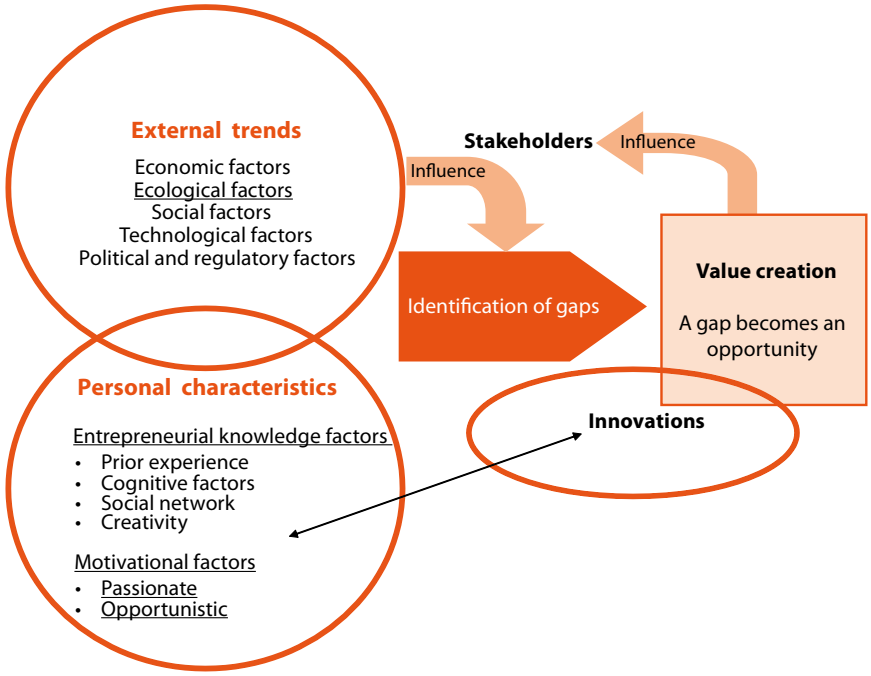

Fig. 1. Contributing factors and the process of discovering opportunities for sustainable entrepreneurship (applied from Barringer and Ireland (15), and Patzelt and Shepherd, (4))

The process of discovering opportunities is also tightly coupled with the motivations of the entrepreneur, which may be passionate (inward-looking) or opportunistic (outward-looking). A passionate approach focuses on the preferences and capabilities of the entrepreneur, while the opportunistic approach focuses on the entrepreneur's examination of the current economic environment or the projects already underway for opportunities (14). In the next section, we discuss in detail the motivational incentives that drive entrepreneurs.

2.2 Motivational Incentives

According to the view of Casson (14), the entrepreneurial process occurs because people act to pursue opportunities. Casson views opportunities as "situations in which new goods, services, raw materials, and organizing methods can be introduced and sold at greater than their cost of production". This view emphasizes the importance of personal economic gain in the discovery of entrepreneurial opportunities. However, there are several motivational and personal factors that contribute to the decision to become an entrepreneur. Especially in the field of sustainable development, there are a number of other factors that can contribute to the process. However, it is true that pure personal gain can be motivating.

Understanding the motivational factors for entrepreneurship has been an active research topic. Shane et al. (16) have extensively studied the motivational factors for entrepreneurship and have listed several personal traits that drive entrepreneurship. For example, individuals who thrive on achievement are more likely to pursue entrepreneurial jobs. Also, such traits as risk-taking, tolerance for ambiguity, high internal locus of control, self-efficacy, independence, drive, and egoistic passion have been suggested as assisting the start of entrepreneurial actions. While these personal factors can partly explain why some people are more likely to pursue entrepreneurship, they do not shed light on the motivational and knowledge conditions favourable for the emergence of entrepreneurial actions.

Patzelt and Shepherd (4) suggest that individuals who attend to different aspects of their environment are more likely to discover opportunities in that environment compared to those who only seek financial gain. For example, individuals who attend to their natural environment and the earth, its biodiversity and its ecosystems, are more likely to be concerned about them and subsequently form opportunity beliefs to preserve them. Similarly, people attending to the communal environment are more likely to discover opportunities in that environment compared to those who seek only financial gain. Patzelt and Shepherd (4) conclude that: *"Motivation to direct attention toward sustaining the natural and communal environment likely arises when individuals perceive that their physical and psychological well-being is threatened."*

This section briefly reviewed the personal aspects that motivate individuals towards sustainable entrepreneurship. Nevertheless, motivations alone, whether traced to the individual's passion or opportunism, are often not sufficient for establishing a new

sustainable venture. In fact, sustainable entrepreneurship is dependent on several factors external to the entrepreneur. The following section addresses these external factors through the observation of entities. These entities, referred to as *stakeholders* of a company, are potentially interested in and influence the creation of a new business. The following section defines the concept of stakeholder and presents the possibility of their engagement in the discovery of entrepreneurial opportunity by means of networking and communication.

2.3 Role of Stakeholders

In entrepreneurship, the search for opportunities can be handled by analysing the entities that have a stake in the enterprise, namely the stakeholders. The stakeholder theory addresses the organizational management (17) and business ethics (18) focusing on morals and values of direct and indirect stakeholders of an organization.

Direct stakeholders are traditionally comprised of the investors, employees, suppliers, and customers. Indirect stakeholders include governments, political groups, trade associations, communities, and the public at large. A wider definition in case of sustainability is given by Schaltegger *et al.* (19):

- Shareholders and investors
- Banks and insurance companies
- Directors
- Employees
- Trade unions and employee committees
- Customers
- Suppliers
- Competitors
- Public authorities (governments, local authorities, etc.)
- Non-governmental organisations (lobby groups, media, activists' organisations, etc.)

This classification of stakeholders is valid for for-profit and sustainable enterprises alike. When it comes to discovering sustainable entrepreneurial opportunities, each stakeholder has a different interest and role to play. Therefore, to position a potential opportunity, it is important to address the interests of the stakeholders and study their influence with respect to the opportunity. For example, stakeholders influence the size of the window of opportunities in the market. Their actions can create new market gaps or simply fill in a discovered gap. Also, the identification of stakeholders can help entrepreneurs in the creation of new market gaps that fit their business ideas by lobbying involved stakeholders. For these reasons, it is important to use the stakeholder analysis during the discovery of opportunities, as stakeholders represent either a threat or an advantage to the business opportunity.

In the case of sustainable entrepreneurship, special attention is attached to stakeholders, as their vision of the market is often considered during the search for entrepreneurial opportunity. The recognition of stakeholders can also allow entrepreneurs to be more proactive in the creation of opportunities.

In the context of discovering opportunities for sustainable entrepreneurship, proactivity explains the process through which an entrepreneur can actively influence key stakeholders to create such external conditions that allow a gap to become an opportunity for the entrepreneur. For example, proactivity is relevant in cases where changes in public policy or public opinion can be achieved through lobbying appropriate stakeholders, thereby influencing the creation or removal of certain entrepreneurial opportunities.

Both elements of anticipation and taking control are present in most conceptualizations of general proactive behaviour. For example:

- Crant (20, p. 436) refers to proactive behaviour as "taking initiative in improving current circumstances; it involves challenging the status quo rather than passively adapting present conditions".
- Parker, Williams and Turner (21) define proactive behaviour as "self-initiated and future-oriented action that aims to change and improve the situation or oneself".
- Grant and Ashford (22) define proactive behaviour as "anticipatory action that employees take to impact themselves and/or their environments".

In addition to anticipation and taking control, the definitions of proactive behaviour often highlight its self-starting nature. Thus, Frese and Fay (23) suggest that personal initiative involves going beyond the assigned tasks, developing one's own goals, and attempting to solve problems that have not yet occurred. Likewise, Grant and Ashford (22) argue that proactivity can include doing things before being asked, inventing new means, or negotiating new ends. Self-initiation is essential to both taking control and being anticipatory.

In summary, proactive behaviour has three key features:

1. It is **anticipatory** - it involves acting in advance of a future situation, rather than just reacting.
2. It is **change-oriented** - being proactive means taking control and causing something to happen rather than just adapting to a situation or waiting for something to happen.
3. It is **self-initiated** - the individual does not need to be asked to act, nor are detailed instructions required.

Equally important to the identification of stakeholders and the understanding of their needs is the design of the entrepreneur's offering, whether product or service, in

a way that provides value to the customer and any other stakeholders involved. This aspect is discussed in more detail in the following section.

2.4 Co-creation of Value and Service Orientation

The creation of value is central to entrepreneurship. As Drucker suggests, *"Successful entrepreneurs, whatever their individual motivation — be it money, power, curiosity, or the desire for fame and recognition — try to create value and to make a contribution. [...] They try to create new and different values and new and different satisfactions, to convert a 'material' into a 'resource,' or to combine existing resources in a new and more productive configuration"* (24, p. 34).

Since the core purpose of economic exchange is the creation of value, the entrepreneur's approach to value creation can have significant implications for different stages of entrepreneurial activities, especially the discovery of opportunities and the role of consumers and other stakeholders in the creation of value. Callaway and Dobrzykowski (25) draw attention to the importance of the approach taken in viewing value creation and suggest that certain perspectives on the subject can enable entrepreneurs to recognize opportunities that may have been missed otherwise. Before explaining how the perspective on value creation can influence the discovery of sustainable entrepreneurial opportunities, it is important to provide a brief overview of contemporary perspectives on value creation. Here, we mainly focus on goods-dominant (G-D) logic and service-dominant (S-D) logic.

Goods-dominant logic views the firm as the creator (manufacturer) of value. In this view, the exchange of goods and money distributes the value created (manufactured) by the firm in the market. Here, the consumer and the firm play distinct roles, with the firm having the responsibility to create value through a series of activities it performs (26). For example, in the case of a car, value is embedded in the car by the transformation of raw materials into a product desired by the customer. Therefore, the firm creates value by the manufacture and delivery of a car.

Service-dominant logic, however, views both the firm and the consumer as the co-creators of value (26). In this view, all exchanges are based on service and "value is always co-created, jointly and reciprocally, in interactions among providers and beneficiaries through the integration of resources and application of competences" (26, p. 146). Unlike the perspective offered in goods-dominant logic, in service-dominant logic, the consumer and the firm do not play distinct roles. Here, the firm acts as the intermediary to the process of value co-creation, as value is ultimately derived and determined by the consumer in use. For example, from this perspective, a car has no value by itself when it is not used. A car is merely an input to the value creation process and has value only when used in the context of a user's life.

This emphasis on value-in-use as opposed to value-in-exchange shifts the attention from making and distributing things to be sold to the "beneficial application of operant resources" (26, p. 148), such as knowledge and skills, involved in the co-creation

of value and determination by the beneficiary through use. As a result, this perspective offers new possibilities for value creation influencing the way one recognizes and uses available resources. This is why Callaway and Dobrzykowski (25) suggest that the S-D logic may enable entrepreneurs to recognize opportunities that may have been missed otherwise. Calling for a "service-oriented entrepreneurship," Callaway and Dobrzykowski (25) propose that instead of the goods-centered entrepreneurship approach of looking upstream at the value imbedded in products, by using an S-D logic lens, entrepreneurs should look downstream at the customer-provider interaction and find new opportunities for value co-creation with the customer. This focus on value-in-use and the role played by users and stakeholders in the co-creation of value highlights the increasing need for addressing the lifetime use of products and the role redefinition of actors involved in value co-creation.

The shift from thinking in terms of value-in-exchange to value-in-use also mirrors the transition from mass production to flexible production in service economies and the growing attention to the concept of Product-Service System (PSS). To minimize the environmental impact of both production and consumption, product-service systems aim to dematerialise the economy by providing alternative scenarios of product use and value creation. This is done by bundling products with service solutions that jointly fulfil customers' needs while reducing the flows in production and the consumption of goods. This results in lowering their environmental burden (27). As highlighted by Mont, the product-service system concept has "the potential to bring about such changes in production and consumption patterns that might accelerate the shift towards more sustainable practices and societies" (27, p. 239). Of course, only a service-oriented entrepreneurship with an S-D logic lens and emphasis on value-in-use can provide sustainable entrepreneurs with the fresh perspective required for challenging the use of available resources and re-defining the roles played by customers and other stakeholders.

3 *Methodology*

In this paper, case study research methodology using an interpretive stance is selected because this method is especially useful when tackling the research questions of "how" and "why." This is also useful when the phenomena under study are not readily distinguishable from their context. In addition, the use of the comparative case study method is appropriate in the early stages of research or when a fresh perspective is needed (28). Interpretive studies generally attempt to understand the phenomena under study through the meanings that people assign to them. Interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense-making as the situation emerges.

Open-structured interviews (see Appendix 1) were conducted with three entrepreneurs indicating their approach to sustainable entrepreneurship. In addition, obser-

vations based on personal experience of the researcher(s) are reflected in this study.

Three entrepreneurs were interviewed in this study. The first interviewee represented a non-profit organization offering services for companies to develop their operation in the developing nations; the second is a founder of a design consultancy start-up with interests in providing sustainable design solutions; and the third is a founder of a company that provides investment vehicles in the emissions trade market.

4 Analysis

This section presents the results of the interviews conducted for this study. First, the three case examples based on the interview of three different entrepreneurs involved in sustainable development are introduced. Then the results are discussed.

4.1 Case Example 1: Grameen AppLab

Grameen AppLab (www.applab.org) is a non-profit organization that engages with organizations, government entities, and socially-minded companies interested in better understanding and meeting the needs of the poor. In addition, it develops sustainable business models for mobile services focusing on the agricultural sector. AppLab operates as a facilitator to sustainable entrepreneurship as it helps people and companies in creating and discovering opportunities for business even at a very early stage. The interview was conducted with the AppLab country manager in Uganda to get further insight into AppLab's operations.

Large customer groups are left underserved in the global economy, as commercially oriented entrepreneurial activities normally address only the most profitable customers. AppLab's goal is to provide goods and services addressing the social needs that governments, agencies, and businesses cannot provide. The AppLab country manager possesses a long experience developing mobile applications for socially-excluded customer segments in a multinational telecommunication company. This prior experience and understanding has driven him to further explore the markets of providing mobile services to the poor. This reinforces the idea that the knowledge of the natural or communal environment helps in the recognition of opportunities for sustainable development. Furthermore, AppLab is based on the global micro finance initiative run by Grameen Foundation that allows the development of new ventures that exploit opportunities for enhancing social wealth.

Economic development, social improvements, political stability, regulatory advancements, and technological expansion have created the opportunity to provide meaningful information services to the poor in developing countries. Uganda has been showing increasing growth rates in the recent years. Even though the credit crunch has affected this growth in the last few years, social improvements focusing

on security have created an environment where entrepreneurial activities can be conducted. Political will and regulatory agendas have driven public-private partnerships as AppLab works in close cooperation with local governments and local operators. Decreasing prices due to technological developments have resulted in around 80% of Ugandans now having access to telecommunication networks. These trends, the absence of legacy services, and local needs and user habits have created a window of opportunity for the provision of locally relevant mobile services in Uganda.

While providing agricultural information to the poor, AppLab has developed an innovative business model to include indirect stakeholders to support their initiatives. Direct stakeholders include local software developers, local content providers on the supply side, and the community knowledge workers (CKW) on the customer side. AppLab is liable to its parent organization, Grameen Foundation, for the development of a self-sustainable business model. To reach a level of self-sustainability, AppLab has had to include indirect stakeholders. Community knowledge workers are also working as information agents to gather information on local conditions based on visual indicators of poverty. This strategic information is sold to the World Food Program (WFP) and other indirect stakeholders. With their current agreements, AppLab Uganda has reached 14% self-sustainability.

As sustainable entrepreneurship is a balance between for-profit and social entrepreneurship, both business and social understanding are required for entrepreneurial activities. The AppLab country manager's extensive private sector experience in the development of mobile applications for socially-excluded customer segments as well as his first-hand experience and understanding of the world of the communities served by AppLab in Uganda have enabled him to develop capabilities that assist a sustainable entrepreneur in the identification of opportunities. The opportunity model of the AppLab country manager is illustrated in Figure 2.

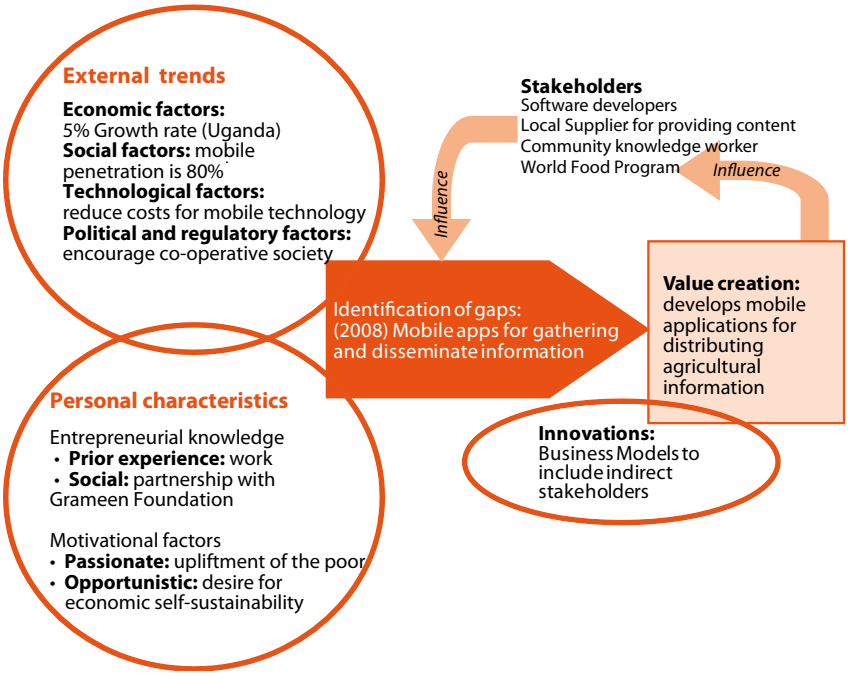

Fig. 2. Opportunity model for AppLab's country manager

4.2 Case Example 2: Aimo Design

Aimo Design (www.aimodesign.com) is a small design consultancy founded in 2010. Aimo Design aims to provide creative solutions for a sustainable lifestyle through the development of products, services, or product-service systems. One such solution is the *Benchmarked* concept presented at the 2010 Habitare exhibition in Helsinki, Finland. Benchmarked is an innovative product-service system platform that aims at changing the public's attitude towards used furniture and thereby promoting the reuse of furniture in public spaces.

Jussi Hiltunen, one of the founders of Aimo Design, has been aware of the environmental impacts of consumerism especially since he moved from the countryside to the city. There, he was disturbed by the rate of production and consumption of meaningless products. The environmental crisis of the 1990s also contributed to Hiltunen's interest in sustainability. As a designer, he knew that he could do something about the current situation; however, he was looking for the right opportunity.

After graduating from the University of Art and Design Helsinki, Hiltunen worked as a designer for a large Finnish elevator manufacturer. During this period, Hiltunen was fairly happy with his job despite uncertainties in the future renewal of his work contract due to the financial crisis. He had the mindset for entrepreneurship, but he did not actively pursue any entrepreneurial opportunities. Later in 2010, Hiltunen partnered with his friend, Timo Niskanen and participated in the Habitare 10 De-

sign Competition with the objective of discovering, developing, and implementing ideas for a recycled seat suitable for public spaces. Their concept, Benchmarked, won second prize at Habitare 10, which motivated them to start their own design consultancy focusing on the creation of solutions that enable people to make sustainable choices in their daily lives. It was now their chance to follow their passion and make a difference in society.

Benchmarked attempts to breathe new life into old furniture by changing people's attitudes towards obsolescence and the reuse of old furniture in public spaces. Time leaves its mark on used furniture, often reducing the furniture's perceived worth to the user. Benchmarked aims to take advantage of these wear-and-tear marks and create a renewed interest in the use of old furniture by adding an experiential layer that retells the stories behind each piece of used furniture available in public spaces and their visible aging marks. This can be made possible with the help of the augmented reality technology and the placement of printed marker tags on old furniture, allowing the public user to access and explore the life history of the piece of furniture used for resting in the public setting.

In addition to changing public attitudes towards old furniture and creating new value for the user out of the very signs of aging that usually make products undesirable and obsolete, Benchmarked changes the role of various stakeholders. First, the role of the furniture manufacturer is changed from a mere furniture manufacturer and seller to a service provider responsible for providing a great seating experience by ensuring that the furniture is well maintained. The role of the public space owner is also changed from a furniture buyer to a partner whose cooperation with the furniture company is crucial to the success of the service offering. Also, new business partnerships need to be formed (for example, with a mobile network provider) for the provision of the augmented reality information service. This product-service system has a great potential for a meaningful environmental impact by reducing the production and consumption of new furniture for use in public spaces and offices in developed countries. This concept demonstrates how service orientation and a holistic approach that considers the product lifecycle, the role of various stakeholders, and the co-creation of value in use can lead sustainable entrepreneurs to the identification of new opportunities.

Even though Aimo Design is still a young consultancy, it enjoys having a number of significant customers, partners, and sponsors. Hiltunen is already considering a future move to the Asian markets. "It's more competitive, but there are more opportunities," he said in the interview. At the moment, he is very enthusiastic about working in his own company, but in the distant future, he would like to slow down his working pace and take it easy: "I would like to live peacefully in my own cottage and have a garden there". Of course, the environmental considerations and sustainable life-style choices will always remain important to him.

The opportunity model for Jussi Hiltunen is shown in Figure 3. Both the external and personal characteristics have been vital to the discovery of the opportunity. The gap in the market was finally identified through the Habitare 10 design competition,

with the positive reception of the Benchmarked concept motivating the start of the Aimo Design consultancy.

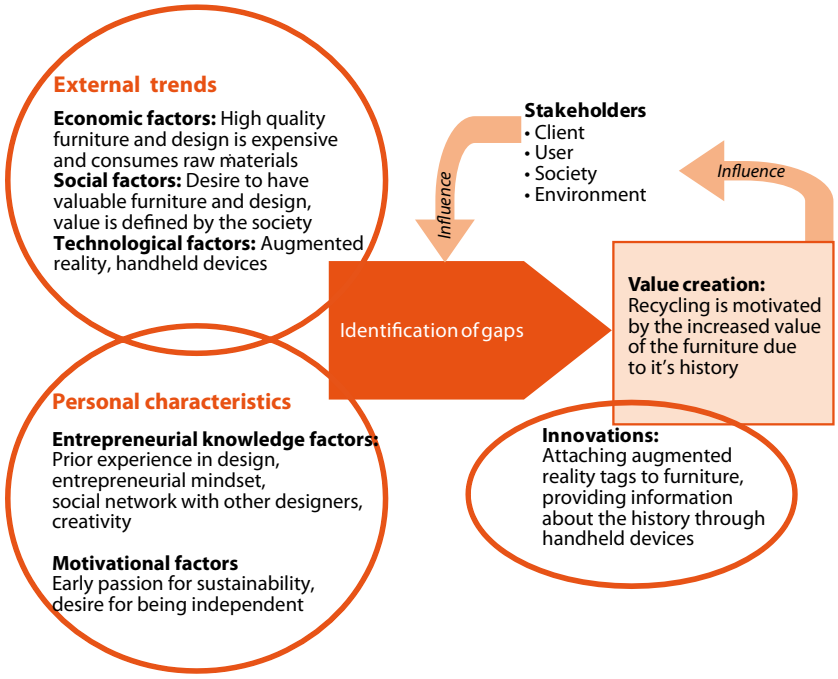

Fig. 3. Opportunity model for Aimo Design's Jussi Hiltunen

4.3 Case Example 3: GreenStream Network

Public policy measures to mitigate climate change can directly create a market for new services. Jussi Nykänen, the CEO of GreenStream Network (www.greenstream.net) and one of its founders, was still unaware that his opportunity had arrived in 1997. This was the year of the Kyoto Protocol, which introduced three new market-based mechanisms for industrialized countries to reduce their CO2 emissions on the national level: emissions trade, joint implementation (JI), and the clean development mechanism (CDM). When Nykänen's company was established in 2001, the European Union Emissions Trading Scheme (EU ETS) was under construction. This created the opportunity for a new venture to act as a broker and provider of advisory and intermediary services to companies, governmental agencies, and non-governmental organizations on carbon and renewable energy trade and their implications.

Nykänen describes his motivation towards sustainable entrepreneurship as stemming from his long-term personal interest in environmental protection and the lure of entrepreneurial freedom. Although Nykänen's personal motivational factors do play a role, taking advantage of this particular entrepreneurial opportunity requires having expertise in a specific field. Nykänen's earlier history as a lobbyist and environmental

market specialist in a large energy company provided him with the vitally required prerequisites. As a lobbyist, he became familiar with policy-making, gaining insight into what makes policies succeed and acquiring a sense of what and how different drivers impact the future. Nykänen calls this the ability to "read between the lines". In addition, these years gave him international networking experience, an important asset when considering international markets, and the freedom to look further into the future, a luxury that most people working under organizational restraints usually don't have. Hence, it took only a little push from a colleague (who had raised the question of entrepreneurship) for Nykänen to get caught up in this idea.

GreenStream's business relies on product and service innovation and the willingness and ability to change. As their stakeholders advance in their learning curve, the GreenStream's market becomes rapidly saturated or heads for decline. For this reason, their survival and growth strategy is to be in product development, either ahead of the "business-as-usual" type of incumbent companies with whom a firm of GreenStream's size can no longer compete, or offer products that large companies find too complicated to deliver. Consequently, GreenStream's largest source of revenue is now the green investment vehicles, i.e., investment funds that finance joint implementation and clean development mechanism projects. Figure 4 shows the opportunity model describing Jussi Nykänen's start-up of GreenStream Networks.

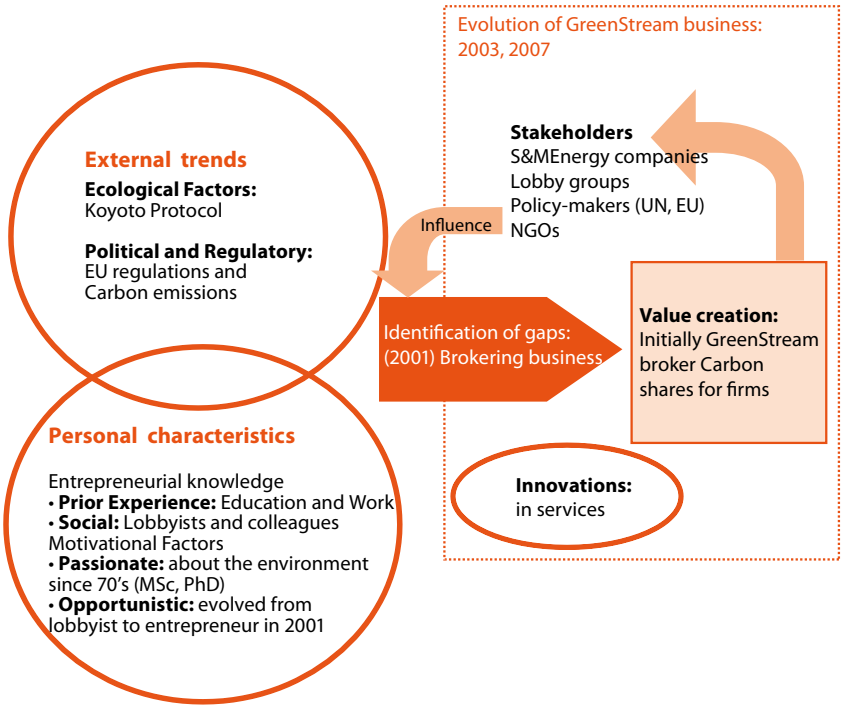

Fig. 4. Opportunity model for GreenStream Network's Jussi Nykänen

Nykänen also mentions greenwashing[1] as a risk to the development of green markets. This is because even though an individual company may be found guilty of greenwashing, the reputation of the whole market is nevertheless at stake. Another risk is that products may lose their green status as a result of changing criteria and changes in the operating environment. For example, palm oil, originally thought of as a green fuel, has later raised concerns due to the actions of its cultivators in clearing tropical rainforests. This has caused difficulties for companies who have made investments based on the belief that these issues would be solved. Another example is found in the voluntary carbon markets where companies such as hotel-chains and banks have financed emission reduction projects nullifying their own emissions. The companies have engaged in voluntary emission reduction mainly for its PR value. An article was published in a top journal criticizing activities related to this market in a particular region, causing a change in public opinion against the whole market. Consequently, the companies lost their incentive. Hence, the green markets are particularly vulnerable to reputation issues, which emphasize the need for developing commonly accepted public criteria and control mechanisms for the markets.

Figure 5 shows the evolution of GreenStream's business in the last decade.

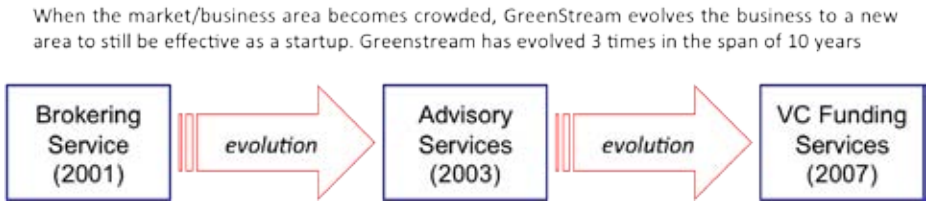

Fig. 5. Evolution of GreenStream's business in the last decade

4.4 Results and Discussions

In each of the three cases presented, the personal motivational factors of the entrepreneur played an important role in the choice of the selected entrepreneurial fields. For two of the interviewees, this motivation was environmentally oriented and for the other, it was socially oriented. None of the three entrepreneurs interviewed had a purely for-profit orientation.

Each of the interviewed entrepreneurs employed their personal expertise and experiences in offering products and services that classify them as sustainable entrepreneurs. In the GreenStream and Grameen AppLab cases, the entrepreneurs' prior expertise came from their work experience for large companies or international or-

1 It is a term describing the deceptive use of marketing in order to promote a misleading perception that a company's policies or products are environmentally friendly.

ganizations. All three cases demonstrated a shift towards a service orientation in creating new markets and in creating value in new ways.

The types of market gaps exploited in each case and the underlying factors leading to their creation was the main differentiating factor between the presented cases. In these cases, the gaps were created either by policy measures, social, environmental and technological trends, or the differences in people's access to information. Each case highlighted the importance of understanding the context of entrepreneurial activities, the value creation, and how various stakeholders should be involved in order to turn an identified gap into an entrepreneurial opportunity.

5 Summary

Sustainable entrepreneurship distinguishes itself from entrepreneurship in general as it includes environmental and social values. Sustainable entrepreneurship can be either for-profit or non-profit. However, an important aspect of non-profit entrepreneurship is its self-sustainability.

Personal motivations of the entrepreneurs involved in sustainable development play an important role in the discovery of environmentally or socially sustainable opportunities. The personal motivational aspect especially stands out in the Grameen AppLab case.

During the opportunity discovery phase of entrepreneurship, it is important to understand the roles played by various stakeholders. This is important for positioning the enterprise in its market environment. Moreover, being proactive with the stakeholders brings up new opportunities, as seen in the GreenStream case and its evolution through the years.

Finally, considering the service-dominant logic concept of value-in-use and the role of users and other stakeholders in the co-creation of value may enable entrepreneurs to recognize new opportunities that might otherwise have been missed. The Aimo design case illustrates how value creation can be approached through the creation of innovative product-service systems.

For companies operating in the field of sustainability, the inclusion of social and environmental aspects provides a more challenging environment in which to operate. The reputation of such companies for being sustainable is often their best asset, and great attention needs to be paid to protect this reputation. As an example, sustainable entrepreneurial ventures are vulnerable to the backlash against greenwashing or other exploitations. This can adversely affect not only their businesses but their entire market.

Sustainable entrepreneurship offers idealists a true channel to use their creativity for the common good. In a way, all entrepreneurs need to be idealistic to some extent to be willing to change the status quo. However, maintaining this idealism and the values driving sustainable entrepreneurial activities is one of the major challenges

faced by sustainable entrepreneurs. Business models for sustainable entrepreneurship would be an important research area for the future.

Sustainable entrepreneurs need to be more sensitive to the business environment and their stakeholders in order to survive the competition with larger companies. They should also be agile and willing to adapt to the changes in their market and to stakeholder requirements. This is the strength of sustainable entrepreneurship in comparison to large companies who suffer from inertia while sustaining their position in the market. Sustainable entrepreneurs, like all entrepreneurs, are at the forefront of creating inroads into viable business opportunities which are later occupied by larger corporations.

The process of discovering opportunities is not that different from that of for-profit entrepreneurship. The differences only become visible as sustainable entrepreneurship emphasizes the entrepreneur's personal social and environmental values and motivations and gives more weight to political and regulatory factors.

Sustainable development is a long-term trend that will shape our common future. The scale of issues requiring attention today and in the future inevitably lead to the tightening of the international political commitments in the form of incentives and regulations. At the same time, we are experiencing such extreme levels of human-related changes in our natural environment that any meaningful future development can no longer ignore the social and environmental aspects. These factors together mean that the size of the market for sustainable entrepreneurship is well beyond the current level of entrepreneurial activities in this area. This study well indicates that economic, environmental, and social change does not always reside in policy makers' frameworks or corporate social responsibility reports, but in actions taken by sustainability-oriented individuals, such as the sustainable entrepreneurs.

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Appendix: Interview Questions

Personal background

1. Briefly describe your working history.
2. What were the most important factors that made you start up a new venture? Explain why.
3. How would you describe the term entrepreneurship for sustainable development?

Firm characteristics

4. Do you consider your firm to contribute to sustainable development? If so, explain why.
5. Who do you consider as your key stakeholders? Explain why.
6. What would you describe as the most important innovations in your firm's history? Explain why.
7. Have these innovations led to changes in the market? If so, explain why.

Future scenarios

8. Do you expect your business environment to change in the future? If so, explain how.
9. What do you see as the most important risks and opportunities to your firm in the future?
10. Do you have other questions in mind that you would like to address?

1.4 Staying Small is Good for You: Scenarios for Small Companies in Global Niche Markets

Timo Kiravuo[1], Meri Kuikka[2], Zengcai Qu[3], Antti Rahikkala[4], Md. Mizanur Rahman[5], Henri Tokola[6], tutor Kai Kuikkaniemi[7]

[1] Aalto University School of Science and Technology, Department of Communications and Networking, PO Box 13000, FI-00076 Aalto, Finland

[2] Aalto University School of Economics, Department of Business Technology, PO Box 21220, FI-00076 Aalto, Finland

[3] Aalto University School of Science and Technology, Department of Electrical Engineering, PO Box 13000, FI-00076 Aalto, Finland

[4] Aalto University School of Science and Technology, Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[5] Aalto University School of Science and Technology, Department of Energy Technology, PO Box 14100, FI-00076 Aalto, Finland

[6] Aalto University School of Science and Technology, Department of Engineering Design and Production, PO Box 14200, FI-00076 Aalto, Finland

[7] Aalto University School of Helsinki Institute for Information Technology HIIT, PO Box 19215, FI-00076 Aalto, Finland

{Meri.Kuikka}@aalto.fi, {Timo.Kiravuo, Zengcai.Qu, Antti.Rahikkala, Mdmizanur.Rahman, Henri.Tokola, Kai.Kuikkaniemi}@tkk.fi

Abstract

Globalization, the Internet and worldwide logistics have made the world a huge market place, and not just for multinationals. Small companies can as well take advantage of the situation, look for possibilities and find niches to dominate. We study

several cases and find common themes from successful small companies. From this we extrapolate scenarios to show the existing potential.

Keywords: small companies, niche markets, global companies

1 Introduction

Globalization and reduced trade barriers have opened up new markets. China is now known as the workshop of the world, exporting its goods worldwide, and Brazilians are selling airplanes to Europeans. However not all new markets are defined by geography. Developments in communications have made it possible to distill a market from a sparse customer set. Previously it was virtually impossible to make a profit servicing a small specialized customer base, or even to find potential customers. Now the Internet makes it possible to find those people in the world who absolutely want a better pipette or jungle hammock.

In this study we analyze several small businesses that are operating globally in niche markets. Most of these companies could not have existed twenty years ago. We analyze our findings and extrapolate them into scenarios to highlight potential opportunities.

Global operations are challenging, and especially a small company might not have the resources to tackle the various cultural and regulatory issues it faces. Or it might be stumped by the problem of finding customers, who may be spread around the world. However our cases show that these problems can be surmounted.

The rewards of the global niche markets are not just financial: in several of the cases the entrepreneur is also making a personal journey and fulfilling a dream. The small size of these companies allows them to be flexible and provide personal service, often creating a virtual community of customers.

2 What is a Global Small Business?

In this section, we describe definitions for terms related to global small businesses. We also study the challenges faced by companies when going abroad and discuss reasons behind why some companies choose to stay small.

2.1 Definitions

The concepts of "small business", "niche market", "global business" and "born global" are discussed and defined here.

Small Business

Most small businesses are privately owned and operated, with a small number of

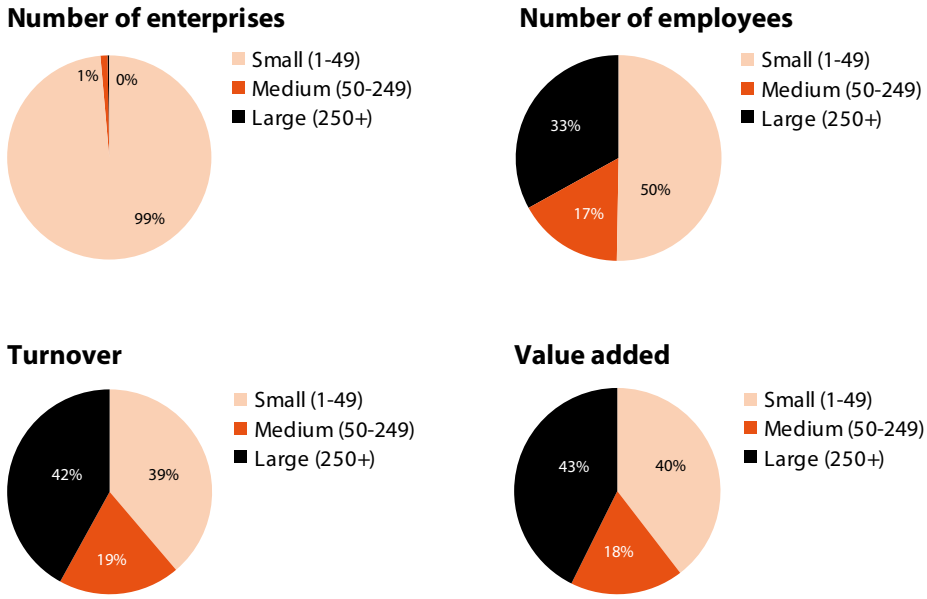

Fig. 1. Number, employees, turnovers and added value of small, medium and large enterprises in EU in 2006 [2].

employees and relatively low volume of sales [1]. Most of the companies in the world are small businesses, i.e., in the EU, based on information from the year 2006, 91.5% of the companies have only 1-49 employees and they employ 50.4% of all employees [2]. Figure 1 shows some key figures related to the size of enterprises.

In academic literature, small businesses are often considered together with medium ones as "small and medium sized businesses" (also SMBs, small and medium sized enterprises, SMEs) [3]. The smallest businesses are called micro businesses. In the EU, the legal limit for the micro businesses is 10 employees [4]. The term "mom and pop business" is often used to describe single-family operated business.

The legal definition of a small business varies by country and industry. In the EU, small businesses have fewer than 50 employees, and either their turnover or balance sheet total is less than $10 million [4]. In the United States, a business is legally small if it has fewer than 500 employees in manufacturing and less than $7 million annual receipts (total income plus cost of goods sold) for most nonmanufacturing businesses except, notably, for agricultural businesses, which must have less than 0.75$ million annual receipts [5].

When comparing small businesses to medium and large businesses, the size of the company is both an advantage and a disadvantage. Advantages include the possibility to start and operate the company, with low cost, even operating only part-time. The strengths of small companies are the flexibility and independence of the company and its workers. There are, however, several disadvantages as well. The hardest one in the beginning of the company is usually to cover costs with sales, i.e. avoid under-

capitalization. A major challenge of the small business is to find, with low marketing investments, the customers sought. Running the company has a noticeable overhead in the form of extra paperwork and compliance to legal regulation. For a small company, these can be quite a burden. In addition, larger businesses tend to determine changes for the smaller ones [1].

Niche Markets

The word "niche" comes from architecture and entered the language of marketing management in the 1980s. A niche market is a fragment of a larger market, defined by a focus on a specific product or customer segment. Niches can be geographic areas, a specialty industry, ethnic or age groups, or any other particular group of people. Niche markets are often ignored by mainstream businesses. Sometimes a niche product can be a variation of a common product that is not produced and marketed by larger enterprises [6].

The "long tail" phenomenon is important to understand the relevance of niche markets. Even if the niches themselves are small, together they constitute a large volume of potential business. The long tail phenomenon is described in the Figure 2.

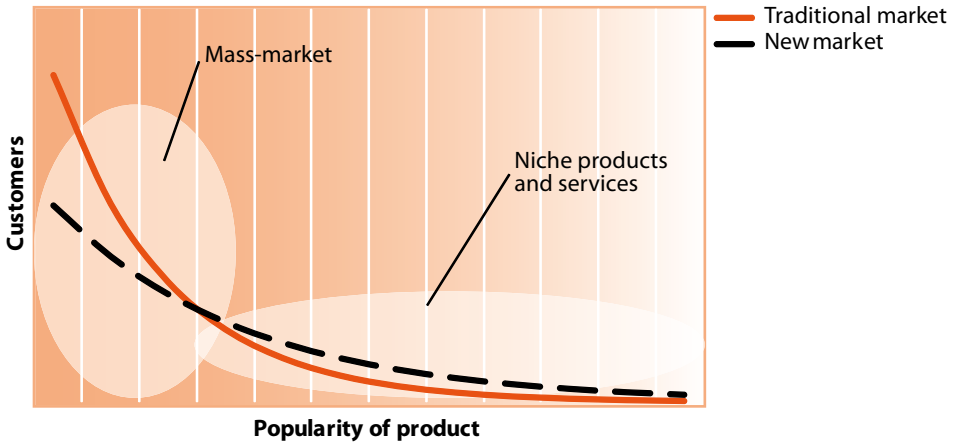

Fig. 2. Niche products are typically marketed to the people in the long tail of the popularity distribution. In case of new markets, there is more space for the niche products, because volume at the tail of the popularity is larger.

Global Business

When a company operates internationally, it can be called international, multinational, global or transnational. These are often used as synonyms for each other, but there are differences between these adjectives. One way to describe them is the following [9]:

International company: an importer and/or exporter. They have no or few investments abroad.

Multinational company: has investments abroad, with a focus on adapting the product for each individual market.

Global company: has investments abroad and it markets its product using the same image/brand in all markets.

Transnational companies: companies with complex structures. They have central corporate headquarters but they give decision-making, development and marketing powers to each individual foreign market.

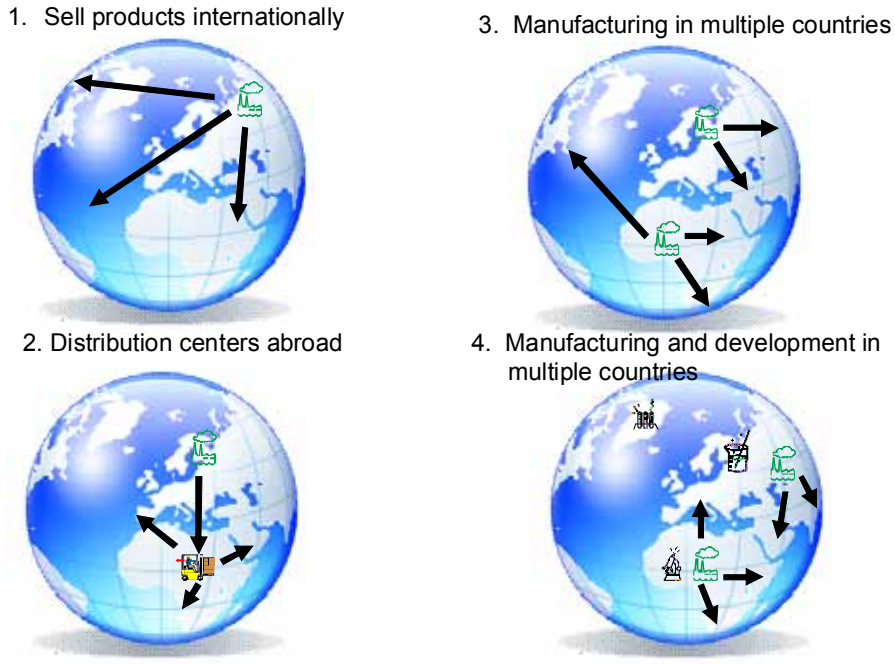

Fig. 3. Traditional strategies to operate internationally

Doing business in a foreign country is more complex than at home. There are several differences starting from taxation when goods or services cross country borders. Countries differ also in economic development, political environment, consumer and business cultural issues and competition [9]. Hofstede (1980) identifies four value dimensions across with cultures may vary: individualism-collective, masculinity, power distance and uncertainty avoidance [10].

Born Globals

Many different definitions exist for the born global company. For example Oviatt and McDougall (1994, p. 49) define born globals simply as "business organizations that, from inception, seek to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries" [11]. Luostarinen & Gabrielsson (2002) take a more detailed approach [12], defining born globals as companies that:

1. start international operations before or simultaneously with domestic operations,
2. base their visions and missions mainly on global markets and customers from the start,
3. plan their products, structures, systems and finance on a global basis,
4. grow exceptionally fast on global markets,
5. plan to become global market leaders as a part of their vision,
6. utilize different product, operation and market (POM) strategies, as firms have traditionally done, and
7. follow different global marketing strategies.

Meanwhile, Knight and Cavusgil (1996, p. 11) believe that born globals are entrepreneurial and, from their inception, perceive the world as one market and thus do not confine themselves to a single country [13]. They perceive international markets as providing opportunities rather than obstacles [14]. Therefore, the main focus of born globals is growth through international sales. To achieve this, these firms produce highly specialized customized goods for international niche markets, and they have access to international networks and international financial markets [13, 14].

2.2 Challenges for Small Companies in Global Niches

For a small company, global niche markets can provide good opportunities, as larger companies often bypass them and competition is easier. However, niche markets are also associated with high risks and challenges. In this chapter we study these challenges in detail.

Marketing

Advertising and marketing can be very difficult in niche markets. Niche markets are usually distributed throughout the world and can have very specific customers who can be hard to reach. Mainstream advertising methods are usually not cost effective.

Small companies often also have limited resources to use on advertising. Methods used to reach global niche customers can include, for example, piggybacking, word-of-mouth mechanisms and personal contacts.

Resources
A small company often has relatively few resources, and trying to enter global markets can make this limitation more severe. Resources can include funding, human resources, physical resources and social networks. Care is required to leverage the available resources, and selecting an appropriate niche helps to focus the effort.

Changing markets
Niches can change fast, and getting trapped to a diminishing niche is as much of a risk as being bound to a niche that is going mainstream and will be exploited by larger companies. Simultaneously new niches emerge from technology and culture trends. A company in a global niche needs to update its concept and market strategy with the change of market and customers. This requires both long and short term vision. A small company can also take advantage of its flexibility and adapt faster than a large enterprise.

Competition
A niche market can be a way of avoiding competition, especially from larger companies. At the same time a company locked to a niche market is at risk of being ousted by a single superior product. And a small company does not usually have the advantage of scale.

To avoid the risks of niches, a small company can try to take advantage of the niche in several dimensions. Besides a product that meets the needs of its customers, it can provide superior quality and service, flexibility, customization, and localization. A small company can also appear more personable and community-friendly.

2.3 A Small Company, Why?

Perhaps the strongest case for a company to stay small is made by Bo Burlingham in his book "Small Giants" [15], where he studies several successful small companies and concludes that by keeping the company small and manageable an entrepreneur can focus on quality and become great instead of large.

Burlingham's study focused on local US companies, but we believe that most of his findings can be applied to global companies as well. A key characteristic is what he calls "intimacy": the bonding between the owners, directors and workers to each other and to the structure called "company". Respect and caring is reflected in relationships, communication and efficiency within the company. This intimacy also affects the relationships the company has with its suppliers and customers. Several of the small companies empower their employees to make decisions, enabling them, thus, to be more flexible and to adjust to the customer's needs.

A more interesting issue for the global small companies is that small companies are often closely attached to the community where they are located. While a small company, which is serving a global market, can be located in a single physical com-

munity and be connected to it, more interesting is the idea of a distributed company that is truly connected to a virtual community. The open source software community, for example, which consists of smaller organizations focused on specific projects, has existed for several decades virtually on the Internet.

However, an important question is: "does a company need to grow?" Venture capital fuelled enterprises usually face a mandatory growth path, as a corporation has a responsibility to its investors. But a small company does not necessarily need much investment, as many investors may find stable productivity as beneficial as risk-fuelled growth. Also, while a small, well-managed company that focuses on its core competences and quality can produce a good return on investment, rapid growth carries many risks with it, as when the company grows beyond the founders' capabilities of control.

The owners of the company should also decide what they want to achieve. Growth is not mandatory and, as Burlingham's thesis suggests, happiness does not necessarily follow money. Beyond a certain size, the management of a company separates the owners from workers, and the demands on the entrepreneur grow sharply without a similar growth in satisfaction.

3 *Existing Small Companies in Global Niches*

In this section, we study several small global companies in niche markets and analyze their common characteristics. The study is based on a large list of small companies, which can be found in Appendix 1. The companies are segmented according to their customers. We also discuss the properties of the niche and how they can be found. In the end we also try to find reasons for why small companies can survive and stay competitive in the long run.

3.1 Customers

Small companies can offer services and products for consumers and other companies and organizations, the way all other companies do. But, because for small companies global marketing is hard to organize, they concentrate typically on the customer segments that need no or very little marketing. Small companies can specialize to very high knowledge or high end products, which restrict the customers and make selected marketing efficient. Another quite common way is to partner with a single big global company that distributes your products.

Consumer Market

Consumer-oriented global niche markets are challenging, as customers are hard to reach and may not have themselves identified the need for the product or service being marketed. Also consumers may not understand the product or service and

typical purchases are small, causing more overhead than more sophisticated corporate customers.

An example of hitting a niche consumer market is that of OldCarOnline.com. They have found their niche in customers interested in vintage cars. Similarly, a company may target practitioners of most hobbies, like outdoors enthusiasts.

High End Consumer Market

Niches based on expensive products or services may provide a profitable market especially if competition is low and the target audience known. A small customer base is not a problem if the target group is wealthy. For example, Tesla electric sports cars are not cheap, but demand is larger than the volume of the company.

Exotic niches present a promising venue for an entrepreneur, either as an exporter or an importer. Travelers abroad often find products that they like and so increase demand. This increases the size of the market for entrepreneurs.

The rise of the Internet has given huge rise to opportunities in niche markets since finding and exploiting niches has now become more easily available for aspiring entrepreneurs. Luxury products may now be purchased and shipped from abroad with less effort than before.

Knowledgeable Markets

A market may have a very high knowledge of the requirements and products, and the product may demand very specific processing and skills.

Polymer Source produces very clean polymers, basically pure molecules, for research and manufacturing. The market for these materials is very small and the prices can be thousands of dollars per gram. The company also offers a synthesizing service, creating polymer molecules for customer specifications.

Value Adding Markets

A small company may find its niche as a producer of a specific component to the value chain that produces a finished product.

A well known example is the Dolby Corporation that produces noise suppression methods, without manufacturing the physical devices. Another example is the Regio Firm that produces positioning services that need a mobile telecommunications network to be usable.

3.2 Relation to the Niche

A company may target existing or new niches, or create a new niche out of an existing market. Also technology, mostly the Internet, can be used to create a new niche out of existing components.

Entering an Existing Niche

The advantage of entering an existing niche is that the market segment itself is already proven and the challenge is to beat the competition. As niche markets are not always as competitive as mass markets, it is possible to find a stagnated niche and succeed through superior execution, price or some other differentiating factor.

Tayler Corporation supports a cartoonist and his family with a free web comic (of which there are about 50 000). The income is based on the artistic quality of the comic, which allows the company to sell printed collections, T-shirts and other merchandising. While the volume of the business is not huge, the cost overheads are kept down via methods like self-publishing and a small organization. Ametherm manufactures current limiting thermistors for the global electronics market and succeeds through the superior quality of their product.

Globalization enables companies to find existing remote niches, for example Finnish farmers have found a demand for vitamin rich northern berries in Japan.

An Unexplored Niche

New technologies, such as solar power, create new opportunities. Naturally being a trail blazer has its risks, but also offers newcomers the chance to define and dominate a new market. Tesla Motors has managed to create the market for electric sports cars. Hennessy Hammocks has set the bar for jungle hammocks rather high (arguably the market is small, but the company is supporting its founder). Admissions Consultants use the Internet to reach customers looking for entry to educational institutions and guide them through the process; before the Internet it would have been very difficult to grow a business of this kind to volume. Groundspeak was born of the hobby of geocaching, where people hide a guest book in a container at a physical place (like near a statue in a park) and publish the GPS coordinates online for others. Groundspeak provides the basic service for finding the cache coordinates for free and charges a fee for premiums services and geocaching related products.

Finding a Niche in an Existing Segment

Existing markets may contain potential niches. While Tata Motors is not exactly a small company, its Nano car shows how a niche can be created by looking for the lowest standards of car people are willing to buy. Nixu Software sells network devices as "software appliances": the customer buys a generic PC and installs the software complete with an operating system, making the box a dedicated device, with no need for system administration, thus reducing the cost of ownership.

3.3 What Keeps Small Companies Alive?

One could imagine that in global markets dominated by larger companies, small companies cannot sustain profitable business. There are, however, few important advantages where a small company can distinguish itself.

Intimate working environment

Firstly, a successful small company creates an intimate working environment where everyone knows each other and recreational activities are often arranged; in general, it should feel good to work for the company. This makes the whole crew work together for the common aim, a notion that the employees of large companies often lack. When people enjoy their work, they can produce quality work.

Specialization

Secondly, concentrating on a single product or service gives the edge for small companies against larger ones. Big companies concentrate on mass markets, but a small company can focus on very specific area and –target customers. This allows small companies to be leaders in their niche markets, and big companies can stick to mass markets.

Personalization

Thirdly, small companies can serve their customers in a more personal manner than big companies. If a customer has a problem, it certainly helps that they are able to contact management directly. Creating a loyal customer base is vital for small companies, because a business model can be copied, but the network of clients cannot

4 Scenarios: Carving Global Niches

In this section, we consider five fictional small companies that operate in global markets. The companies and their product, business model and global operation ideas are shown in Table 1. We tried to find companies with an interesting product idea and a radical business model. These companies also operate in a way that is not easy for a large company.

Table 1. Studied small companies, their business ideas, global strategies and reasons why they are small.

Company	Business idea	Global strategy	Why small?
AtHomeAgain	Strictly home-based company	Uses all possible international channels	Low income is enough
ByeAndHello	Moving company	A single office, that moves.	Flexibility, personal and unique products
Executive Scapegoats	Web 2.0 PR crisis management	24/7/365 presence on the network from globally distributed offices/persons	Quick reaction and flexible organization
Prima Vista Hotel	Mobile luxury hotel	Hotel moves to seasonal premium locations	Unique, personal, flexibility
Genuine FlimFlam	Make money fast through science and technology	Targeted Internet sales	No brand problems, unique

In addition to presenting a description of the companies' business idea and operations, a SWOT (strengths, weaknesses, opportunities, threats) analysis is offered.

4.1 At HomeAgain - A Decluttering Franchise

AtHomeAgain is a franchise loosely based on a real world blog: http://unclutterer.com/. The core business of AtHomeAgain is selling the AtHomeAgain brand, which is based on services and tools to help individuals keep their homes clear of clutter.

The website behind the brand, declutterer.com, was started by a housewife who was disgusted by the amount of things that kept piling in her cupboards and closets. She started a blog on the topic, which gained popularity over time and became a business when other people started to ask her for help in clearing their own clutter. After a while, the owner distilled her ideas to a formula and, having gained personal brand recognition (similar to Martha Stewart or Oprah, but on a smaller scale) through her blog, she started a franchise business. The business now has a direct staff of five and 200 franchise operators that the owner has trained to declutter customers' houses.

The parent company keeps track of the quality of the brand and advises and motivates the franchisees. Currently the business is operating nationwide in the United States, but is strongly considering international expansion, which is seen as a challenge due to cultural differences.

(S) Personalized service for each customer through franchising, light and nimble organization, ability to grow due to the franchising model.

(W) Selling a relatively simple concept, easy to copy.

(O) Unique business idea, few competitors in the market so far.

(T) Threat of competitors due to easy to copy business model, cultural differences in international expansion.

4.2 ByeAndHello – A Moving Company

ByeAndHello Ltd is a family-based company that moves around the world. The company goes to a country where the living costs are cheap and tries to find local low cost products that can be sold at high prize in other countries.

ByeAndHello was originally formed by Byrna Yeba and Helen Faari, a couple who wanted to see the world. Byrna Yeba is originally from Namibia and Helen Faari is from Manchester, England. They have also an adopted a son from China. Because of their background, they have a global and multicultural perspective. They started their company at the beginning of the 1990, when they moved to China and adopted their child. China was just beginning to open its markets and Yeba and Faari used their knowledge of the Western world to start a business. As the ByeAndHello company consists of only themselves, they are able to take certain risks. If the living costs are cheap, then the company can go on even several years without income. The company

finds or manufactures products in low cost countries and sells them to the high-cost countries. Flexibility allows it to sell even the products that have very few customers. When the Internet became common, it caused problems by cutting their business, as it made it easy to order the products directly from the suppliers in other countries. But nowadays, the company concentrates on the rarer products that cannot easily be found from the Internet, which seems to be a good business model. They use the Internet to sell the products to where they get the best price.

(S) Resulting from its small size, the company's strength is flexibility. When the company operates in a low-cost country, it is possible to operate for a long time without new income. The company has lived long in the low-cost countries, and they know how to get things rolling in such countries. These countries work slightly differently from the Western countries, e.g. people can be more family-based.

(W) The company is relying on being able to identify and market fashionable products. The revenue stream is not very reliable, nor wide. Constant travel and movement creates stress.

(O) It is easy for ByeAndHello to take risks. A small company does not need much overhead. Projects can be ended immediately when you see that they do not end well. This can be one reason why they see the niches before others.

(T) Emerging economies are a demanding and potentially stressful environment. For example, the healthcare can be quite low level and items common in the West may be difficult to obtain.

4.3 Executive Scapegoats – A Web PR Company

Ann-Britt Eklund was horrified by the Gulf of Mexico oil spill in summer 2010: personally horrified by the disaster and professionally horrified by the PR fiasco, that is. Having recently graduated from the Stockholm University with a major in corporate communications, she decided to do something about the PR side.

Eklund's company, Executive Scapegoats, provides large corporations with insurance against PR disasters in the modern world. For $10 000 a year his staff monitors the prime English language social websites like Boing Boing, 4Chan, Twitter, Slashdot etc. using both human browsing and spider technologies. When a potential incident against a customer is noticed, the customer is informed and immediate countermeasures initiated.

Typically, an experienced blogger uses an old user account that was created and has been used occasionally to make it credible and present him/herself as a spokesperson for the company taking responsibility and blame for the incident. In case of a product problem getting out of hand, there will be articles from at least three people of different levels at the company (all written by Executive Scapegoats) and the handling of the case is stretched to over a week, to make sure that it does not flame up again. Executive Scapegoats also liaison with the regular corporate PR staff to make sure that the company message is aligned. When necessary, Executive Scapegoats provides

a person that can be dismissed over the incident and will be available for media to be interviewed for the next two months.

The company's strategy is to streamline the process of handling minor PR incidents and to prevent them from growing to major cases, especially to customer dissatisfaction cases.

The company employs people around the world to maintain a 24-hour coverage and recruits students of English literature, as these are available at low cost, generally have a good command of the English language and can modify boilerplate customer service messages as needed to make them look authentic. The operating centers of Executive Scapegoats are located in South Africa, Philippines, Alaska (US) and Puerto Rico (US), all of which have available English speaking staff at low cost.

After the initial start, the company's clients quickly noticed the excellence of the company's digital communications skills and several companies asked Executive Scapegoats to take over their whole web presence. Eklund quickly agreed to this lucrative expansion and changed company's strategy to become a company that provides web PR services. However Executive Scapegoats was not integrated well enough to the customer companies' personnel and management. Also, Executive Scapegoats did not understand the corporate culture and traditional PR, and hiring more staff did not help to clarify the situation. After three years of the experiment and rising costs, plummeting profits and unhappy customers Executive Scapegoats cancelled all general PR contracts and focused back to its niche, i.e., providing hip and web savvy crisis management to large corporations.

Currently, Executive Scapegoats is considering replacing the monitoring centers with telecommuting in 2020, and the goal for 2025 is for the company to have no offices: accounting and administration outsourced and Eklund managing the operations over the Internet. The company is also planning to expand to other languages.

(S) Small and agile core of the company. Decentralization allows good coverage of regional websites. The service is highly appreciated by corporations.

(W) Decentralization entails that the regional employees are, most likely, difficult to control. Also, students as workforce may not be reliable. Furthermore, once a scapegoat is needed, the person taking the blame faces personal disaster unless he/she only appears on the Internet. Operations management may be too much for one person. To gain foothold with corporations in countries of other major languages, the company must have other operations managers fluent in different languages.

(O) Unique opportunity, since the company is the only operator in the world. There is a possibility to grow larger.

(T) If it is revealed that Executive Scapegoats is involved with taking blame in a major disaster, both the company and the client will face a PR disaster. As such, student workforce becomes a liability. Outsourcing can lead to sensitive information leaks.

4.4 Prima Vista Hotel - A Mobile Hotel

Prima Vista hotel combines several ideas: wealthy clientele with an annual income of $500 000 USD or more, container shipping, seasonal vacation hot spots and luxury boatbuilding. The hotel consists of 70 40' containers that can be easily relocated using commercial logistics services such as shipping and trucking. Forty of the containers expand to luxurious bungalows, the rest are used to provide the support services of the hotel.

A key innovation has been the design of the container bungalows. One wall of the container folds down to provide the 5 meters of depth and the 12 meters of length that the container has. The ceiling of the container also turns up and an additional ceiling and wall panels fold out. The container contains all the needed furniture, and bathrooms are located to the fixed wall of the container. The containers have been designed by the Finnish high-end sailboat company Nautor, known for the Swan boats. Nautor has long experience on designing and building high-quality carpentry for hostile environments and combining comfortable interiors with exteriors that survive in harsh conditions.

The container dwellings are insulated against both heat and cold, with large quadruple window panes on the fold-out walls. Heating and air-conditioning are available. The opened containers are spacious, about 50 square meters in area. The interior can be generic or themed.

The containers and mobility form the basis of the hotel, but location is what the customers want. The management is all the time scouting for the best locations and trends. The hotel might stay for a week in the Burning Man festival, then move to a remote part of Canada for the fall colors and spend the deepest winter in the sun of Antarctica, by the fjords of Patagonia. Locations have several requirements, as the hotel requires heavy logistics and the customers have their own travel arrangements.

(S) Mobility: containers can be shipped to follow the market. Intelligent design from an experienced boat builder uses the available space smartly. Novelty will aid in initial marketing, and novelty of location can be a permanent feature. Also, the location has no off-season.

(W) Small market, high cost. High marketing expenses. Shipping and handling costs. Moving the whole hotel will cause additional wear and tear. Location needs preparation for services and utilities.

(O) The hotel can provide luxury accommodation in harsh environments, such as polar areas or deserts. Young travelers like to try new things. There are popular landscapes where regular hotels cannot easily be built.

(T) Competition from regular hotels. Small market segment. Tourist source market is not stable. Once the novelty wears off, the market may move. Customers interested in remote vacation spots might prefer more traditional styles of accommodation, like tents.

4.5 Genuine FlimFlam Inc. – A Trend Company

Mission statement: "We should take the sucker's money before some other swindler gets it." FlimFlam focuses on finding and developing subculture trends. It got out of crystals and magnet straps as they went mainstream, and its newest business plan is based on science. The founder of the company was having a beer with a friend, who is biochemist by profession. The chemist talked about how there is a rumor going around that sonication of cheap wines improves their quality- sonication being the application of ultrasound, as used in sonochemistry.

Quickly taking initiative, the founder requested for a scientific test if the sonication of wine actually had an effect on wine structure. The results were positive. The company made a survey about whether wine sonicators actually are sold in global wholesale web sites. They found none; however, cheap low-power ultrasonic stirrers were widely available. The founder and his team ordered a few sonicators from different factories in China, chose the one with the best price versus quality value, and then designed a universal fitting to attach the sonicator to wine bottles. Tasting of the wine after sonication gave mixed results. To get more public opinion the team visited several festivals and parties during summer to give free tasting of sonicated and non-sonicated wine and to get feedback. Again the results were mixed. However, they decided to produce a stock made up of 50 prototype copies. Creating a dedicated website and paying a couple of euros a month to Google to get their wine sonicator first in the Google search results, they sold the whole stock in two months virtually with no marketing.

The next product of FlimFlam is going to be the $ 500 "Sonolysator (tm)" product marketed at wine aficionado magazines and wine dedicated websites to wine enthusiasts. The marketing material puts heavy emphasis on the trend created by the "new" wine countries (like Australia and South Africa), which are known to have broken with the traditional French methods, and adds a hint of molecular gastronomy to create the impression that sonication is what you need to do, to be up to date on wines.

Part of the marketing campaign is the challenge "Can your nose tell the difference?"

A year later the high-end market had shown a strong disinterest and the product has been repackaged as a 49.95 USD "Magic Wino" wine enhancer that transforms cheap box wines to gourmet quality. The strongest sales channel is the TV Shop.

(S) Small and agile company, capable of taking advantage on possible new niches.

(W) The product is easy to copy. If successful, competition will emerge. Because the company is small, the product cannot be demonstrated in public events worldwide.

(O) The only company selling the product, a good foothold in the market.

(T) Hard to expand the niche target population, especially with a small marketing budget. If big corporations get interested in the product, they might wipe FlimFlam from markets.

5 Conclusions

We believe that global niche markets are an underutilized field of opportunity and that the developments of past several decades have made global business feasible for small companies. In this study, we have outlined some of the challenges and risks faced by small companies in niche markets, but believe that they can be overcome. Usually larger companies tend to overlook smaller niche segments, and therefore small companies can keep themselves away from the more competitive mass markets.

Niche markets are vulnerable to losing the niche to larger companies, which might shift it to mainstream. However, small companies are usually characterized by a great degree of flexibility and adaptability in coping with the changing trends, as these kinds of companies are able to update their concepts and market strategies quickly by changing markets and customers.

One challenge for consumer-oriented global niche markets is that customers can initially be hard to reach. However, once they are found, companies operating in consumer-oriented global niche markets have the potential to become very attractive businesses. Another challenge for small companies interested in becoming global is logistics, but in the age of the Internet these challenges are met easily by establishing a global virtual network where products/services can be shipped without establishing logistics abroad.

Another benefit of small company structures is the fact that small companies can interact more closely with clients, developing a sense of community and making business more enjoyable. Studies on successful small companies also show that small companies are easier to manage and can focus more on the quality of product/service, turning their businesses great instead of big.

Furthermore, we argue that keeping a company intentionally small can enhance return on investment as a small company can be more efficient and flexible. This makes sense, especially in niche markets, where economies of size do not always apply.

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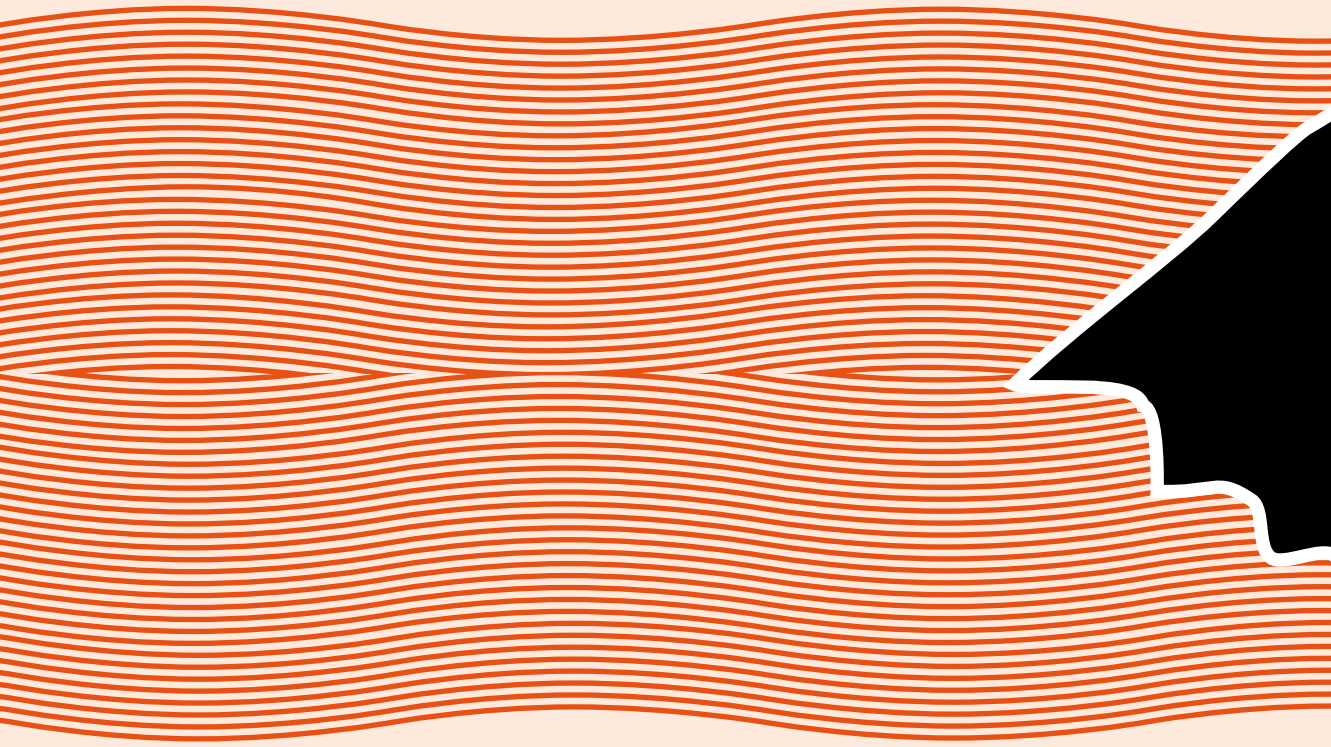
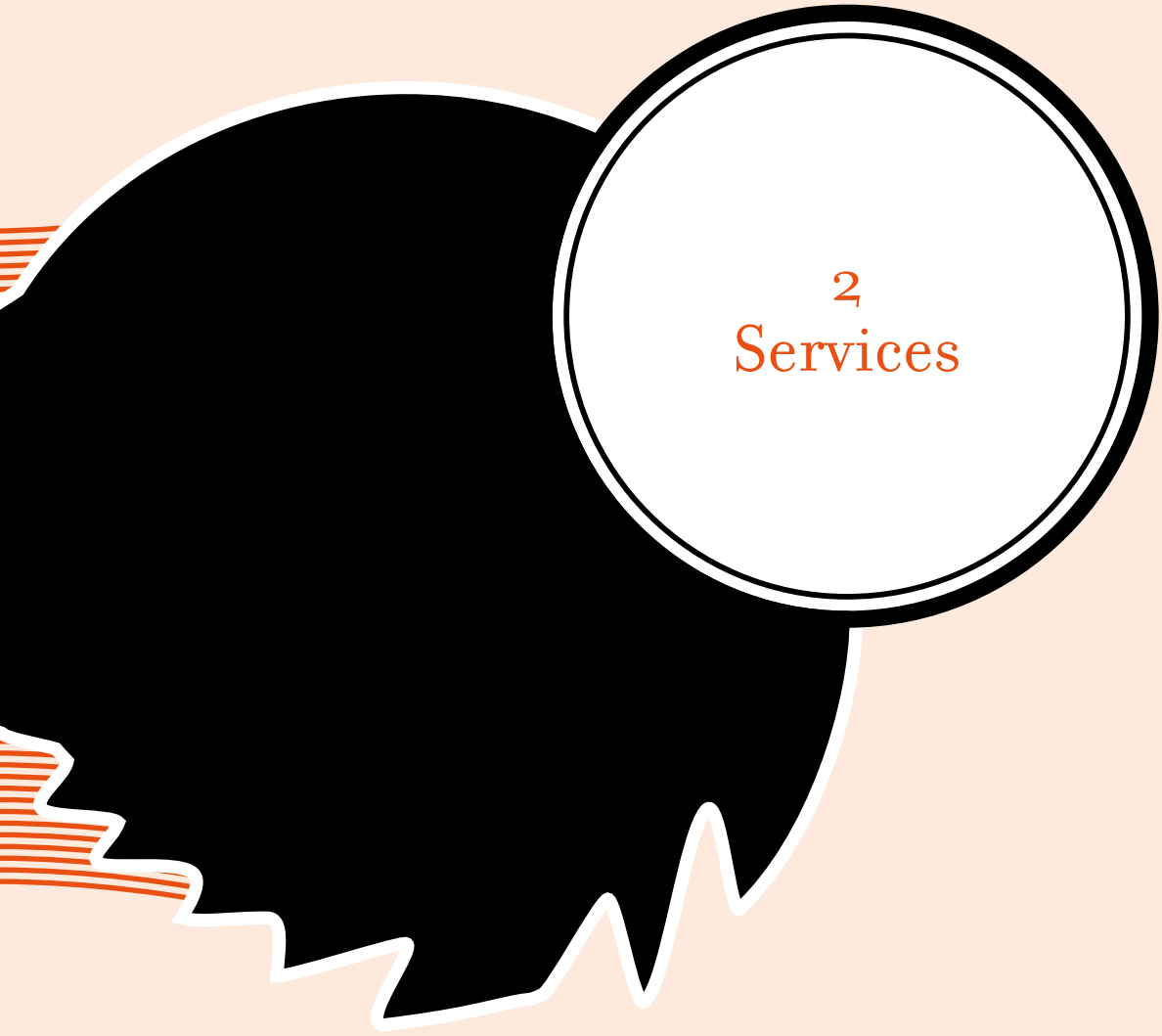
Appendix: Companies Studied

Table A1. Some small companies, their business idea, and global operating mode.

Customer segment	Company	Idea of the company	Global operating mode
Big companies	Regio Firm	Positioning service	Partnering
	F-secure	Information security	International sales
	Ametherm	Small electrical devices	International sales
	Nixu Software	Information security	International
	Balsamiq	Wireframes for web pages etc.	International
	Biohit	Pipettes, pipette tips, diagnosis equipment	International
	Ecplaza Global	Companies can present their products	International
	Supponor	Digital billboards for sports events	International
	Symbicon	Digital advertisement panels	International
	Lambirds	Jobs abroad?	International
	Tesla Motors	Electric cars	International
	JEOL	Electron microscopes and spectroscopy	International
	SES audio design	Audio furniture	Regional
	Silicon solar	Solar energy systems	International
	Nano car	Car manufacturer	International

Experts	Asper Biotech	Genotyping	International sales
	Biohit	Pipettes, pipette tips, diagnosis equipment	International
	Polymer Source	Research-grade molecules	International sales
	Ecplaza Global	Companies can present their products	International
	JEOL	Electron microscopes and spectroscopy	International
Small companies	F-secure	Information security	International sales
	Nixu Software	Information security	International
	Balsamiq	Wireframes for web pages etc.	International
	Biohit	Pipettes, pipette tips, diagnosis equipment	International
	Bingo Card Creator	Customized bingo cards	International
	Ecplaza Global	Companies can present their products	International
	Supponor	Digital billboards for sports events	International
	Symbicon	Digital advertisement panels	International
	Last minute	Fligths, hotels etc. via Internet	International
	Lambirds	Jobs abroad?	International
	Tesla Motors	Electric cars	International
	JEOL	Electron microscopes and spectroscopy	International
	SES audio design	Audio furniture	Regional
	Silicon solar	Solar energy systems	International
Consumers	Lasermonks	Selling used and refilledprinter cartridges	Regional sales
	SantaMail	Sending customized letters upon request	Internet
	Doggles	Eyewear for dogs	Internet
	Tayler Corp	Comics	By-product
	Suunto	Sports precision instruments	International
	F-secure	Information security	International sales
	GreatCall	Telephone services	Regional sales
	Hilleberg	Tents	International
	Hennessy Hammocks	Tents	International
	Balsamiq	Wireframes for web pages etc.	International
	Bingo Card Creator	Customized bingo cards	International
	Groundspeak	Geocaching services and equipment	International
	Douban.com	User reviews for cultural products	National
	Last minute	Fligths, hotels etc. via Internet	International
	Admissions Consultants	Consulting on applications to high schools, work, etc.	Regional
	Distance Education Org	Online degrees and courses	International
	Tesla Motors	Electric cars	International
	Custom-built Archery	Customized bows	
	SES audio design	Audio furniture	Regional
	Silicon solar	Solar energy systems	International
	Old Car Online	Classic cars	Regional
	MoneyGram Int.	Money transfer	International
	Nano car	Car manufacturer	International





2
Services

2.1 What is Service Research? Present Status and Future Directions

François Christophe[1], Tapani Hyvämäki[2], Simas Rackauskas[3], Md. Mizanur Rahman[4], Timo Rinne[5], Leena Sivill[4], tutor Cathy Nangini[6]

[1] Aalto University School of Engineering, Department of Engineering Design and Production, PO Box 14100, FI-00076 Aalto, Finland

[2] Aalto University School of Electrical Engineering, Department of Automation and Systems Technology, PO Box 15500, FI-00076 Aalto, Finland

[3] Aalto University School of Science, Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[4] Aalto University School of Engineering, Department of Energy Technology, PO Box 14100, FI-00076 Aalto, Finland

[5] Aalto University School of Economics, Department of Management and International Business, PO Box 21290, FI-00076 Aalto, Finland

[6] Aalto University School of Science, Low Temperature Laboratory, PO Box 15100, FI-00076 Aalto, Finland

Abstract

A shift in the global economy from products to services has generated increasing interest in research on services. This paper explores the current state and future directions of service research. Starting with a definition of service as a concept, the paper continues with an analysis of current views on service research at different levels, conducted by reviewing academic journals and institutions and interviewing a specialist in service research. This review answers the question as to whether service research

can be characterized as a science on its own and it provides insight into the potential future directions of service research in Finland and abroad.

Keywords: service research, service science

1 Introduction

The transition from a manufacturing economy to a service economy and from goods-oriented suppliers to service providers has created an increasing demand for service-related research and development [1]. However, this raises a number of questions about services as a research field. What does service research actually entail, and where is it headed in the future? Can this research field be defined as a science?

In this paper, we explore how service research is structured and prioritized at present. Research topics are reviewed from scientific journals, research institutions and universities, and one expert interview is conducted, in order to form an overall picture of services as a research field. On the basis of these findings, an assessment is made of the maturity of services as a research field. Finally, we discuss possible challenges and opportunities for future research.

1.1 Concepts of Service and Science

The term 'service' is present today in many fields of activities, including product development, systems engineering and computer science, and it has been used for several decades in business and management. However, is the concept of service always the same or does it have different meanings depending on the context? The extant literature refers to the viewpoint of business and management. In economics, service is described as the intangible equivalent of economic goods and the nature of services as a process. The similarity between goods and services is that they are both targets of economic or societal exchange. Another definition of service is provided by computer science and, more specifically, systems architecture. In this context, the term 'service' refers to a set of related software functionalities, together with the policies that control their usage. In conclusion, the term 'service' always relates to a specified context.

It is likely that services have existed for as long as humankind. Only the form and our understanding of services have changed over time. Services as a sector began to arouse research interest among academics and practitioners in the 18th century (e.g. Adam Smith). Despite this, services were recognized as a significant research field only at the beginning of the first decade of the 21st century. One initiator of this research was IBM [2], which also introduced the term 'service science, management and engineering' (SSME) [3]. The ultimate need for establishing scientific research on services is often justified by the proportion accounted for by services in the GDP of developed countries and also by the increasing amount of revenue that companies

gain from services [2], [4]. It is stated that nowadays as much as 80% of the output of the Western countries comes from services, and therefore the proportion of services produced by Western countries must have been very significant for centuries.

This gives a reason to ask why services have not aroused significant research interest until now. What has led to the increased need for service research in recent decades, while earlier the services managed very well for a long time without scientific research? The same paradox regarding service research can be seen from the funding point of view. If 80% of the output of the Western countries comes from services, why is the funding of service research not proportional to this? In recent decades, a shift has been noticed in manufacturing-based companies to the generation of revenue from service operations rather than goods production. Perhaps the reasons lie in this transition: a large group of industries needs to express a common interest in order to generate a surge of research.

To understand whether research related to services can be called a science, one should first consider the attributes that define a science. We consider here the concept of science in general, without distinction between social, human and exact sciences. Dictionaries define science as "the observation, identification, description, experimental investigation, and theoretical explanation of phenomena". Therefore, science can be considered as an activity conducted using a scientific method that aims at explaining an observation or a phenomenon. A scientific method is generally a duality between induction and deduction. Induction is the abstraction of observed phenomena to form a theory. On the other hand, deduction is the validation of the induced theory by the prediction of similar phenomena. This dual process is generally called the scientific method and can be presented as follows [5]:

1. Observation and description of a phenomenon or group of phenomena.
2. Formulation of a hypothesis to explain the phenomena. In physics, the hypothesis often takes the form of a causal mechanism or a mathematical relation.
3. Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations.
4. Performance of experimental testing of the predictions by several independent experimenters and properly performed experiments.

Research on services is carried out using scientific methods, but does this mean that there is a service science? Several IT companies currently have research centers that focus on services, such as HP's Centre for Systems and Services Sciences, Oracle and IBM's Service Research and Innovation Initiative, and Fujitsu. In the EU, the NESSI group (Networked European Software and Services Initiative) established a Services Sciences Working Group. The definitions given by these research groups do not define service science as a basic science, but more as the ability to bring together diverse disciplines. Service science can be seen as an interdisciplinary umbrella that

enables economists, social scientists, mathematicians, computer scientists and legislators to cooperate in order to analyze, construct, manage and develop complex systems oriented to providing services. At least the following definitions can be found:

- Service science is the study of the application of the resources of one or more systems for the benefit of another system in economic exchange [6]
- Service science is about integration, optimization and sustainability [7]
- Service science can be seen as an inter-disciplinary activity which attempts to unite various areas based on trans-disciplinary (or cross-disciplinary collaboration) [7]
- Service science is defined as a new discipline "to merge technology with an understanding of business processes and organization and to understand how that capability can be delivered in an efficient and profitable way" [8]
- Service science is an interdisciplinary field that "combines organization and human understanding with business and technological understanding to categorize and explain the many types of service systems that exist as well as how service systems interact and evolve to co-create value" [9]

In conclusion, service science should not be considered a specific science but rather it should be seen as a common field of research interest for people in a variety of scientific disciplines. However, it is all but clear whether the current use of the term is able to capture all the relevant dimensions of service-related research. This is why we choose to prefer the term service research and why we wish to analyze critically what information is available about the research field from a wider perspective.

2 Methods

The framework of our analysis was based on a literature review of articles presented in scientific journals that are either specifically dedicated to service research or frequently refer to the theme of services. The Finnish service research topics were explored by searching the service research interests of each public research institution and university in Finland and by exploring the research programs offered by Finnish public research financiers.

The interpretive research method was used in this study to find answers and different interpretations to our epistemological questions about the nature of service science and service research. The purpose of the interpretive research method is to understand the surrounding social world and to achieve a convincing explanation for the phenomenon under study. Interpretive research is based on the assumption that our knowledge is created through social constructions such as shared meanings, documents and other artifacts [10].

Several different sources of data were used in this study, including a wide variety of

international academic journals, data from several international research communities and also a comprehensive interview with Professor Marja Toivonen, a researcher who is active in the academic community within the service research field. Based on our findings and interpretations of the data, we have drawn our own conclusions regarding the status of service research today and its future directions. As one output of our research, we formulate our view in terms of four branches of the service research field.

3 Results

This section is a brief review of academic journals focusing on service research in developed and developing countries. Local publications are left outside the scope of this review. Traditionally, academic journals have been one of the most important avenues for researchers to publish the results of their studies. Therefore, journals are also a very important source of references for further study. Journals for specific research areas are typically established when the following conditions apply: firstly, researchers continuously identify the same gap in a research area, which is not covered systematically in any journal or other academic publications. Secondly, there is a gap between two research areas with a natural relationship [11].

3.1 Service Science in Academic Journals

The resources of Aalto University Library in Töölö, Helsinki were used as the primary data source for reviewing academic journals covering service science [12]. The electronic journal portal of the library provides electronic access to about 500 academic journals. This source was complemented by the Finnish National Electronic Library Interface, Nelliportaali [13].

Service-oriented journals were identified by searching for all journals containing the word "service" in their titles as well as in their list of key words. This simple search returned about 500 references, the majority of them being annual reports or other non-research-related publications. Manual analysis narrowed the list down to 60 references that could be considered service science journals; these were selected for further analysis.

The majority of the journals cover service or services in the context of an application area, for example financial services, health services, information services and psychological services. In total, 53 journals out of the 60 cover services from some application perspective. Financial services are well represented with 16 journals, followed by health care services with seven journals.

Only seven out of the 60 journals discuss service science topics on a more general level. Amongst these seven journals, the majority focus on the management of services or on strategic development of the service business or service concepts. Service quality is also considered to be an important area of research, represented by two

dedicated journals. Service modeling, engineering and operations are covered through case studies, usually in a certain application area. However, case studies have only a minor role in generic service science journals.

The Journal of Service Research is published quarterly and is widely considered the world's leading service research journal. It focuses on areas such as human resources and organizational design, service innovation, operations and the economics of services. The Journal of Service Management has a clear managerial and organizational focus and also has the most ontological focus, covering, for example, service theory, design, analysis, architectural design and ethics. The Service Business and Service Industries Journal are journals published quarterly that focus on the management, human resources, organizations and economics of services. The International Journal of Quality and Service Sciences and Managing Service Quality cover service management from a quality perspective: how to manage services in order to improve their quality. Furthermore, the Journal of Services Marketing can be considered a general service science journal, with a focus on the management, planning and implementation of services.

Application journals focus on service science mainly from the perspective of implementation in a certain application area. Services modeling, design, development and operations are the main areas covered in application journals. The journals mainly publish case studies, which are used to study how more general areas of service science are implemented in different application areas.

Academic journals fall quite naturally into the two categories of General Service Science Journals and Application Journals as presented in Table 1. The first category includes research in management, strategic planning and quality services, since they can be studied independently of any application area. Research on management and strategy rely heavily on organization theories, where the results can be generalized to any application area. The second category, on the other hand, includes service modeling, engineering and operations — applications that are more dependent on the environment in which they are implemented. Therefore, it is justified and reasonable that application-based journals have their own approach to service science research.

Table 1. Two categories of academic journals in service science.

General Service Science Journals	Application Journals (examples)
Journal of Service Research Journal of Service Management Journal of Service Science Service Business Service Industries Journal International Journal of Quality and Service Sciences Managing Service Quality Journal of Services Marketing	Financial Services Marketing Financial Services Review Frontiers of Health Services Management Health Services Management Research International Journal of Web Services Research Journal of Behavioral Health Services & Research Journal of Financial Service Professionals Journal of Financial Services Marketing Journal of Financial Services Research Journal of Foodservice Journal of Health and Human Services Administration Journal of Retail Banking Services Journal of Retailing and Consumer Services Manufacturing & Service Operations Management Psychological Services Service Oriented Computing and Applications Social Service Research

3.2 Service Science Research in Developing Countries

As investments in the service sector are mostly targeted at the richer segment of the market, there are fewer opportunities for the other segments [14]. In most developing countries, public service sectors such as healthcare, law enforcement, judiciary service, and service utilities suffer from deplorable inefficiency, unpleasant service delivery and lack of transparency [15].

The implications in service design and implementation are varied with respect to geography, cultural factors affecting the work force, public perception, policies, social factors etc. [15]. There is a great need to benchmark the various forms and models for delivering different services, and it is therefore very important to identify whether the ongoing research in service delivery fields has the appropriate emphasis with respect to the local perspective.

This subsection explores how service research is carried out in developing countries in Asia, especially on the Indian sub-continent, in terms of quantity and relevance to basic necessities. In fact, this search found a very limited number of Asia-based research institutions and journals that focus solely on service research. The main journals found that were linked in some way with service research include the Journal of Services Research (JSR), the South Asian Journal of Management (SAJM), and the Asian Journal of Management Research (AJMR).

3.2.1. Journal of Services Research (http://www.jsr-iimt.in)

A total of 137 articles published in the Journal of Services Research since 2001 were reviewed, and a summary was compiled based on the research theme and topics covered. Since its inception in 2001, this journal has published around 250 articles in 20 issues and 10 volumes. Some 80 percent of its published articles primarily focused

on service needs in either India or other Asian countries, especially those related to service management in the hospitality sector, for example, hotels, restaurants, tourism, etc., followed by the financial service sector including private/public banking, insurance, stock market, shares, etc. There is also a growing interest in incorporating ICT into the service business, for example, in online service delivery, supply chain management, management information systems (MIS), online pricing, online selling, e-booking, credit card payment, etc. Customer relationships, characteristics, and behavior in the service business were studied in a few articles. Some articles were dedicated entirely to service innovation research and service as a science.

Even though the Journal of Services Research, in its vision statement, emphasized service research in terms of healthcare, quality education, safe drinking water, sanitation, etc. as the most crucial service needs, this journal produced an insignificant amount of research on the outcome of these themes. Only four articles were published on educational issues, and these focused on whether education needs to be considered a service, how to build service marketing as a new academic field, web-based intelligent collaborative learning, and changing the pattern of university financing in India. None of the articles were devoted to addressing crucial education questions, such as the quality of mass education and the challenges involved in mass education. Likewise, only four articles concerning the healthcare/health sector were published, and these focused on patients' perceptions of services provided by doctors, nurses, institutes, the cost of government healthcare in India, the financing of health insurance, and the organization of private healthcare.

Other service areas on which this journal has focused are customer relations in business, telecom services, e-governance, airline industries, environmental issues, globalization, service management, book reviews, etc. The major subject matters covered by this journal are compiled in Table 2.

Table 2. The number of articles published in the Journal of Services Research, categorized by focus area.

Subject matter	Articles published
Hospitality management, Hotel, Restaurant, & Tourism	19
ICT in service business	9
Education as a service	4
Customer relationships in business	8
Banking, insurance, stock markets	14
Healthcare services	4
Miscellaneous service research	18
Service management book review	57
Airlines, Telecom, Globalization, Environmental service	5

3.2.2. South Asian Journal of Management (http://www.amdisa.org)

The South Asian Journal of Management is the publication platform for promoting management excellence in South Asia by networking management development institutions and for facilitating their partnership with corporate enterprises and public agencies in the region. The South Asian Journal of Management was launched in 1993 and has published 17 volumes to date. This journal publishes research on issues relating to the public service sector and public institutions. We evaluated 36 articles published in six issues of this journal and we found that the articles put special emphasis on public sector institutions. The banking sector was the prioritized sector in the service management research represented by this journal. Other sectors such as power, railroads, transport, etc. were also represented in a few articles. Among the business articles, issues such as customer behavior, price volatility with trading volume, recruitment advertising to promote corporate image, service value chains, brands in emerging markets, managerial ethics in corporate business, the significance of trust and loyalty in business, etc., are significantly represented. On the other hand, public issues such as healthcare, government utilities, sanitation, safe water, urban housing, public education etc., receive less emphasis.

3.2.3. Asian Journal of Management Research (http://ipublishing.co.in)

The Asian Journal of Management Research is a half-yearly, international, refereed journal that focuses on publishing scholarly articles on service management and service-related areas in business and industry only. Established in 2010, the journal has published two volumes to date. This journal does not consider the issues discussed above relating to services that address the basic needs of developing countries.

3.3 Service Research in Finland

This sub-section explores the present and future of service research in Finland on the basis of public records and a semi-structured interview. Key research units and public research financiers are identified with their respective research interests. Conclusions are drawn about whether service research in Finland is on the right track compared to national and global trends and service research interests in the international arena.

3.3.1 Research Foci of Universities and Research Institutions in Finland

The main Finnish research institutions that have specified an interest in service research are presented in Figure 1.

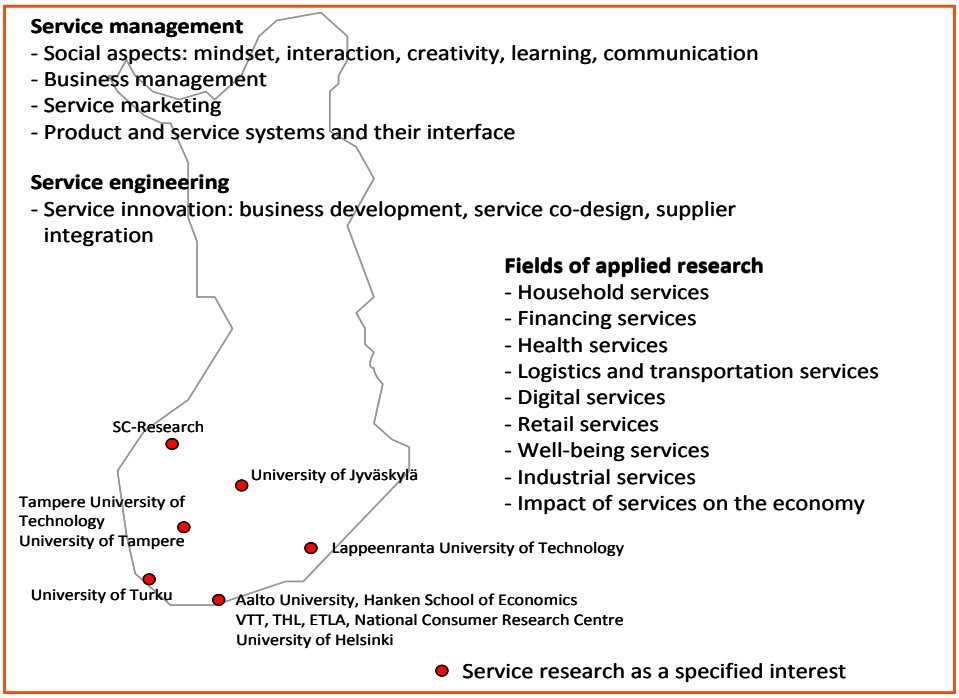


Fig. 1. Service research institutions and research foci in Finland, 2011.

The **National Consumer Research Centre** concentrates on investigating factors that affect consumer society [16]. Its research interests cover consumer-related issues in household services, service availability, financing services and health services. The **ETLA** Research Institute of the Finnish Economy is currently active in the SERVICEGAP research project, aiming to assess "The Impact of Service Sector Innovation and Internationalisation on Growth and Productivity", funded by the European

Commission 7th Framework Programme. ETLA focuses on international trade in services, foreign mergers and acquisitions in services, and their effects on the productivity of enterprises and employment in EU countries [17]. The **THL** National Institute for Health and Welfare, established the Health Services and Policy Research Group in 2007. THL focuses on the effectiveness of health services and the promotion of health policy and health services. Another THL research group focuses on service quality and performance for the elderly [18]. The **VTT** Technical Research Centre of Finland has included service science and business in their latest strategy for 2010-2014 [1]. The research interests cover strategic research, services and the built environment; context awareness and service interaction; risk and reliability management; organizations, networks and innovation systems; business and technology management; logistics and transport systems services; service science and service business; and service innovation.

The **Hanken School of Economics**, with Professor Christian Grönroos, has research interests in modern service marketing, service management (i.e. market-oriented management of services in service and manufacturing firms) and what is known as the Nordic school of marketing thought. The Helsinki Institute for Information Technology **HIIT** is a joint research institution of Aalto University and the University of Helsinki. One of HIIT's active programs focuses on enhancing Internet infrastructure in order to enable Internet-based services [19]. The **University of Jyväskylä**, with Professor Antti Hautamäki, shares a research interest in service innovation, user-centered innovation activities, innovation ecosystems and cognitive and social preconditions for innovation processes, such as creativity, learning and communication. The **Tampere University of Technology**, with Professor Miia Martinsuo, has research interests in the service business mindset; service business development in intelligent machines; industry networks; service business development in engineering SMEs; service business capabilities in technology-based firms; and supplier integration in product and service development projects. The **University of Tampere**, Tampere Business School, has a research unit, Synergos, that focuses on service management research. The **Lappeenranta University of Technology** has a research unit, SC-Research, operating in Lapua, that focuses on knowledge-intensive services, service innovations, the interface between technology and service activities and service activities in the manufacturing sector. **Aalto University** has recently restructured its service research activities on the basis of results from the Service Science Summit 2009 held by Aalto University together with IBM [20]. Its **Service Factory** has announced five topical areas of research: service co-design, digital service innovation, industrial services, future retail services and well-being services. In addition to the above, many other universities and research institutions perform applied research on services in case-by-case projects.

3.3.2 Funding of Service Research in Finland

Service research funding in Finland is mainly provided by three funding agencies: the Academy of Finland, Tekes and Sitra. Other sources of funding are the European Union and numerous private foundations and trusts, but their significance is rather minor compared to the three main funding agencies. Funding provided by the Academy of Finland is divided into programs and centers of excellence. Currently, none of these programs concentrate directly on service research. This means that, although services are necessarily present in many of these research areas, the focus of research is not on studying or developing services. Funding provided by Tekes is divided into programs and SHOKs. SHOKs are joint ventures founded by companies and universities that bring together the expertise of industry and academia in order to carry out research. Table 3 shows five ongoing service research programs and SHOKs and also two recently-completed programs funded by Tekes. These programs cover several hundred research projects in academic institutions, government institutions and companies. Funding provided by Sitra is also divided into programs. In two of these programs, the research is concentrated directly on service development, see Table 3.

Table 3. Publicly-funded service research programs in Finland [21], [22].

Organisation	Status	Program name
SITRA	Completed	Health Care Program 2004–2009
SITRA	Ongoing	Municipal Program
TEKES	Ongoing	Innovations in social and healthcare service systems 2008-2015
TEKES	Ongoing	SERVE – Pioneers of Service Business
TEKES	Ongoing	Services for free-time 2006-2012
TEKES	Completed	Infra – Construction and services 2001–2005
TEKES	Completed	Rembrand – Serving real estate business 1999–2003
SHOK		Health and welfare, SalWe Oy
SHOK		Information and communication business and services, TIVIT Oy

On the basis of these findings, Tekes and Sitra have already become well established in Finnish service research, with several ongoing or completed programs. This is in accordance with the main objectives of these organizations to promote welfare and sustainable development. An interesting finding is that, out of the three main funders, the Academy of Finland has no funding at all in projects related to service research.

3.3.3 Interview: a Viewpoint on the Current State of Service Research in Finland and Globally

D.Sc. Marja Toivonen is a research professor at the Technical Research Centre of Finland (VTT). She coordinates the service research at VTT, which involves altogether over one hundred service researchers. Earlier, she was the director of the Business Innovation Technology (BIT) research centre at Aalto University. Therefore, one can say that Prof. Toivonen is one of the leading professionals in service research and especially service innovation research in Finland. The interview with Prof. Toivonen sheds light on the focal areas of Finnish service research in the past, present and future.

According to Prof. Toivonen, service research started to develop as its own research field in 1970s. This was due to the shift in the Western countries from manufacturing-oriented economies to service-oriented economies. The first research topics studied were based on sociology and economic geography. In the 1980s, another interesting research school in service marketing started to develop. This school considers services as offerings and also focuses on the very recent concept of service-dominated logic from the services marketing perspective. The third major branch of service research is the service engineering school, which started in the 1990s, originating mainly in Germany. Services engineering emphasizes service development from the service-provider perspective. In addition to these three main branches, there are also some minor schools of thought, such as services operations management, which are part of a broader field of operations management. Nowadays, these different schools have converged to a considerable extent and now interact with one another.

According to Prof. Toivonen, Finland is, on the one hand, a leading country in many fields of service research globally, but on the other hand, it is among the latest-comers as a service country. Historically, this can be argued by the fact that Finland evolved from an agricultural economy to a manufacturing economy much later than the other Nordic countries, and in fact Finland started to become a manufacturing economy at the same time as it moved towards a service economy — a process that is still ongoing. Knowledge-intensive or expert services, such as marketing services or legal services, are especially scarce in Finland. However, this contradictory in view of the fact that Finland has well-developed mechanisms and policies for supporting service development. Finland has been very active in developing service policies and service research, participating in service policy development projects in the EU and OECD context, which has also been very research-oriented. Finnish research in the fields of services marketing and services innovation are especially well-known worldwide.

The main research interests of Prof. Toivonen concern combining user-based service innovation and employee-driven service innovation. Nowadays, service innovations are made too far away from the users and customers, and for this reason, organizational changes that give employees more power to influence service development

are needed. More specifically, this means that methods and practices for improving interaction between R&D departments and the people at the customer interface need to be developed and adopted in companies. Prof. Toivonen also hopes that there will be more education in Finland specializing in services. Some professional education already exists for companies, but it would also be important for academic and applied sciences universities to organize courses.

3.4 Proposal for a General Model of Service Research

Figure 2 represents our interpretation of the service research field. We propose that service research should mainly be focused on four sub–fields: management, engineering, business and macro-economics. Currently, research is unevenly divided over these four branches. For instance, service research in the management field has already been well-investigated, whereas in the engineering branch, it seems that a lot still remains to be done.

Management - Organization - Employees	**Engineering** - Service Providers
Business - Marketing - Customer involvement	**Macro-Economics** - Markets - Society

Fig. 2. Four main branches of service research.

Previous research has shown that service business sets different requirements for a firm's strategic and organizational processes than does product business. Service business also influences working culture and sets new requirements for personnel management. Intangibility and information-intensiveness are among the most important characteristics of services [23]. Managing and providing services requires a deep understanding of the customers' value chain and also continuous interaction with the customer. This kind of understanding and knowledge is gathered through experience, and as it often exists as tacit knowledge in the organization, it is therefore difficult to copy from one person to another. However, continuous training helps keep the personnel's skills up to date. Since the development and delivery of services requires the participation of well-educated and experienced specialists, a service organization can be called a specialist organization.

During the past decade, companies have realized the important role of services in their business development. Focusing on services rather than on products offers companies the biggest potential for growth in the future. Recently, firms have also realized that, in many cases, selling services is much more profitable and generates steadier revenue streams than selling products [24]. The role of the customer is very

important in the development of service concepts and service offerings. Several studies have shown that focusing on interactive buyer-seller relationships can develop transactional and basic component offerings into more complete offerings of integrated solutions [25].

Service engineering is a discipline that mostly involves service innovation, that is, innovation in service processes. Service innovation is often contrasted with "technological innovation". It is closely related to service design and new service development. Tekes has defined service innovation as follows:

"A service innovation is a new or significantly improved service concept that is put into practice. It may, for example, be a new customer interaction channel, a distribution system or a technological concept, or a combination of all these. A service innovation always includes replicable elements that can be identified and systematically reproduced in other cases or environments. The replicable element may be the service outcome or the service process as such, or a part of them. A service innovation benefits both the service producer and the customers, and it improves its developer's competitive edge."

A service innovation is a service product or service process that is based on a certain technology or systematic method. In services, however, innovativeness does not necessarily relate to the novelty of the technology itself, but often lies in non-technological areas. Service innovations may, for instance, be new solutions at the customer interface, new distribution methods, novel applications of technology in the service process, new forms of operation within the supply chain or new ways to organize and manage services.

Service research includes applied research in particular service sectors, for example, tourism, the public healthcare sector, social media, banking and financial institutions, etc. These can also be studied at the macro-economic level. Many international journals cover this field, placing a special emphasis on it. The Journal of Family Planning and Reproductive Healthcare, the International Journal of Healthcare, Finance and Economics, the Journal of Finance & Management, among others, have produced a considerable number of articles in their publications on macroeconomic issues.

4 Future Directions of Service Research

The trend towards better understanding of services has provided a number of interesting directions for future research. Each of the four main branches of service research has its own research agenda, which is further extended to other branches. Referring back to Prof. Toivonen's interview, the existing branches of service research have increasingly begun to exchange views in order to find common ground, to test theories from other perspectives and to discover new ideas. At the same time, Prof. Toivonen reminds us that, while the extant research branches are becoming more interactive, new research groups are emerging, making service research even more

diversified and multidisciplinary. This naturally sets challenges for the categorization of future research directions.

Nevertheless, attempts have recently been made to clarify future research directions. One of these was by Ostrom *et al.* [26], whose survey covered more than 200 academics and 95 business executives around the world. They came up with ten main research priorities and a few common overarching research themes. The first group of research priorities included topics related to strategy: fostering service infusion and growth, improving well-being through transformative services, and creating and maintaining a service culture. Transformative service research is defined here as service research that centers on creating uplifting changes and improvements in the well-being of individuals and communities, resulting in a better quality of life in present and future generations. The second group of research priorities relates to service development: stimulating service innovation, enhancing service design, and optimizing service networks and value chains. The third group of research priorities relates to service execution: effectively branding and selling services, enhancing the service experience through co-creation, and measuring and optimizing the value of services. Finally, Ostrom *et al.* [26] cite as their tenth research priority the leveraging of technology to advance service. Overarching themes of the above research priorities include global and local trends and technological developments that act as drivers for change in services. Another overarching theme was found in focusing research on business-to-business contexts. The above research priorities can be placed schematically in the main branches of service research, as presented in Figure 3.

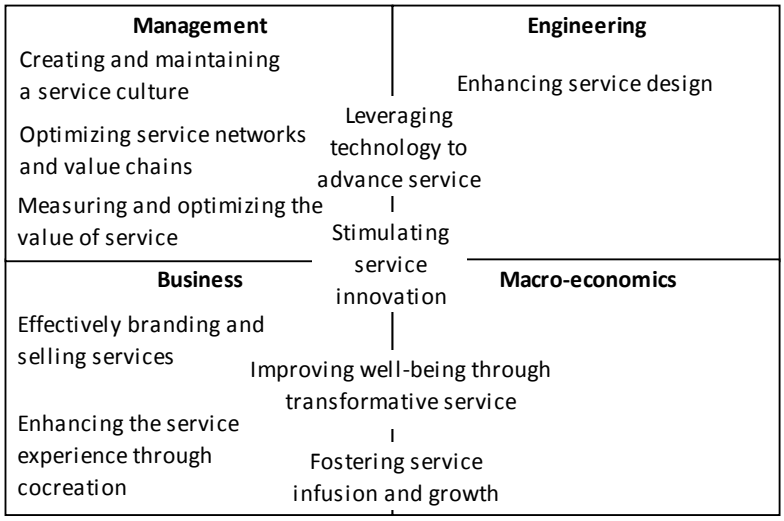


Fig. 3. Research priorities in service research adapted from Ostrom et al. [26].

The research priorities identified by Ostrom *et al.* [26] were based on the use of one method and a limited scope of interviewees. For example, there was limited involvement of leaders from the public sector. Consequently, the detailed contents

of and criteria for each research priority can only be understood by reading their full paper. Furthermore, the identification of research priorities does not facilitate the understanding of the relative significance of each priority. Hence, there is a need to continue to explore service research priorities using a variety of different research methods and to expand the scope and level of detail of these studies.

4.1 Trends in Service Science Searches

The aim of this section is to find service research trends in the public sector and in academia, as well as to discover which topics or definitions are more commonly used. To find the service research topics of interest to the public, we used the *Google Trends* application. Four terms for comparison were examined: service science, service engineering, service business and service management. *Google Trends* analyzes a portion of Google web searches in order to compute how many searches have been carried out for the entered terms relative to the total number of searches made on Google over time. The results are shown in Figure 4: the upper graph shows how many times the phrase appeared in Google search field and the lower one shows how many times the phrase appeared in the news. The bars at the top of the figure show the average relative search volume for each term. It can be noticed from the graph that public interest in service science terms is gradually decreasing. This can partly be explained by the fact that the Internet is increasingly used for leisure, so that the science-related search volume is steadily decreasing. Deep dips in the curves during the Christmas holiday season only substantiates this. On the other hand, Google news shows increased interest in all service science terms, starting from 2008. The most common service science terms appearing in Google search were "service business" and "service management", whereas "service engineering" and "service science" were seven times less frequent.

Fig. 4. Public interest trends in service science search terms (from Google trends).

The academic interest trend was analyzed using the appearance of the same four terms in the scientific literature – articles found by *Google scholar* in the fields of business, economics, social sciences and the humanities. Figure 5 shows search hits for each of the terms for the period between 2000 and 2010. Service science search terms

in academic journals revealed a steady increase in all categories, which is contrary to the public interest trend. This means that more and more scientific papers devoted to service science topics are written each year. Unlike the public trends search, the academic search shows more interest in service management compared to business, and more interest in service science compared to engineering.

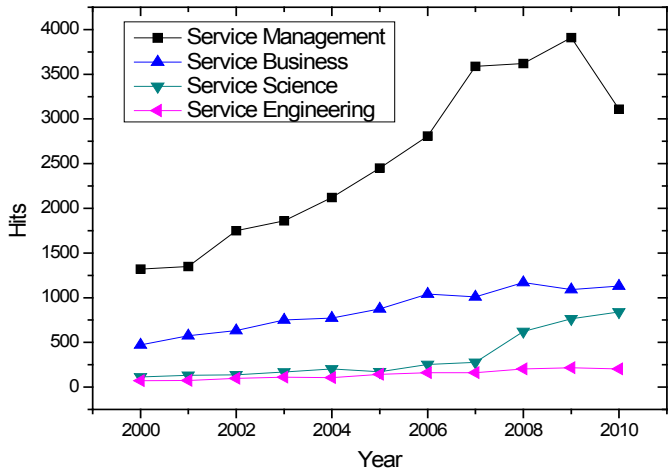


Fig. 5. Academic interest trends in service science search terms (from Google scholar).

5 Conclusions

Our paper indicates that service research provides fertile ground for researchers in various disciplines. Service research can definitely not be called a science in its own right, but rather a joint field of research interest. Service research aims to understand how services, from the level of individuals to the level of economies, affect our society and behavior, and how services should be designed, promoted and executed in order to add value in different parts of the value chain and from the perspective of different stakeholders. Consequently, there is a variety of interesting branches of research and future research directions.

Today, service research is divided into two main categories in the international academic journals. Generic service research journals focus on management, strategy and the quality of services, while application journals cover service research in their own application areas, such as financing or health care, and these journals are more focused on service modeling, development and operations. Categorization in academic journals supports the findings from other data sources and also our own interpretation of service research branches today.

Of the three main public research financiers in Finland, Sitra and Tekes support

service research substantially. They have several ongoing research programs and at least as many programs that have been completed in recent years. This suggests that the significance of service research has been noticed in Finland, and that the relevant support systems are well developed and established. According to the interview with Prof. Toivonen, Tekes is also acknowledged outside Finland as a very active promoter of service innovations research and policies, supporting the perception of Finland as a leader in particular areas of service research.

When compared to the overall picture of service research, it is realistic to expect that all research priorities cannot be covered at the highest level in Finland. While some generic topics may remain a specialty of Finnish researchers, applied service research should focus on topics that are important to the local economy, such as clean tech, forest cluster, basic metals and mining industries, knowledge-intensive b-to-b services, consumer services (e.g. tourist industries), the public sector and ICT. Research in the public sector and in domestic industries is based on an understanding of Finnish society, while research on export industries should focus on understanding the characteristics of the main market regions.

Today, investments in service sectors primarily target richer market segments. Developed and developing countries are vastly different from each other in terms of service necessities. In developed countries, improved satisfaction/luxury is the trend in service innovation, whereas in developing countries, fulfilling the basic needs is still the key objective. Lack of funding may be the main cause for the lack of service research in developing countries, as corporate businesses are only interested in funding service research that has potential marketing benefits for their business.

Future research on services is based on the four extant branches of research, i.e., service engineering, management and business and macro-economic studies, with a variety of applied research fields. Research priorities in each field are influenced by technological development and societal change. Especially the latter factor is very important for the future, considering that sustainable development should be an overarching global objective. It is necessary to understand the role of services in this transformation. Independent academic research is in this respect very important to ensure that all the relevant research fields receive enough attention.

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2.2 Attackers' Advantage: Introducing Discontinuous Service Innovations to the Market

Pia Ojanen[1], Tatu Lyytinen[2], Andrea Buda[3], Zagros Hatami[4], Anna Korolyuk[5], Henri Tokola[6], tutor Kai Kuikkaniemi[7]

[1]Aalto University School of Science, Department of Media Technology, PO Box 15400, FI-00076 Aalto, Finland

[2] Aalto University School of Economics, Department of Information and Service Economy, PO Box 21220, FI-00076 Aalto, Finland

[3] Aalto University School of Engineering, Department of Engineering Design and Production, PO Box 14100, FI-00076 Aalto, Finland

[4] Aalto University School of Art and Design, Department of Design, PO Box 31000, FI-00076 Aalto, Finland

[5] Aalto University School of Science, Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[6] Aalto University School of Engineering, Department of Engineering Design and Production, PO Box 14200, FI-00076 Aalto, Finland

[7] Helsinki Institute of Information Technology HIIT, PO Box 19215, FI-00076 Aalto, Finland

{Pia.Ojanen, Tatu.Lyytinen, Andrea.Buda, Zagros.Hatami, Anna.Korolyuk, Henri.Tokola@aalto.fi, kai.kuikkaniemi@hiit.fi

Abstract

We contribute to the discussion of discontinuous service innovation from a multidisciplinary perspective. How can a company or a start-up attack the market in order to become a dominant player? First, we provide a taxonomy of innovation, clarifying what we mean by continuous and discontinuous innovation. Second, we combine

the innovation discussion of goods-dominant logic with service-dominant logic, focusing on innovation in use. Third, we build a research framework using technology, a business model and design perspectives, combining them with service and market readiness perspectives. Then, we analyze an Aalto Venture Garage start-up, Tribe Studios, and their gaming concept, Stagecraft, using the extensive case methodology. We argue that all perspectives – technology, business and design – are equally important in the paradigm shift from a goods-dominant to a service-dominant logic. Attackers can challenge the market by inventing radically new technologies, business models or designs that generate seamless and balanced experiences that customers will value and reward.

Keywords: Service Innovation, Discontinuous Innovation, Service-dominant logic

1 Introduction

In recent years, there has been a paradigm shift from goods orientation to service orientation. Today, most developed economies are already service-led economies. For example, the service sector in the US accounts for over 80% of American economic output [1]. At the same time, large organizations see the development of their service business as essential for their future success. Chesbrough (2011) argues that service-oriented thinking provides an avenue for escaping the commodity trap [2]. As the knowledge and expertise related to manufacturing and business processes are widely distributed, it has become difficult for companies to differentiate their products and sustain such differentiation over time. This pressure is a result of the increased competition caused by the emergence of new players from emerging economies that have benefited from the narrowing of the knowledge gap.

Even if service innovation has been widely discussed in recent history, this complex phenomenon is confusing for many and different disciplines approach it in quite different ways. Different ways of looking at service innovations have emerged based on various technology, business and design perspectives (Figure 1). Currently, there is no existing literature that connects these different perspectives.

Fig. 1. Technology, business and design perspectives have a very different understanding of what Service Innovation means.

Traditionally, innovation has been discussed mainly from a technological perspective. The purpose of this study is to combine two streams in literature focusing on technological innovations [3] and service innovations [4] to understand what will drive future innovations. Our focus especially is on discontinuous service innovations, which completely change the market game and create new commercial opportunities. The research question is as follows: How is service-dominant logic changing the innovation discussion?

We analyze technology, business and design perspectives to forecast future innovations that might change the value configuration, value creation, value capturing, value exchange and value in use. From the technology perspective, we analyze how technological development with value configuration can enable the development of new services. Second, we open up a discussion on business models: business model development can enable new ways of creating and capturing value, meaning how companies make money. Third, we discuss design perspective and how it increases our understanding of the user. Fourth, we define service-dominant logic primarily as a customer-oriented logic, which is defined in service design as an approach to creating new ways of exchanging value and understanding value in use. Finally, we deepen our understanding of a market perspective of the service economy.

In order to re-conceptualize the research framework, we analyze Tribe Studios, a start-up aiming to challenge the current ways of gaming. By analyzing this case, we aim to understand how service-dominant thinking enables the development of new innovative services that challenge the current market balance. ICT also enables an almost infinite scalability of the services compared to services based on physical human interaction, which will scale only by increasing the amount of people. In this research

project, we focus on business-to-customer services. However, we acknowledge that the value of ICT-enabled services is equally important in business-to-business cases.

The case study is analyzed from three perspectives: technology, business and design. We argue that each of these perspectives is equally important, while still emphasizing the importance of service-dominant logic as a new way of thinking. Attackers can challenge the current market players by inventing radically new technologies, business models or designs which create market innovations that generate the experiences that customers will value and reward.

1.1 Literature Review

In this section we review the literature on innovation studies. Many of these studies have been based on product-dominant logic. Service science introduces a paradigm shift for traditional innovation studies. The purpose of this study is to combine two streams of literature focusing on technological innovations [3] and service innovations [4].

Traditionally, commercial innovations have been controlled with two distinct forces: the market, and technological and scientific development [5]. Market forces produce continuous changes in commercial opportunities. Market forces are briefly discussed in this study in the market section. Developments in technology and science enable the creation of new products, improve the performance of the existing ones and enable the production of products with lower cost. Innovation has traditionally been discussed from the technological perspective and technologies have been seen as the sources of change in markets.

Often, innovations are continuous, incremental improvements to existing products or services. In contrast, discontinuous innovation is something totally new and game changing. It results in drastic changes throughout the entire market. Discontinuous innovation can be divided into two categories: radical and disruptive (Figure 2).

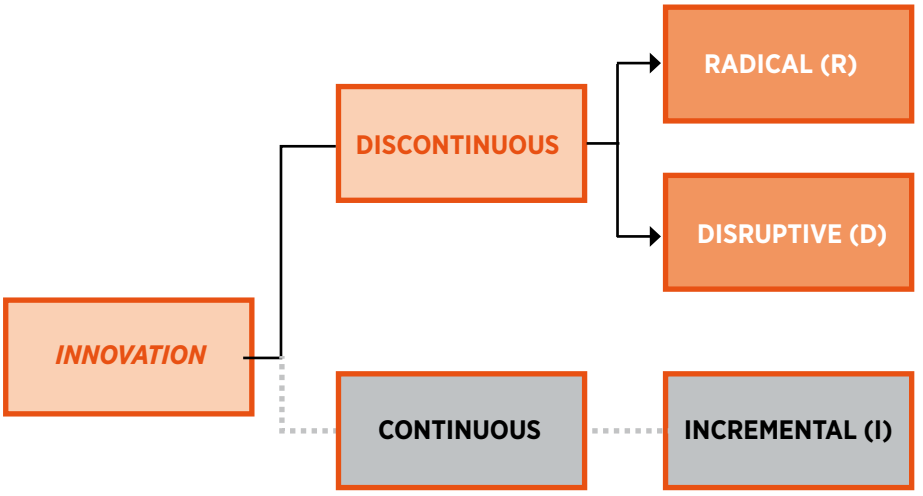

Fig. 2. Innovation Taxonomy

Changes in markets, caused by discontinuous innovations, have been discussed using disruptive and radical innovation concepts [3, 6]. Traditionally, innovation is defined as disruptive when a new technology surpasses seemingly superior technologies already on the market. Radical innovation, in contrast, has been defined as a new technology that creates new-to-the-world products. Because radical innovations are new both from the perspectives of producers and consumers, these innovations are rarely driven by demand. For example, in the past the transmission of speech through landlines was a radically new-to-the-world product, which created a completely new task for customers by enabling discussion between distant locations. More recently, mobile phones, which have made wireless communication possible, have been a disruptive innovation compared to fixed landline phones. The mobile phone industry was disruptive from the manufacturers' point of view as well, because it almost completely destroyed the landline business. Adding the camera function to mobile phones is seen as an incremental innovation which has improved the existing product compared to earlier mobile phones without cameras.

Recently, scholars have begun focusing on service-dominant innovations [4, 7]. As argued by Michel et al. (2008), most innovation-theory literature presents a short-sighted view of innovation due to the fact that the studies approach value creation from the perspective of goods-dominant logic instead of service-dominant logic [7]. Service-dominant logic has created a paradigm shift towards service science [8, Chapter 2.1].

Before providing an overview of the suggested shortcomings of this paradigm shift, it is important to briefly review the main differences between the goods- and service-dominant logic perspectives. As pointed out by Vargo et al., goods-dominant logic views the firm as the creator of value [9]. Based on goods-dominant logic, the exchange of goods and money convey the value created by the firm in the market place [8]. Here, the consumer and the firm play distinct roles, with the firm being responsible for value creation through a series of activities that it performs. Service-dominant logic, however, views both the firm and the consumer as the co-creators of value [4]. In this view, all exchanges are based on service and value is always co-created, jointly and reciprocally, in interactions among providers and beneficiaries through the integration of resources and the application of competences [4]. Unlike the perspective offered by goods-dominant logic, in service-dominant logic the consumer and the firm do not play distinct roles. Here, the firm acts as the intermediary in the process of value co-creation, as value is ultimately derived and determined by the consumer.

Michel et al. (2008), in their study of discontinuous innovations, point out three principal shortcomings with innovation literature: first, instead of focusing on service offerings, the studies have a product-centric focus; second, instead of considering the perspective of the end-user, the studies focus on the firm-level effects; finally, the studies fail to have a customer-oriented perspective that can highlight the importance of the application of operant resources, such as knowledge and skills in the value co-creation process [7].

To overcome such shortcomings, Michel et al. (2008) define discontinuous innovations based on both value-in-use and value-in-exchange criterion:

> *An innovation is discontinuous if it (1) significantly changes how customers co-create value (value-in-use criterion) and (2) significantly affects market size, prices, revenues, or market shares (value-in-exchange criterion).* [7]

Further, they argue that changes made to the way the firm and the customers engage in value co-creation can be responsible for discontinuous innovations. This is done namely by exchanging the user roles as users, buyers and payers for the offerings and changes to the value creation by the firm via embedding operand resources into objects, changing the integrators of resources, and reconfiguring the value constellations that result in discontinuous innovations.

Chesbourgh (2011) states that companies attacking markets within a service economy need to adopt a completely new mindset [2]. In order to compete, attackers need to approach technology, business and design from a service-oriented perspective. The key element is no longer a new product, but the usage of the service. This means that more innovations pertaining to usage aspects of the services are needed. In a service economy, there is definitely space for discontinuous innovations. Following the innovation taxonomy defined above, radical service innovation refers to new service designs that create new tasks for people which did not exist before. Disruptive innovation, in contrast, changes significantly the way people execute an existing task and replaces the current way of completing the task.

2 Research Framework

Innovations can be approached from different perspectives. Innovation can be an advance in technological development. It can be a new way of doing business, resulting in a new business model. Design of a service or a product can be innovative. New ways of offering a service to customers can be innovative. In addition to creating a breakthrough service or product, an innovation has to be introduced when the market is ready for it. Finally, if all the pieces of the puzzle fit, the change will have an impact on how people complete a particular task that the service or the product is designed for.

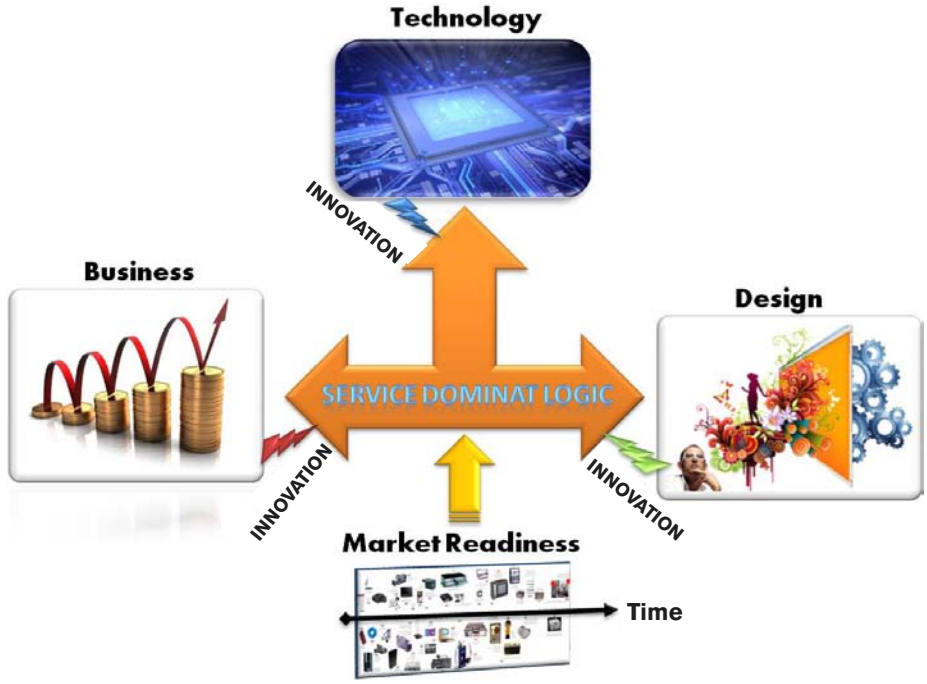

Fig. 3. Research Framework

2.1 Technological Perspective

Technological innovation can be examined from two perspectives: core technology innovation and architectural innovation [10]. Core technological innovation involves either improving an existing component or a totally new component which has been created from scratch, whereas an architectural innovation involves reconfiguring an established system by combining existing components (core technologies) in a new way. This does not necessarily mean that the components themselves are untouched by architectural innovation. Architectural innovation is often triggered by a change in a component, perhaps the size or some other subsidiary parameter of its design, which creates new interactions and new linkages with other components in the established product. The important point is that the core design concept behind each component, and the associated scientific and engineering knowledge, remain the same.

Technological innovations have been discussed using incremental, radical and disruptive concepts [3, 6, 10]. In this research project, we follow the taxonomy defined earlier in the study (Figure 2). Continuous innovations introduce incremental improvements to existing products. Normally, established companies introduce continuous innovations to reinforce their market dominance. On the contrary, discontinuous innovations are based on implementing something totally new based on the latest engineering or scientific discoveries.

Figure 4 presents an example of discontinuous technological innovation. Technological innovations in digital image processing disrupted mechanical photography. Image-capturing sensors and digital memories replaced traditional film, creating new value configurations that replaced the existing technologies.

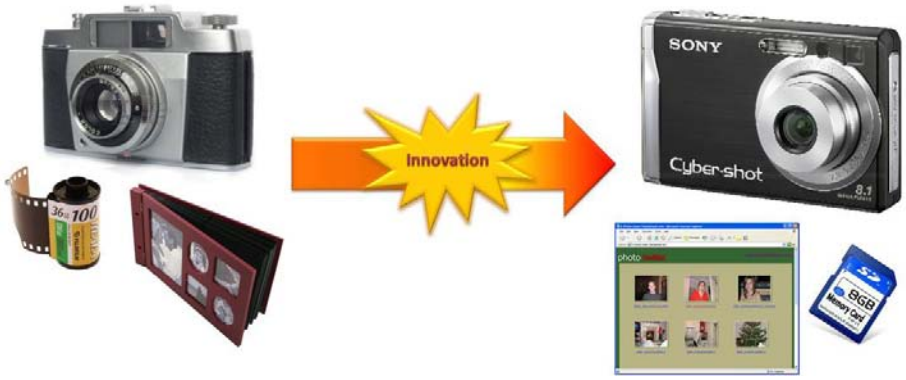

Fig. 4. Example of discontinuous technological innovation: digital image processing disrupted mechanical photography.

From the customer perspective, many products based on technological innovation are improved copies of existing products. It takes much effort until the effects of the technological innovation are mature enough to result in radical or disruptive innovations. Typically, new technological innovations require lots of research and development.

2.2 Business Model Perspective

Business model innovation is the discovery of a fundamentally different business model within an existing business [11]. A business model is defined as follows:

> *A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.* [12]

Business model innovation differs from technological innovation by simply redefining what an existing product or a service is and how it is provided to the customer. This means that business model innovation does not replace existing technologies, products or services; rather, it redefines how the value is captured. A business model

can be considered innovative when it significantly affects the revenue model, organizational structure and the value chain. Continuous business model innovations aim to improve an existing business, for example by lowering the price of an offer. Discontinuous business model innovations create new ways of capturing value by reconfiguring the organization culture, value chain and revenue model.

Figure 5 shows an example of discontinuous business model innovation: the creation of the iTunes online store, where you can buy albums and single songs in digital format, has disrupted the traditional CD-based model. This model changed the way that value is captured within the music business.

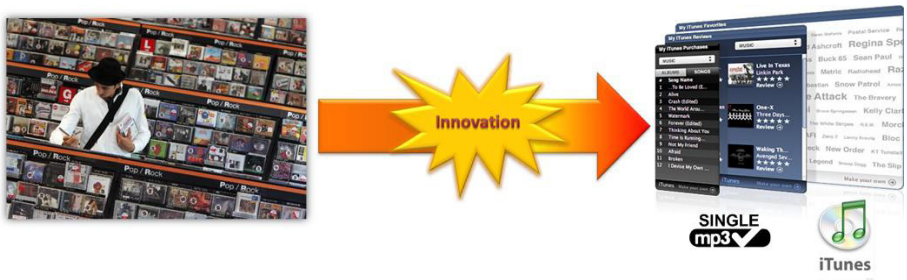

Fig. 5. Creation of the iTunes online music store and the selling of individual songs have disrupted the traditional CD-based model for how to capture value in the music business.

2.3 Design Perspective

Design can be viewed as a multifunctional activity that acts as a "knowledge agent" for fostering innovation: it acts both as a knowledge integrator, promoting the flow of knowledge from the inside to the outside of a company, and a knowledge broker, promoting the reverse flow of information from the outside to the inside of the company [13]. In this way, it has been suggested that design provides a process for negotiating solutions between the company and the user.

Design research is an evolving field and there are several schools of thought when it comes to the approach taken and methodology used for gaining the insight and knowledge needed for innovation [14, 15]. According to Sanders, design research can be, on the one hand, design-led or research-led and, on the other hand, have either a more expert mindset, by viewing users as reactive informers and the subject of study, or a participatory mindset, by viewing users as active co-creators and partners. As a result of these approaches, Sandersa and Stappers argue that design practice is also evolving towards an increased level of user involvement, changing the role of users from mere subjects of study and sources of inspiration to co-designers [15].

In attempt to understand the role of design in the creation of innovative solutions, two perspectives are worth mentioning. Based on Klaus Krippendorff's definition of design as making sense of things, Verganti proposes the concept of design-driven in-

novation as the significant change in the emotional and symbolic content of products through a deep understanding of broader changes in society, culture, and technology [16, 17]. In Verganti's view, such innovations to the meanings and languages of product cannot result from mere user-centred investigations. Instead, design-driven innovations are pushed by a firm's vision. According to Verganti, a firm improves its ability to understand, anticipate and influence the emergence of new product meanings by relying on external interpreters (e.g., architects, artists, firms in other industries, schools, the media) that share the same problem: understanding the evolution of socio-cultural models and proposing new visions and meanings for products. Therefore, to manage such innovations, he highlights the importance of managing the interactions with such interpreters in order to access, share and internalize knowledge about product languages and influence shifts in socio-cultural models.

In the other perspective, the role of design thinking in tackling challenges that involve more complex systems and processes is highlighted [18, 19, 20]. Here, design thinking is linked to the creation of innovative processes, solutions and even new ways of communicating and collaborating. Design thinking integrates both intuitive and analytical thinking, enabling the recognition of patterns and the construction of ideas that are rich with emotional meaning while at the same time being functional [18]; therefore, as pointed out by Brown and Wyatt, design thinking not only focuses on creating of human-centred solutions, but it is very human as well. Various design tools and methodologies are employed to gain user insight and empathy so that the design process is informed and inspired. As Fulton Suri explains, for radical innovation both evidence and intuition are needed: evidence in order to become informed and intuition in order to inspire designers in imagining and creating new and better possibilities [21].

When comparing the above-mentioned perspectives, Verganti's design-driven innovation and a firm's role in pushing new product (or service) meanings and language to the market may appear at odds with Brown's notion of human-centred design thinking. However, Brown is referring to a different type of human-centred approach than the traditional user-centred approach rejected by Verganti. According to Brown and Wyatt:

> *Once the brief has been constructed, it is time for the design team to discover what people's needs are. Traditional ways of doing this, such as focus groups and surveys, rarely yield important insights. In most cases, these techniques simply ask people what they want. Conventional research can be useful in pointing toward incremental improvements, but those don't usually lead to the type of breakthroughs that leave us scratching our heads and wondering why nobody ever thought of that before. […] Although people often can't tell us what their needs are, their actual behaviors can provide us with invaluable clues about their range of unmet needs. [18]*

As seen here, Brown's approach of gaining insight about user life, experience and behaviour through observations and immersion in the world of users is very much

in line with Verganti's proposal to understand the evolution of socio-cultural models with the help of various stakeholders or external interpreters. While Brown's model highlights the spaces of innovation where design thinking can be applied, it does not provide a clear measure for assessing the innovation type. Therefore, to assess whether an innovation is discontinuous, we combine Verganti's design-driven innovation criterion of radical changes in the meaning and language of a product or service, which radically change the socio-cultural models of use, with Michel et al.'s criterion of significant changes in the role played by users – as users, payers and buyers in the co-creation of value for a particular product or service that is offered [7].

Figure 6 shows an example of a discontinuous design innovation: Nintendo changed gaming with the introduction of the WiiMote controller as a replacement for traditional joysticks. The engaging and active gaming experience offered by Wii dramatically changed the language of interaction and the meaning of gaming. It dramatically changed the role of the user by changing the way they play virtual games and interact with the game characters and other players.

Fig. 6. Nintendo introduced a discontinuous design innovation in the gaming industry: WiiMote as a replacement for traditional joysticks.

2.4 Service Perspective

The service perspective changes the innovation discussion by offering new possibilities that change the user role as payer, user and buyer and reconfigure the value constellation. Service innovation is considered to be discontinuous when:

(1) it creates new tasks which did not exist before
(2) it changes the way people do the existing task

The paradigm shift towards service orientation means that in order to have a high impact on future innovations, the emphasis will be on addressing user needs. Technology, business and design need to work together, creating a seamless experience. Discontinuous service innovation is the process of devising a new or improved service concept that satisfies the customer's unmet needs. Radical service innovations create

solutions to problems and needs by creating new tasks that do not necessarily even exist today. Disruptive innovation, in contrast, significantly changes the way people execute the existing task and replaces the current way of completing the task.

Outcome-driven innovation means that value can be defined from a customer perspective in a manner that can guide not only improvements to current services, but also the creation of an entirely new task or job [22]. The desired outcome of the service is to help customers accomplish a particular task. The customer suffers from a symbolic pain that needs to be removed with the help of the new service. Radical and disruptive service innovation completely changes the way people behave while performing a particular task. Therefore, according to Bettencourt, the focus should be on the task and not on the solution itself [22]. A proper understanding of customer needs enables one to understand the value in advance. Opportunities for new service innovation can be identified through careful analysis of the tasks. Identifying the core task of the customer is not always trivial. The service provider also needs to understand who the customer actually is.

2.5 Market Readiness Perspective

Market readiness is a crucial factor for the success of any new service. While market readiness analysis can be arbitrarily complicated, the concept itself is fairly simple: there must be enough customers who are ready to pay for the innovation offered. There is no single lucky moment when the new service or product will be released onto the market and automatically experience a great success. The innovation spreads gradually. In this chapter we discuss market readiness from the perspectives of timing, innovation adaption, communication channels and innovation diffusion.

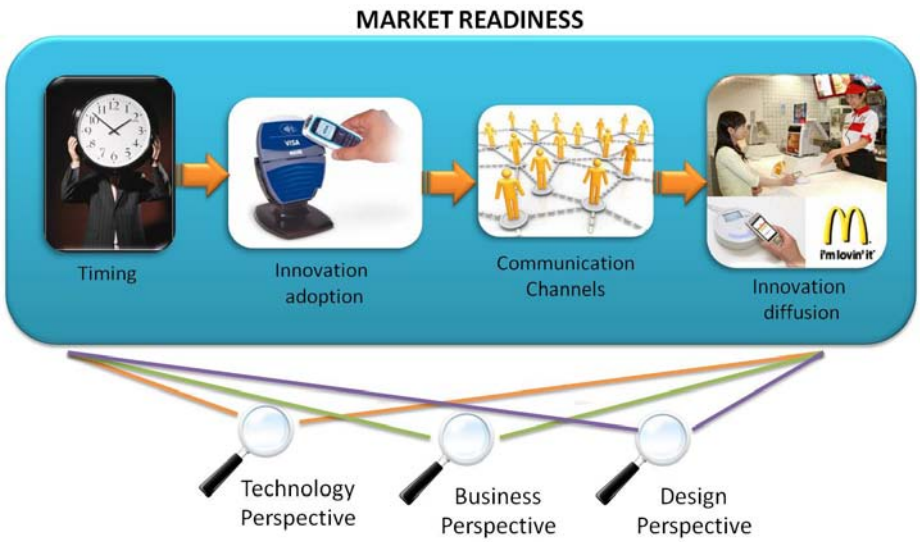

Fig. 7. Market readiness framework

Timing to market is balancing the risks of premature entry (entry too early) and the problems of missed opportunities (entry too late) [23]. Market forces such as political, economic, social and technological developments, as well as legal developments, influence what would be the best time to enter the market. A potential pioneer in this study, referred to as an attacker, must balance the opportunities and benefits of innovation with the risks and costs related to product or service development and marketing. On the other hand, a potential follower needs to consider the marketing activities of the early entrants and possible competition by potential entrants. However, as argued earlier, the most important aspect is to understand the needs of the customer. The invention can be incredibly smart, the idea can be awesomely brilliant, the costs can be much cheaper - but if the place and time are wrong, the customers will not adopt the service.

Innovation adaptation is a process which emerges when a potential customer has discovered a particular innovation. First, discovery of the existence of the innovation happens in a random way. Second, if the person is interested, more knowledge is sought. Third, the customer weighs the relative advantages against existing ones and evaluates how the innovation fits into an individual's life. Fourth, use of the service defines customer satisfaction. Fifth, a decision is made for continuous usage.

The research shows that the first people who try a new service possess the following qualities: they are risk takers, young, have a good financial situation and are very social [24]. Such people are called lead users. Lead users can also be people who have high visibility and social status in society. After these opinion leaders have confirmed that the service is worth its price, they recommend it via their broad social channels. This process is called diffusion of innovation (Figure 9). Such people are especially important at the early stages, when a particular service only has a few established clients. Thus, the acceptance of a service by clients at the early stage is dependent more on social contacts than on rational choice.

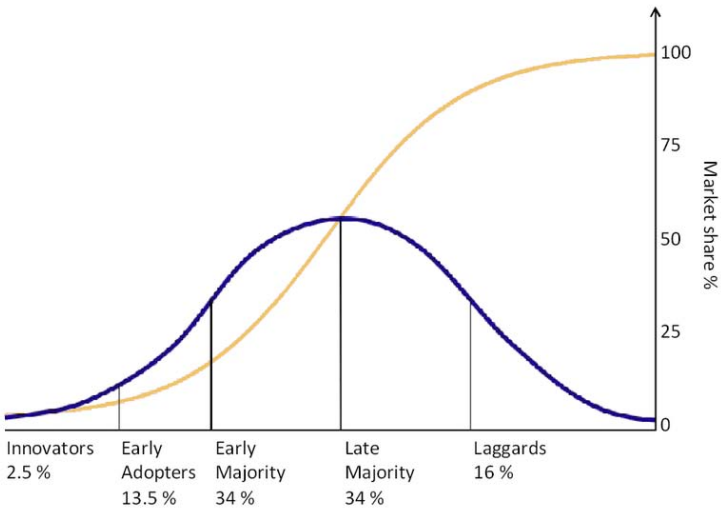

Fig. 8. Diffusion of innovations [25]

Rogers mentions observability as one of the factors influencing the diffusion of innovation. Here we discuss observability from a network theory perspective to understand how the diffusion of innovation is spread through communication channels [25].

Network theory is one attempt to use mathematical formalism for finding patterns in human behaviour, including market behaviour. The surprising news is that these patterns exist. A network is a system that includes nodes and links between the nodes. Each node is connected to one or more nodes. Facebook is a network: personal profile pages are nodes and friendship relations are links. The scientific community is a network: the scientist is a node, linked to colleagues via joint publications. In the mobile network nodes are mobile numbers and links are the phone calls. Furthermore, applications of this theory exist in such fields as biophysics, economics, computer science and DNA studies. The main result of the network research is that, although any network node behaves independently, the network as a whole follows some universal patterns. Pareto's Law, states that that, for many events, roughly 80% of the effects or consequences come from 20% of the causes. Such events are the result of the power law distribution within real-world networks, meaning that 20% of the users for the most part cause the remaining 80% of innovation diffusion to be adopted.

Many innovations in modern ICT enterprises have their foundations in network theory. The famous peer-to-peer protocol of Skype creates networks of users as nodes and calls between the users as links. The relevance algorithm of Google Search is directly based on the existence of hyperlinks between the web pages. Nowadays, the innovation is often not merely a new product. The value is added by creating the infrastructure or the network. Twitter or Facebook are not important because of the personal profile pages they offer, but because these services facilitate communication between millions of people. Thus, viewing service innovation and creation from the perspective of network theory can prove to be extremely useful.

3 *Case Study*

We use the extended case methodology to map the theoretical framework and draw some conclusions based on real evidence [25]. With this case methodology, we make use of empirical data gathered about an actual case to re-conceptualize or extend existing theories. The researcher examines the literature relevant to the problem area, and employs the empirical data to fill in the gaps, reveal flaws, elaborate on their meaning and extend coverage. The extended case method approach goes through many cycles of confrontation between the data and the theory, directing the analyst to additional data and drawing on additional concepts and theories.

In this study we integrated the service-dominant logic approach with a current innovation discussion. We do not intend to create new innovation theories as such, but rather to complement the current discussion with service-dominant logic, thereby

clarifying the terminology used and helping to create a more collaborative approach to unite the disciplines and find the essence of what makes a service innovation successful. We selected a start-up called Tribe Studios[1] and their gaming concept Stagecraft[2] for deeper evaluation, as start-ups are often the source of radical and disruptive innovations [12, 26]. The analysis is based on an interview with the CEO, Elina Arponen, conducted by one of the researchers. The original interview was in Finnish and the material has been translated into English.

During the research process, we familiarized ourselves with the emerging start-up community at Aalto University to select the most interesting start-up for deeper analysis. We initially considered 12 start-ups from the Aalto Entrepreneurship Society[3] and Aalto Venture Garage[4] and ultimately decided to study the Stagecraft gaming concept since it showed the most interesting characteristics reflecting our theoretical discussion. We will analyze the case from a technological perspective, a business-model perspective and a service-design perspective, as well as a market readiness perspective, in order to assess its potential for radical and disruptive changes in the market and even in society. In the theoretical part of the study, we tried to understand the innovation from an ex-post perspective, meaning that we analyzed historical cases from the past to the present. As in the case study part of the study, we make some ex-ante conclusion to predict the future use of our theoretical framework.

3.1 Tribe Studios

Stagecraft is a novel gaming concept (Figure 9), also referred to as social movies, which provides complete games to be enjoyed in a single evening. For simplicity, Stagecraft is referred to as a game in this text. The game provides short multi-player stories where players become actors and co-create unique experiences through their own involvement and decisions. Every player will act out an assigned role with some forced actions and motivations. The value for the user is co-created during the interactive experience with a group of people. Each game is a unique social drama within a particular time-span, mimicking the social events of real life with no winners or losers. The founding team consists of six experienced professionals from the gaming business with a total of 48 years of previous experience in the field. Next, we analyze the Stagecraft concept from the perspectives of technology, business and design while focusing on service-dominant logic. Finally, we discuss the market potential and readiness of the concept.

Technology perspective Customers can download and install the game client on their personal computer for free. However, the game cannot be played merely with

1 Tribe Studios: http://www.tribestudios.com/
2 Stagecraft: http://www.stagecraftgames.com/
3 Aalto Entrepreneurship Society: http://www.aaltoes.com/
4 Aalto Venture Garage: http://www.aaltovg.com/

Fig. 9. Tribe Studios aims to challenge the traditional first-person shooter games and simpler social Facebook games by creating a new genre of social movies.

the client. Server-side functionality is used to control the game and social interactions between players. An online store is the front-end for selling tickets to the games and matching the players algorithmically; this is done to enable better social experiences for people who are not playing with friends. These architectural components are combined in a new way compared to traditional online gaming, such as first-person shooter games.

The architecture and modularity of the story engine is unique. The technological innovation is the way the engine can be utilized to build the stories. It is the most treasured secret of the company. One founder had parts of the engine already implemented before the company was founded. On the other hand, the physics engine and graphics engine are existing products. According to CEO Elina Arponen:

> *Building a physics and graphics engines from scratch would be like re-inventing the wheel.*

All of these components are composed together, to create a seamless and realistic experience for the customers with this unique platform.

Business perspective Stagecraft sells a short and a high-quality premium experience, which separates the earning logic radically from the currently popular freemium model. According CEO Elina Arponen:

> *In the freemium model gaming companies provide anything they come up with, often relying more on volume than quality. Eventually, a small percentage of gamers will pay something. Many companies applying the model do not analyze whether it is best suited for their concept or not.*

Stagecraft provides three different revenue models. Customers can buy tickets for single games in a similar manner as they do movie tickets. One ticket is valid for

one game at a particular scheduled time. It is possible to buy tickets in three separate ways. First, it is possible to purchase an individual ticket for a specific game and play with other people who happened to buy the same ticket. The second option is to buy an entire show and invite friends to play together. It is cheaper to buy one game than individual tickets for all players. It also speeds up the diffusion of innovation when old customers can invite friends to join them and, thereby, become familiar with the concept. It is especially beneficial to market this option to opinion leaders, who have high social capital and great influence with others. Third, active users can pay a monthly fee to become a member in order to get access to the game and additional benefits. However, even members cannot have unlimited access; but they will get discounts.

The company is concentrating on the business and on core components such as the story engine. The company is highly dependent upon its value-chain. Some parts of the development have been outsourced, even if they could have been implemented internally as well. In particular, graphical assets such as 3D modelling of the characters have been outsourced to China. Chinese animators were found from a game connection speed-dating event. The quality of work is high and prices are very competitive. Web programming has been outsourced to experts as well. So far, everyone has enjoyed working with Stagecraft because the spirit is good and the job is interesting and different compared to conventional projects such as modelling 3D-soldiers for first-person shooter games.

Currently, Tribe Studios is looking for key partners for Stagecraft who would hold the Intellectual Property (IP) for compelling stories, which can be transformed to interactive gaming experiences. The best possible outcome would be a contract with an existing well-established brand (i.e., a movie, television show or book), such as "Sex and the City" or "Desperate Housewives". These well-known brands are probably not the first brands that come to mind within the context of online gaming. However, the game engine of Stagecraft is designed to turn the focus towards drama and social play instead of shooting and fighting. In such cases, the entire story could be designed by the IP holder, and Stagecraft facilities would be responsible for providing and hosting the service. The integration of established brands would accelerate the diffusion of innovation.

Inspiring organizational culture and fostering creativity are the focal point of the operation. Even the office space has been decorated with inspirational accessories to encourage people towards creative thinking. CEO Elina Arponen cites the recent literature about motivating people at work:

> *Daniel H. Pink describes in his book that autonomy, purpose and mastery are the main ingredients of motivation. [27]*

Founders in Tribe Studios have their own responsibilities, which they manage individually, as they see fit. CEO Elina Arponen comments on the working environment in this way:

In creative organization one dictator tends to kill the spirit. The goal is continuously engage everyone in the creative process, enable continuous learning and thus keep everyone motivated at all times.

To ensure autonomy, a Results Only Working Environment[5] (ROWE) is an important element of the organizational culture. In ROWE all workers are expected to reach their goals on time, but they are not expected to be present at the office from nine to five, to have two legal coffee breaks and to work according to a rigid process. This does not mean the absence of a social dimension; quite the contrary. In weekly meetings, strategy is discussed at lunch, followed by an analysis of the production process and the service in the afternoon. Skype chat is used for communication: two simultaneous channels contain most of the important news and information about the company's progress. Therefore, everyone knows what is happening, even though they do not necessarily meet at the office on a daily basis.

Most important decisions are made in workshops, when everyone dedicates the entire day to discussing one issue together. They usually invite outside experts or consultants to attend these workshops to bring new ideas and viewpoints to the table. The workshops are organized around inspiring themes: one workshop was an opening of an art exhibition and once they even had a workshop in a Finnish sauna.

Design Perspective The idea for the service arose when the group started thinking about what kind of game they would like to play themselves and what is missing from the market. Three core values of the game were defined already at the beginning; a short time span, a social and interactive gaming experience and that the game be of high audiovisual quality, especially compared to Facebook games. They also wanted that the game could be played multiple times by one person.

The design and innovation processes are iterative and agile. All founders contribute to the overall design and are in charge of their respective areas of expertise. Workshops function as a means for facilitating the design and decision-making process. The most difficult part has been the designing of the gaming mechanics, because it is so fundamentally different from traditional engines. There are no existing models or benchmarks based on the work of others.

Tribe Studios is actively collecting information about the market and analyzing prospective customer needs. One market research survey is an ongoing collaboration with students from Laurea University of Applied Sciences. In addition to traditional surveys, private discussions with prospective users have been organized. Collaboration with the users has been fruitful and the employees of Tribe Studios emphasize that it is very important to get contact with users from early on. Employees have found people for the interviews from among their own circle of friends and acquaintances. Elina Arponen says that the interviews have been more on a higher level, seeking boundaries for requirements:

5 **Results Only Working Environment: http://gorowe.com/**

Questions map overall attitudes and expectations, such as what kinds of games that person already plays, how that person spends their free time, who would recommend online games or other games to that person, etc. If someone has named a referee, we have called that person and organized an additional interview.

One important insight from the interviews has been that heavy gamers who are already playing many first-person shooter games are not the core audience of Stagecraft. They are already so used to the traditional gaming conventions that it might be difficult for them to embrace a new mindset. People who do not play many traditional computer games, but might play, for example, Facebook games and seek entertaining experiences as a way of spending free time, are the core audience. People have been interested in the games and there has been very good conversations going on about them. The material about the discussions is often unofficial. The process has been continuous and the game design has been changing accordingly. Currently, the design has been fixed and the final implementation work is ongoing. When the first beta version is out, a lot of feedback will be gathered from the users, which will be followed by a new iteration round. Communication and marketing strategies are evolving constantly and the employees of Tribe Studios still refine the target market to find out who comprise the core audience and customers.

In the beginning, the founders wanted to keep everything a secret. When they participated in the Aalto Venture Garage Bootcamp in summer 2010, they were afraid, because they had to reveal the idea in public. CEO Elina Arponen recalls:

One of the first tasks at the Bootcamp was to interview one prospective customer during that evening and analyze the results the day after. We were very careful with the questions not to reveal anything important about the idea, even when that person was our friend. Now that feels ridiculous. We are eager to discuss our idea with anyone who is willing to listen and give feedback or pointers, anywhere we go. It can even be at the bar; we are working everywhere we go.

They also encourage other entrepreneurs to expose their idea to collect feedback and iterate their ideas based on criticism and additional ideas and needs identified during discussions. Users have been closely involved in the iterative service creation process.

Users co-create the value together during the game. They receive a lot of power from doing this, but it also gives them a great responsibility. If users do not do anything, nothing happens and the experience is poor. The stories are emergent and users can create the experience at the same time that they are playing the game. Many popular games of today, such as Sims and Minecraft, do not rely heavily on pre-processed content; instead, gamers can create the content.

Social gaming over the Internet has become a popular means for meeting either new people or maintaining existing social relationships. Facilitating a social network is one central responsibility of the provider of the game. It offers many new oppor-

tunities for service design. One interesting consideration is how to provide the best possible social value for users who want to meet new people and who are looking for certain kinds of interaction. Co-players have to be matched somehow provided with an interesting high-quality gaming experience. An intelligent algorithm can suggest games based on a number of variables such as preferences, gaming habits, location or even random factors. Social contacts, entertainment and having fun are the building blocks of the game. There are no winners or losers and everybody should get something out of the experience. If the outcome is viewed from the individual player's perspective, everyone gets to act out the main role in the story. The outcome should be interesting and fascinating drama, which creates emotional responses. Everything intertwines around the people who attend the game.

Market Perspective People who have been gaming since childhood are now growing up. A large portion of them are working full time and some of them have kids. The target audience is huge and there is lots of room for new concepts. According to CEO Elina Arponen, there is currently a gap in the market:

> *The average age of a typical gamer is, at the moment, 32 years. In some countries it is even as high as 35 years. There are more women over 18 years of age than men under 18 years of age among these gamers. Based on the statistics, it is obvious that a large number of adult females as well as adult males with steady jobs and pay are consuming games. However, there are not many high-quality games available for this segment.*

In general, the gaming markets are still growing. In console games the market is quite stable. However, online gaming and social games are constantly gaining in popularity. Moreover, more women than men play PC games, whereas console gaming is dominated by men.

In modern society, the usage of time is very fragmented. Many people do not have time to dedicate dozens of hours weekly for gaming, but they still would like to play. Stagecraft allows players to experience the game once and return later to enjoy the same game with another group or another story altogether.

> *There is no forced need to come back. Some people do not want to start playing current online games because they believe it affects them like a drug. You get addicted and, after that, gaming might require a huge slice of your of time every week.*

There is a need for time-efficient but high-quality gaming experience, targeted towards adults for whom time is money. The market clearly exists, but, at least for the moment, there do not seem to be any direct competitors and, therefore, no big players who would already dominate the market. The company believes that the timing is right. The company has also intended its product for international markets since day one.

Traditional gaming conventions do not apply in the context of Stagecraft. However, the game borrows familiar elements from existing concepts. The purpose is to create a novel genre of gaming, in between games and movies, which could be described as social movies. Therefore, the heavy gamers of today probably do not represent Stagecraft's core customers. Their expectations and rewards are already highly defined and it might be difficult for them to adjust to a completely new style of gaming. On the other hand, live role players and people who play Facebook games are in the target group. Stagecraft has been influenced by live role-playing, which is very popular in Finland and Scandinavia. CEO Elina Arponen explains:

> *The general image of live role-playing might include a bunch of nerds dressed as elves, fighting with boffer swords, but highly intelligent story lines have been created and acted out in recent years. The background to evolved live role-playing has enabled the occurrence of this novel concept precisely in Finland.*

3.2 Analysis

The technology of Stagecraft is innovative, but the level of innovation lies somewhere between continuous and discontinuous innovation. The main conclusion is that the aim of the technology use has been to create discontinuous changes in the market. This means that it is more important to try to achieve radical changes in the market using innovative technologies than to try to define which technology is discontinuous and which is not. Rather, it is important to understand in which context the innovation is discontinuous. We can conclude that Stagecraft technology is discontinuous, as the context in which the technology is applied, somewhere between the movie industry and the gaming industry[6], is new and might create significant changes in the market. If Stagecraft were to compete in the category of a social movie within the traditional movie industry, then the technology is clearly radical. On the other hand, if Stagecraft were to compete within the gaming industry, then the technology is rather continuous.

The revenue model and the way the value is captured are both innovative. Selling movie-type tickets for a gaming experience is a discontinuous idea. Enabling a player to buy tickets for a social group is also a new-to-the-world idea that not many have previously implemented within the gaming industry. Technology is the main enabler for a new buying experience, as it uses existing social networks to create a viral way of selling group tickets. Innovative value capturing is also enabled via the organization culture, an innovative environment and management of the value chain.

The design as such does not represent a significant innovation. However, the way in which value is co-created in the gaming experience shows a high attention to human values in the design. The actual graphic design is outsourced. Still, it is good to

6 **Blue Ocean Strategy: http://www.blueoceanstrategy.com/**

remember that the supplier can be an important source of innovation.

The timing seems to be good, as the gaming generations from the 1990s are finding new ways to play games during their limited amounts of free time. The clear focus on lead users indicates the correct way to begin market entry. On the other hand, the popularity of role-playing indicates that a new value proposition fits easily into the existing lifestyle and habits of a significant consumer group. At the same time, social media is creating powerful social networks to facilitate the diffusion of innovation.

The market seems to be ready for the innovation, at least the niche market in beginning phase seems to be ready, and a larger audience will be found later if customers accept the radical change in gaming tasks. The market readiness analysis can be arbitrarily complicated, but our conclusion is fairly simple (Figure 10).

Fig. 10. Analysis of the new user task: players buy tickets to co-create one night game through social interactions. Stagecraft is creating discontinuous service innovation to attack the market.

4 Discussion

We decided to approach the topic from multiple perspectives in order to combine these theoretical approaches and to compare the theoretical discussion with the actual case. The education and mindset of engineers, designers and business people begin to develop in different directions already during their education. At least according

to the stereotypical image, the engineering approach tends to be very analytical, designers rely more on intuition and business people seek answers from existing frameworks. Multiple perspectives can assist companies in assessing the level of innovation of their solutions. Service-oriented thinking can foster innovation and help people envision new forms of value creation. Combining the various perspectives – scientific development and the engineering of technology, the business model, design and market viability – is the key to creating seamless experiences for the customer.

Based on service-dominant logic, the innovation is discontinuous only when it changes the individual task of the user dramatically. Either it re-formulates the existing task or creates a totally new task, generating new behavioural patterns and needs. Service-dominant logic is changing the innovation discussion by changing the way in which value is created. Knowledge about whether the innovation is disruptive or radical is not usually relevant to the user. The user is concerned with the experience and completing the task at hand. However, the taxonomy is very important and useful for innovation providers. It can be utilized to analyze and prepare the right time to market a product, the marketing efforts required, resources and the deeper understanding of the customer. The interpretation of the taxonomy depends on the particular angle that is taken when analyzing the innovation. However, the importance comes from the level of innovation and from understanding the core task and needs of the customer simultaneously.

Implementing the next big innovation requires successful application of these concepts in real cases so that the different perspectives can complement one another. One of the biggest mistakes start-ups and companies can make is to wait for service availability to learn about the customers and their needs[7]. If a customer-oriented view is not involved in the design process, whether by involving the customer in the design process or by diving deeply into thinking about demand and emerging needs of the customer, it is likely that the innovation contains either too many functionalities or the wrong functionalities and that it has been delivered at the wrong time, either too early or too late, to the market. To identify the latent needs or problems with the current tasks, the designer must dive deeply into the individual tasks of the user.

The current trend in the service design process is very iterative and dynamic, which is covered more in detail in Chapter 2.4. It is important to discover the minimum compelling feature set and get the service into the hands of the customers as early as possible. Identifying the minimum compelling feature set is basically equal to identifying the core task of the user. In service-oriented business, the on-going relationship between the service provider and the customer is essential from the outset. Credibility and trust must be earned and built, and the service provider must be able to demonstrate how the symbolic pain of the customer can be alleviated. Especially in the case of implementing a discontinuous business model, the service provider must

7 **Donna Novitsky, Stanford School of Engineering: Entrepreneurial Marketing and University-based Start-ups - Tips and Tricks, 25.3.2011 in Aalto Venture Garage**

gain insight very early on about how the buying decision is made and who is making it, and also understand the process and possible influences when the customers actually pay for the service.

Even though we have focused on a business-to-consumer case in this study, we argue that the same principles apply in business-to-business cases. Service-dominant logic offers a universal way of thinking during the innovation process, in which the customer is placed in the driver's seat already at a very early stage. For example, the Finnish companies Kone[8] and Metso[9], which sell industry machinery and elevators, have gained significant advantages from utilizing service-dominant logic by considering their products as services complementing the task of the customer rather than as complementing technology oriented functionality. In addition, service-dominant logic has enabled new ways of pricing based more on use of a particular service than on buying a particular product.

We also acknowledge that forces driving innovation are not always as straightforward as presented in this study. Political, economic, social, legal and environmental perspectives are just as important as sources of innovation as are technology, business and design perspectives. A single legal change can create disruptive and radical changes to the market and cause a change in the way users complete their tasks. For example, political and legal will helped enable electronic banking in Finland.

Future research could address how task-oriented service-dominant logic could be applied in innovations in industrial machine-to-machine processes, as well as how environmental issues, such as climate change, could be addressed more efficiently by utilizing service-dominant logic. Even though we focused on discontinuous innovation in this study, we argue that continuous innovations are increasingly needed to address societal challenges in this millennium.

5 Conclusions

In recent years there has been a clear economic shift from product orientation to service orientation. Simultaneously, the value creation logic has changed accordingly from goods-dominant logic to service-dominant logic. However, the innovation discussion and research has been largely based on product innovation, whereas the service innovation discussion is only just beginning. The discussion and the taxonomy between disciplines vary and, thus, the worst-case scenario is that people end up arguing about the terminology and the importance of each discipline rather than developing a coherent and solid approach.

In the first part of the chapter we presented a taxonomy and theoretical framework for a service innovation discussion. Then, we analyzed the framework with

8 João Colagrossi's presentation on Metso B2B services 9.3.2011 in the Bit Bang 3 course
9 Jukka Salmikuukka, Kone Oyj: What are the most coolest and most potential NFC applications for indoor usage now, tomorrow and in the future? 12.4.2011 in Aalto Venture Garage

an extensive case study of a start-up-based novel gaming concept called Stagecraft. Based on our work, we argue that discontinuous service innovation can occur when a service-dominant logic mindset is adopted by people from different disciplines to create new-to-the-world tasks for the customer and apply this new way of thinking to all levels of an organization. If all perspectives do not meet at the same sweet spot, the experience and reward will not satisfy the customers in such a way that the current market could be challenged.

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2.3 Service Innovation Based on Maslow's Hierarchy of Needs

Parth Amin[1], Kristi Grišakov[2], Timo Kiravuo[1], Juuso Parkkinen[3], Tuomo Raitio[4], Eric Qu[5], tutor Pavan Ramkumar[6]

[1]Aalto University School of Electrical Engineering, Department of Communications and Networking, PO Box 13000, FI-00076 Aalto, Finland

[2]Aalto University School of Engineering, Center for Urban and Regional Studies, PO Box 12200, FI-00076 Aalto, PO Box 13000, FI-00076 Aalto, Finland

[3]Aalto University School of Science, Department of Information and Computer Science, PO Box 15400, FI-00076 Aalto, Finland

[4]Aalto University School of Electrical Engineering, Department of Signal Processing and Acoustics, PO Box 13000, FI-00076 Aalto, Finland

[5]Aalto University School of Electrical Engineering, Department of Electrical Engineering, PO Box 13000, FI-00076 Aalto, Finland

[6]Aalto University School of Science, Low Temperature Laboratory, PO Box 15100, FI-00076 Aalto, Finland

Abstract

Service development is becoming more and more important for successful business, and a crucial factor in designing good services is to understand consumer needs. Motivational theories have been shown to be useful in identifying the specific needs of consumers and in guiding marketing efforts accordingly. In this chapter, we propose a context-specific method for analyzing consumer needs within a specific market segment based on Maslow's hierarchy of needs. The context is defined by several factors, such as cultural, personal, technological, and social elements. We discuss how the method can be used to identify characteristic unfilled needs for a given segment, and we also create scenarios of future needs. Finally, we apply our method to analyse tourism industry in more detail.

Keywords: Consumer Needs, Maslow's Hierarchy of Needs, Service Innovation, Tourism Industry.

1 Introduction

'In services there is only one way to segment the market: customer needs.'
João Ney Colagrossi, President of Services, Metso

1.1 From Products to Services

With a product manufacturing heritage, most companies once perceived service as a cost. For them, services used to mean either the repair or support of equipment that had been sold to customers or advice/consultation on how to use that equipment more effectively. During the last three decades, product companies from a wide range of industrial sectors throughout the Western economies have considered moving into service businesses. Some of them have rejected the idea after careful consideration, some have strayed into service markets without any real idea of what is involved and others have deliberately executed a carefully considered strategic manoeuvre.

A number of sociological and economic forces have given rise to the service economy throughout the world, starting in the developed economies. As countries have become richer, rising middle classes have sought a range of services to enhance their quality of life. There has been a continuous increase in spending on education, comfort, beauty products, family, holidays, financial security, new entertainment and leisure services. Moreover, as the consumers invest in consumer products, they also invest in services to support them. For instance, electronics home appliances companies have learnt to increase their product line profits by offering service packages with guarantees, extended warranties or maintenance contracts. Similarly, the automobile industry is extending its offering by bundling cars with financial services and insurances.

The factors prompting this change from products to services include a fundamental change in the employment patterns of Western economies in the services sector and matured domestic market for the core product. American manufacturing was reported to constitute 13% of GDP in 2008, a decline from 26% in 1970, whereas the service sector represented around 75% of economic activity. A similar report was published by Eurostat, the official EU statistics body for EU member states, in 2009. The report indicated that the service sector employed approximately 70% of the total employed population, whereas the manufacturing sector employed just 24% of the total employed population [1]. This change is driving the transition from manufacturing to service; manufacturing has been compared to a 'dead dog', while the service sector has been compared to a 'rising star'. Service business is a completely different type of business and involves massive change. It changes operations, people management, finances, financial management, sales, brand strategy and marketing. In fact,

there is very little which does not change when a product company seriously moves into the service industries [2,3].

1.2 Consumer Needs

A consumer is the ultimate user of a product or service. Too many entrepreneurs tailor their products or services around their own personal likes and dislikes, giving little thought to what the actual consumer thinks of them. If the product has no real appeal, then all the clever marketing in the world is probably not going to result in more than a couple of one-time sales. It is very important for a company to establish its own target customers. The study of consumers helps organizations improve their marketing strategies by understanding customer psychology, behaviour, environment, motivation and decision strategies. Understanding consumer needs is crucial for service innovation and successful new service creation [4]. In this study, we focus on consumer services and analyze whether the existing needs theories, such as Maslow's hierarchy of needs, are able to predict and develop future consumer services.

Maslow's hierarchy of needs is a psychological theory depicting the stages of growth in humans, first proposed by Abraham Maslow in 1943. Maslow's theory is widely applied for predicting consumer behaviour. In this study, we propose that Maslow's hierarchy can be interpreted as a representation of universal needs, underlying all consumer actions in the world. Moreover, we present a context-specific method to analyze an instance of a consumer segment and further predict the specific consumer demand. The context-specific method is based on various factors such as culture, country, religion, customer personality, education, gender, marital status, age, environment, educational qualification, occupation, trend and technology. Further, we analyze the tourism industry and try to find the factors affecting the sector and estimate the future demand based on our method.

2 *Maslow's Hierarchy of Needs*

In this section, we cover various motivational theories and discuss their implications for consumer needs from the services point of view.

2.1 Maslow and Motivational Theories

Motivation is a complex human force. Human motivation has especially been studied in the field of organizational psychology. Early writings studying work-related motivation suggested that money was the main motivation for people to work, leading to the rational-economic theory of motivation. Later studies have discarded this simple hypothesis and suggest more complex theories. As this study focuses on the consumer

perspective, that is to say, on people as service customers, we propose to look at motivation from the needs perspective, using the research of organizational psychology.

2.1.1 Maslow's Hierarchy of Needs

Abraham Maslow's famous hierarchy of needs (1943) is based on the hypothesis that unsatisfied needs motivate human beings to act, whereas, satisfied needs result in a lack of motivation. In Maslow's model, the needs are arranged hierarchically and the lower needs need to be sufficiently satisfied before higher needs become motivators. For example, lack of food prevents a person from having artistic ambitions. Maslow's hierarchy of needs is illustrated in Figure 1.

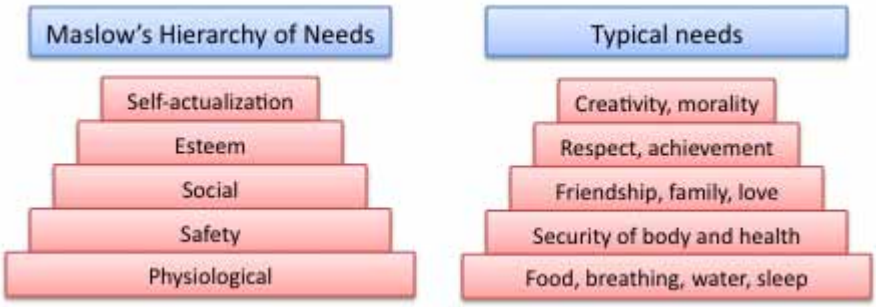

Fig. 1. Maslow's hierarchy of needs and examples of typical needs for each level.

It should be pointed out that Maslow considered his model to be a generalization and admitted that there are various reasons for a reversal of the hierarchy. Thus, a hungry artist does not contradict the model, but is an allowed exception. However, for most people the need to satisfy hunger would preclude all higher interests and, thus, the generalization holds.

2.1.2 Criticism of Maslow's Theory

A fundamental point of the critique is that Maslow's theory is intuitively easy to grasp, but that it lacks actual supporting research. A review of the model [5] finds numerous problems with both Maslow's theory and the research that has attempted to evaluate it, revealing that the concept of 'need' is not defined and that the categories are not defined in a way that would support testing. However, their review also concludes that '…[it] has proven to be a useful theory in generating ideas and as an a priori logical framework to explain diverse research findings'. Also, it has been proposed that satisfaction of physical and safety needs does not automatically trigger higher needs activation as motivators. [6]

2.1.3 Other Models of Human Needs

Alderfer's hierarchy of needs. Clayton Alderfer has presented a modification of Maslow's hierarchy, called the 'ERG theory' (Existence, Relatedness, and Growth, 1972). His model groups the physical and safety levels as existence needs, belonging and interpersonal needs as relatedness needs, and self-esteem and self-actualization needs as growth needs. Alderfer does not see the hierarchy as being as strong as Maslow does and assumes that if needs of one kind cannot be satisfied, the motivation moves to another sector.

Herzberg's Two-Factor Theory. Frederick Herzberg's two-factor theory (1959) divides needs into two groups. 'True motivators' drive action towards a goal, but another set of factors, called 'hygiene needs', do not provide drive; however, their lack acts as a de-motivator. Thus, according to Herzberg, in a workplace setting achievement and the work itself generally serve to motivate the worker, while company policy or working conditions do not motivate workers. Perceived shortcomings, however, act as a cause for de-motivation. If Herzberg's theory is compared to Maslow's, it would seem apparent that physical and safety needs can be seen as hygiene needs, while self-actualization and esteem are more likely to be motivators, and the social level can include factors belonging to both Herzberg's groups.

McClelland's Motivational Theory. David McClelland's interpretation (1958) of the same topic describes four motives. The achievement motive is analogous to self-actualization needs, the power motive to esteem needs, the affiliative motive to love and belonging needs and the avoidance motive to physical and safety needs. McClelland proposes that the strength of these four motives varies between individuals and that not everybody is driven by the same needs, regardless of the needs that have already been satisfied.

2.1.4 Significance of Maslow and other Theories

All of these theories have been criticized, but none have been overturned completely. While appealing to instincts, there seems to be a consensus that a human being is motivated by the need to avoid things like hunger or physical discomfort and by the need to gain things like love and achievement. Personal differences exist and some needs can overcome others; for example, climbing to the top of Mount Everest includes a considerable amount of physical discomfort, but provides a great deal of personal achievement.

As noted, these theories have their background in organizational psychology, which primarily studies work-related motivation and needs. In using these theories to analyze consumer behaviour, we also note that motivation is influenced by emotions, and thus needs do not represent only rational thinking, but also combine the conscious with the subconscious. This is needed in order to understand the profitability of such aspects of entertainment as horror movies or amusement parks, which

apparently are not compatible with Maslow's hierarchy and other models. However, the spectator knows that the feeling of danger experienced when watching a horror movie is just illusory and that the physical discomfort of an amusement park ride can be ended at will.

2.2 Implications of Maslow's Hierarchy to Consumer Services

In this section, we cover examples of the implications of Maslow's hierarchy on the marketing of consumer products and, especially, services in different contexts.

2.2.1 Maslow's Hierarchy and Marketing

Maslow's hierarchy of needs has been used to analyze consumer markets with the so-called stimulus-response model. Marketing and environmental stimuli enter the consciousness of a particular consumer and a set of psychological processes combine with certain consumer characteristics to result in decision-making processes and purchasing decisions. The marketer's task is to understand what happens in the consciousness of a consumer between the arrival of the outside marketing stimuli and the ultimate purchasing decisions. Maslow's theory helps marketers understand how various products fit into the plans, goals and lives of consumers. [7]

According to Daiv Russel [8], 'whatever you are offering, it will fall into one of the categories Maslow has listed in his hierarchy of needs.' So the key for successful marketing is to know the need your product or service satisfies. If your service has to do with safety and security, for example, you should stress the factors that enhance the feeling of safety and stability in your customers' lives. Or, if you run a personal web page or own a club, you should appeal to the belonging need of the customers. You can achieve this by telling your prospective customers about the great opportunities for interaction they will have if they try your service and by using testimonials from past customers. Having former clients speak about the positive results they achieved is a great way to get new buyers. [8]

Russel continues by stressing that after you have figured out where in the hierarchy the need you want to fulfil would fit, it is equally important to clearly communicate to the consumer how your solution will address her particular need. The most important thing is to ensure that your customer knows how his life will change because of your goods and services. [9]

Darrin Coe gives a practical example of how Maslow's hierarchy can be used to get inside the consumer's head [10]. Let's consider a personal fitness training service and place ourselves in the position of the consumer and think as if we are considering hiring a personal fitness trainer. Coe lists specific questions for the consumer related to each need's category:

1. How will personal fitness training impact my acquisition and use of food, shelter or sexual behaviour?
2. How will personal fitness training impact my personal safety?
3. How will personal fitness training positively impact my standing in society?
4. How will personal fitness training positively impact how I think about myself?
5. Will personal fitness training have an impact on my personal sense of fulfilment?

Understanding the customer's needs by using Maslow's hierarchy gives the service provider a tangible advantage in marketing, as they can directly target the service to respond to the consumer's internal dialogue. This can also be used to attract new customers that yet to become interested in the service. Putting yourself in the consumer's place can help marketing to appeal to the consumer by answering each of their needs. Coe concludes by stating that 'Maslow's needs pyramid is a powerful tool that is taught to every marketing and advertising student in the world but it must be understood and applied if it is to actually be useful.' [10]

In many cases, such as fast food and guarding services, the targeted level of the hierarchy is obvious. It is also easy to find examples of services that seem to actually fit all five levels, such as the fitness trainer example given above. For the service designer or marketer, it seems to be crucial to recognize which need categories are targeted, while the hierarchy of the levels is less important. The five levels by Maslow allow for more detailed analysis of consumer needs than do, for example, Herzberg's or Alderfer's theories, which have fewer categories.

2.2.2 Predicting Customer Trends

In addition to understanding customer needs better, Maslow's hierarchy can be used to predict customer trends. As Ron McCluskey writes:

> *What would it be worth to you if you could predict the buying trends over the next year? How about even the next few weeks? By using the principles of the Maslow's hierarchy of needs, you can use the news to predict what your customers will be buying in the future. [11]*

As an example, McCluskey mentions the 9/11 terrorist attacks, which caused a world-wide realization of the threat of further terrorist attacks. This resulted in a notable increase in the need for safety and security among people. This in turn created a demand for products and services that would satisfy those needs, such as personal firearm training. [11]

Venkatesh Rao gives another example of external factors, in particular technology constraints, affecting service markets:

Prostitution may have been the oldest profession, but pornography didn't explode in market size until the Internet became available. So evolution along the Maslow hierarchy is not reflected precisely in market structure — technology determines when the market will properly reflect certain needs, i.e. when the market can actually deliver to that need. [12]

These examples show how different types of external factors can affect customer behaviour dramatically. Recognizing these factors and understanding the changes they cause in consumers' needs is the key to being able to predict changes in the demand for different kinds of services in the future. The economic situation is one such factor that seriously affects consumer behaviour; when times are good, people are free to aim at satisfying the highest levels of need, whereas during a recession people are more concerned with keeping their jobs and being able to offer food and shelter for their families. These have direct consequences for product and service marketing, which McCluskey summarizes as follows:

When things are going bad, market services in the layer of the hierarchy where people feel their need. When things are going well, put more emphasis on marketing services that appeal to the more self-satisfying side of people. [11]

2.2.3 Breaking Maslow's Hierarchy

As noted earlier, the hierarchical organization of the need categories is not so important for customer service analysis. Many services seem to cater to multiple need levels, even for all five levels. The basic function of restaurants here, for example, is to provide food for customers, satisfying their fundamental need. Restaurants can, however, also offer safety, for example at night, and satisfy the need for belonging by offering company to spend time with. High-end restaurants can boost the esteem of the consumers, and even act as a place for self-actualization, for example in the case of locally produced vegetarian food.

It is also possible to break the basic hierarchy, which can be explained by conscious choices made by the consumer. For example, in extreme sports people are willing to risk their safety and ignore some of the physiological needs, at least for a while, in order to fulfil the need of self-actualization. Although the lower-level needs are basically more important, and generally need to be fulfilled first, specific higher-level needs may surpass the lower-level needs.

An example of such behaviour is the search for peak experiences. Peak experiences are defined by Abraham Maslow as:

feelings of limitless horizons, opening up to the vision of life, and having the feeling that one is simultaneously more powerful and more helpless than ever before. It is a feeling of wonder, ecstasy, and awe. It is a loss of placement in the total of space and time. It is

the feeling of conviction that something extremely valuable has happened, to the extent that the subject was to some extent transformed and strengthened, even in daily life, by experiencing it. [13]

Peak experiences, often sought after through activities such as music, dancing, extreme sports, meditation, drug use, sex, exercise, prayer and love, are powerful enough to suppress other needs. Although peak experiences are as old as mankind itself, people continue to actively chase after these experiences. This may stem from the fact that lower-level needs are being fulfilled now more than ever, and people have more time to spend pursuing upper-level needs.

Another case that contradicts Maslow's hierarchy of needs is where the lack of lower-level needs stimulates the desire to fulfil higher-level needs. For example, starvation, poverty, misery or illness may cause a person to try to fulfil the higher levels of the hierarchy, such as social and belonging needs, or even search for spiritual experiences. Moreover, Wahba and Bridwell [5] have found little evidence for the ranking of needs. For example, less individualistic forms of societies may value their social relationships more highly than they do lower-level needs.

However, Maslow's hierarchy of needs serves as a good starting point for observing human behaviour. Despite the exceptions, and some phenomena that do not fit into the hierarchy, Maslow's model is a generalization that can be utilized in practice. Moreover, certain exceptions, if recognized, can be utilized by marketing and developing services. For example, if one wants to lose weight, a solution might be to make oneself forget about being hungry by considering higher-level needs.

2.2.4 Hierarchy of Services

Following one of the principles of Maslow's hierarchy – that needs at the bottom of the hierarchy must be fulfilled before needs higher up can truly be met – Denise Lee Yohn devised a hierarchy of service for consumer needs and motivations as they relate to customer service [14]:

- Service level 1: Basic delivery – simply delivering the requirements. For a fast food restaurant, this would mean that the food is hot, that the drinks are cold, and that service is fast and accurate.
- Service level 2: Commitment and consistency – this is about doing what you say you will do, and doing it consistently.
- Service level 3: Personal and personable service – calling people by name, showing appreciation for their patronage, and attending to their personal needs.
- Service level 4: Making customers feel accepted and valued – by rewarding high-value customers, by offering ways to connect with others in the brand community, and by being transparent companies deliver this service level.

- Service level 5: Helping people feel good about who they are – this is where the right kind of service can make the most difference. This is about making people feel smart rather than stupid because they had to ask for help; helping them feel like they have made a good choice by supporting their purchase decision with added-value services; making them feel like they are important, not only to you, but to others in their lives or in the brand community.

With Maslow's theory as a model, the service hierarchy explains why a company cannot expect to truly fulfil its customers' service needs if it skips over the fundamentals at the bottom of the hierarchy and only focuses on the top – for instance, giving me a special 'thank-you' gift is pretty meaningless if my order was incorrect in the first place. [14]

3 A New Context-Specific Method for analyzing Consumer Service Needs

As shown in Section 2, Maslow's hierarchy of needs has proven to be a widely applicable model for consumer behaviour. We propose that Maslow's model can be interpreted as a representation of universal needs underlying all consumer actions in the world. Furthermore, we show how a context-specific method can be used to analyze an instance of a consumer segment and how this instance can be used to forecast consumer demand. We call this hierarchy the 'context-specific instance' and our method the 'context-specific method'.

3.1 Context-Specific Method

When analyzing the needs of any particular group of consumers, it becomes evident that there are numerous factors that cause variations to the universal set of needs and their hierarchy. These factors include cultural, personal and other external components, such as economic or legal components. Based on this observation, we propose a context-specific method, which we applied to a particular location at a particular time, while taking the surrounding context into account. The new method is illustrated in Figure 2.

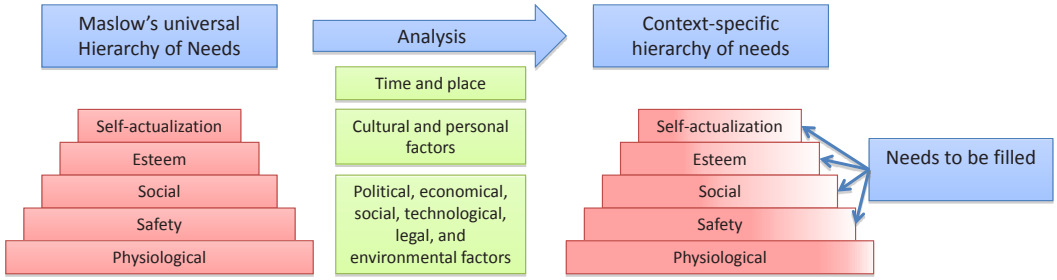

Fig. 2. A flow-chart of our proposed context-specific method. The analysis begins from Maslow's universal hierarchy of needs. Next, the effects of cultural, personal and PESTLE components are taken into account at the given time and location, resulting in a context-specific realization of the needs hierarchy. Colouring is used to indicate the extent to which each need category is filled.

The first and largest factor influencing the local organization of the needs is culture. As Maslow's hierarchy has been seen as a reflection of individualistic Western culture, there are other cultures, especially in the East, where different values cause people to behave differently. For example, in China family is valued much more than in western societies, resulting in an emphasis on shared needs over individual needs. In addition to cultural influence, there are also many personal sources of variation, such as age, gender and wealth, which need to be taken into account. For example, not owning an apartment is usually not a problem to a 20 year old, but might be to a 60 year old who will soon retire at a lower level of income than others.

Understanding cultural and personal variation in the hierarchy of needs is the first step in our method, in which we create a long-term basis for analyzing consumer behaviour in a particular location. In addition to personal and cultural variables, various external factors, such as political climate or technological development, affect the hierarchy of needs, as discussed in Section 2.2.2. The PESTLE-framework, consisting of Political, Economic, Social, Technological, Legal, and Environmental components, is a useful tool for analyzing the effects of these factors. The result of filtering the universal needs through cultural and personal factors on the one hand and PESTLE components on the other is a context-specific hierarchy of needs, with characteristic services at each level of needs. The relative sizes of the need categories may also have changed, and even the entire hierarchy may have been disturbed, as discussed in Section 2.2.3 and illustrated in Figure 3A.

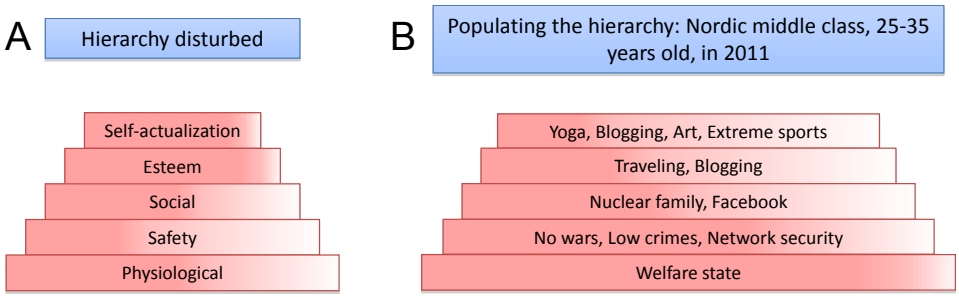

Fig. 3. A) Concentrating on the higher needs may cause disturbance in the lower needs, for example in the case of peak experiences, as discussed in Section 2.2.3. B) Populating the hierarchy for a specific market segment results in a characteristic set of needs for a given consumer group, such as the young Nordic middle class in the year 2011.

Taking the external factors into account is not only a strategy that can be applied to understanding the current situation in a given market. It can also be applied for predicting future changes. In this sense, it comes very close to the concept of scenario planning that helps one to 'take a long view in a world of uncertainty' [15]. The scenario-planning method is not about predicting the future, but rather about perceiving possible futures in the present. The process of building scenarios starts with identifying the main decision that the organisation is faced with in the long-run. It will determine the direction the scenarios will take, the issue they will be focusing on and the way the stories will unfold by taking into account the internal and the external PESTLE factors, future trends and possible 'wild cards'. [15] Combining the needs theories with the key elements of the scenario planning method can help a company to customize customer services and support service innovation. Possible changes in various aspects of the consumer society will be carefully analysed, as will the consequent possibilities they bring to customer services. This allows a company to react quickly and make changes if needed.

3.2 Creating the Context-Specific Instance

An instance is unique in time and location and is specifically defined for a target segment. When these are defined, the ways consumers fulfil their needs can be analyzed. The services being used can be related to the current PESTLE factors.

For example, young Nordic middle-class consumers in the year 2011 are living at peace in an affluent welfare state. They need not fear hunger, cold or crime; it is fair to say that the two lowest levels of Maslow's hierarchy have been satisfied. They might have started their own families or be living alone, and they may consume Facebook and other social media in order to satisfy their belonging needs; however, loneliness is a reported problem. Esteem from peers can be gained by activities like adventure travel or by blogging on any topic. Creativity is common and valued, thus serving

both esteem and self-actualization needs. New changes are also taking place, such as downshifting and choosing a less demanding profession so as to leave time for oneself. In contemporary Nordic societies technology plays an important role in fulfilling the needs, and the Internet provides an unlimited amount of entertainment and social contact. An instance like this provides a snapshot of the target segment. The instance could be made more accurate than our sample, which is merely intended to illustrate the method.

Changes to external factors can be predicted and their influence understood better through the needs models. For example, if the economy changes for the worse, consumers may initially choose less costly services. However, as long as society remains stable and Nordic values hold, people may still consider their lower-level needs fulfilled and focus on self-actualization. If the economy and household income improves, people might focus on self-actualization and purchase services that provide experiences for themselves rather than trying to impress their social network. The already fulfilled levels, however, may change. For example, if the anti-immigration message of populist parties changes people's evaluation of their security situation, a new need for services can be created.

Using the context-specific method for predicting consumer behaviour is obviously inaccurate. However, the model provides a tool for creating scenarios and classifying the needs of different groupings. It might be beneficial to use other needs models than just Maslow's, which we chose as the method for this study due to its popularity in literature.

People's age and needs change. Currently, selling Internet-based services to elderly people is a challenge. As the young generation ages, their needs will change but they will still keep the capabilities they already have. Thus, in a few decades a new service market for technology savvy seniors will open up. Future senior citizens will rely on services such as crowd-sourced real-time reports on street safety or analysis on the combined effects of the various medications they are taking. The new young generation will consider established services such as Facebook definitely un-cool and there will be a demand for something new and different that fulfils the belonging needs of a new generation. However, that generation might have different values and not be satisfied with merely replacing Facebook with a different brand.

The changes in the values and politics is illustrated by Figure 4, where military service was presented by appealing to belonging and societal needs during World War I, in contrast to the clear self-actualization message that was used during 1980s. The changes in society are not reflected only in the marketing message, but also in the contents of military service.

Fig. 4. Changes in politics and other external factors change people's needs and motivations. James Montgomery Flagg's iconic image touched people during World War I, but a 1980's recruitment poster is all about self-actualization.

3.3 Data Sources for Analysis

Finding data to analyze the situation can be difficult, but studies like the European Values Study (EVS) show that there is data available. The EVS is a large public study of national values performed four times since 1981 [16]. Needs can be deducted with some accuracy from values and, thus, the EVS can be used for building a specific version of Maslow's hierarchy.

An interesting possibility to evaluate people's needs is to use data-mining techniques to analyze Internet searches. 'Google Insights' is a publicly available service provided by the largest corporation invested in Internet search technologies. It is fair to claim that people's Internet searches literally reflect their needs. Other information-gathering sources, such as Facebook, could also be used to evaluate people's needs. The amount of data available today is a recent development and the techniques are still improving. With some work, it should be possible to create a system that analyses consumer needs and populates the context-specific instance automatically.

3.4 Practical implications of the Context-Specific Method for Service Design and Innovation

The next section discusses the developments of the tourism industry and shows how the context-specific method of applying Maslow's needs hierarchy can provide insight into and understanding of this industry. Our method can be used to analyze consumer needs, and it can also be combined with service design and innovation methods. Customer-centric methods focus on consumer needs or the 'customer job' [4] and design the service to match the customer, instead of the other way around. With better understanding of consumer needs and how consumer choices reflect their internal psychology and needs, it will become possible to design better services.

4 Tourism Industry

In this chapter we will look more carefully at the tourism industry through the lens of our modified context-specific method. The tourism industry is, of course, a broad topic and difficult to pin it down for a discussion about specific services, as it represents rather the full range of services that determine the overall experience. Therefore, this section will mostly discuss the past and present changes in the tourism industry and the dynamics of the changes when analysed from the perspective of needs theories.

4.1 The Tourism Industry and Maslow's Hierarchy of Needs

Tourism is a leisure activity which presupposes its opposite, namely regulated and organised work [17]. It is one manifestation of how work and leisure are organised as separate and regulated spheres of social practice in 'modern' societies. Indeed, being a tourist is one of the defining characteristics of being 'modern' and is bound up with the major transformations of paid labour.

Tourism contributes to health maintenance, physical education, and the intellectual, cultural and social development of the individual. From the point of view of Maslow's hierarchy of needs, it is an industry which could cover all of the need levels. The travel industry focuses mostly on people's leisure-time actives. However, it includes large numbers of relevant services, such as hotels, flights, food, tourism, shopping, recreation and business. Therefore, the travel industry provides an ideal entry point for studying the service method that has been proposed.

Factors that affect the need hierarchy within the travel industry are the following:

- Travel purpose: business, holiday, venture, social development, honeymoon, visiting
- Culture: religion, interest, taboo
- Individual personality: quiet or active, open or closed mind

- Traveller's education, gender, marital status, age
- Travelling form: single, group, budget travelling, package tour
- Environment at the destination: adverse circumstances, quiet, peaceful, advanced or primitive conditions.

Generally, all of the factors listed above could affect the mental and physical needs of the travellers. Broadly, different needs can be divided into three levels, with some grey areas in between offering interesting niche possibilities (for example, design hostels):

1. Lower needs levels travel: low expense, basic food, accommodation, transportation, students, tight economic circumstances
2. Middle needs levels: suitable expense, delicious food, comfortable accommodation, timely and reliable transportation, physical or mental gratification
3. Higher levels: money is no object in terms of expense, luxury conditions and services.

4.2 Changes in the Tourism Industry

From the 1950s onwards, the global tourist industry has been in a period of rapid development. The number of international tourists has increased from 25.28 million persons in 1950 to 698.3 million persons in 2000, and the income from global tourism has risen from 2.1 billion to 476 billion US dollars. The global tourism industry is growing rapidly and it is on its way to becoming one of the largest industries in the long run. Table 1 shows the statistics for the global tourist industry development in the latter part of the 20th century and the prediction for its continued development through the year 2020. Figure 5 shows the development of tourism industry from 1950 to 2005.

Table 1. The number of international tourists and the income of the global tourist industry from 1950 to 2001 and a prediction for the next ten years.

year	Global tourists		Global tourism income	
	Number of tourists (million)	Annual rate of growth (%)	Amount (billion US dollar)	Annual rate of growth (%)
1950	25.28	-	2.1	-
1960	69.32	10.61	6.87	12.58
1970	165.79	9.11	17.9	10.05
1980	285.33	5.58	105.32	19.39
1990	457.65	4.84	268.26	9.80
2000	698.30	4.32	476	5.90
2001	688.50	-1.33	-	-
2020	1600	4.0-4.3	2000.0	7.0-7.4

Source: World Tourism Organization UNWTO statistics from the year 2003.

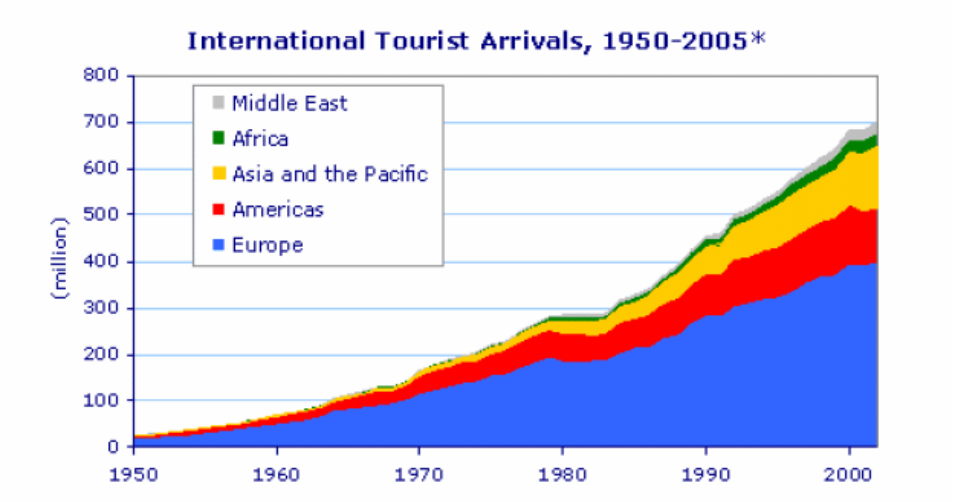

Fig. 5. Development of the tourism industry from 1950 to 2005.

Although the information in Table 1 and Figure 5 demonstrates the changes in the tourism industry starting from the 1950s, the story of mass tourism and distinguishing between different needs levels began much earlier. The mid- to late-nineteenth-century development of the railway permitted mass travel for the first time. Status distinctions came to be drawn less between those who could and could not travel as between different classes of travellers. In the twentieth century further distinctions were drawn between different modes of transport (sea, air, rail) and between the different forms that this took (scheduled/package air flights). But also, as geographical movement became democratised, different places began to cater to quite different tastes. The places where one travelled to became of considerable significance. In nineteenth-century Britain this gave rise to a resort hierarchy with considerable differences of 'social tone' established between otherwise similar places [18,19].

One strategy pursued by the tourist industry has been to initiate new developments which have permitted greatly increased numbers of tourists to gaze upon the same object. In *The end of organized capitalism,* Lash and Urry [20] argue that capitalism moved through a series of historical states: liberal, organised, and disorganised. Each of these appears to be associated with a particular dominant configuration of travel and tourism (Table 2).

Table 2. Development of travelling along with changes in the form of society.

Form of Society	Form of Travel
Pre-capitalism	Organized exploration
Liberal capitalism	Individual travel by the rich
Organized capitalism	Organized mass tourism
Disorganized capitalism	The 'end of tourism'

If the pre-capitalist societies contain a mixture of open and commercialised explorations, liberal capitalism proceeds in a much more commercialised pattern, linked especially to the railway. In London, for example, many grand hotels were constructed in the late nineteenth century. These were very much public places open to all those with money, both wealthy men and women, thus serving their need for esteem. However, such hotels necessitated new forms of rationalised organisation so that meals could be produced much more rapidly [21].

By the end of the century, organised mass tourism was growing rapidly in Britain, as hospitality and travel became not merely commercialised but packaged and organised. Consequently, this also meant that basic physiological and safety needs were fulfilled, thus allowing people to proceed towards the consumption of leisure activities, serving needs on a higher level. However, if disorganised capitalism involves the dominance of non-material forms of production (especially images), then in many ways this is what tourism has always involved [22]. If disorganised capitalism involves the predominance of culture, consumption, the global, the local, and concern for the environment, then all these characterise contemporary travel and hospitality.

Disorganised capitalism seems to be the epoch in which, as tourism's specificity dissolves, tourism comes to take over and organise much contemporary social and cultural experience. Disorganised capitalism then involves the 'end of tourism'. People are tourists most of the time, whether they are literally mobile or only experience simulated mobility through the incredible fluidity of multiple signs and electronic images. However, technology not only allows for stimulation; increased mobility has changed the way our work is organized, thus influencing the relationship between leisure and work time. There seem to be increasing similarities between behaviours that are 'home' and 'away' [23]. For example, increased mobility, Skype calls and laptops have allowed for more flexible 'work-nomads' to appear, mixing work and vacation wherever the destination of their travels.

4.3 Tourism Industry on the Move

Being part of any culture almost always involves travel. Culture-developing and sustaining travel can take a number of different forms: travel to the culture's sacred sites; travel to the location of central written or visual texts; travel to places where key events took place; or, travel to see particularly noteworthy individuals and to view other cultures so as to reinforce one's own cultural attachments. No matter the motivation, all of them are linked to the higher needs levels of Maslow's hierarchy. Mobility is increasingly central to the identities of many young people, to those who are part of diasporas, and to many relatively wealthy retired people who can live on the move. And 'tourism reflexivity' leads almost every site – however boring – to be able to develop some niche location within the multiplicity of choices around the globe that exist already. Tourism is nowhere and yet everywhere.

The following table summarizes the general changes in the tourism industry fol-

lowing the shift away from mass-packaged tourism to reflect the rather broader change towards so-called 'post-Fordist'[1] consumption. [19]

Table 3. Changes in the tourism industry following the shift in consumer behaviour.

Post-Fordist consumption	Tourist examples
Consumers increasingly dominant and producers much more consumer oriented	Rejection of certain forms of mass tourism (holiday camp)
Greater volatility of consumer preferences	Fewer repeat visits and the proliferation of alternative sights and attractions
Increased market segmentation	The multiplication of types of holiday and visitor attractions, based on life-style research
The growth of a consumers movement	Much more information provided about alternative holidays and attractions through the media
The development of many new products, each of which has a shorter life span	The rapid turnover of tourist sites and experiences because of rapid changes in fashion
Increased preferences expressed for non-mass forms of production/consumption	The growth of 'green tourism' and of forms of refreshment and accommodation which are individually tailored to the consumer, such as country house hotels

These changes have affected and continue to affect the ways in which new services are developed. Since the tourism industry is so fragmented, there are endless possibilities for niche products and services. People prefer to travel for shorter periods of time (weekend trips), every time to a new location, looking for that alternative individual experience that sets them apart from the millions of other similar seekers. Some advance has also been made in explaining the consumption patterns of tourist-related services (mostly in economics). The conclusion of such work is that such consumption is indelibly social [17]. Explaining the consumption of tourist services cannot be separated from the social relationships within which they are embedded. A crucial aspect of consumption is being able to buy time, that is, the ability to avoid work and replace it either with leisure or with other kinds of work. This was most famously investigated by Veblen [24], who examined the social dynamics of a 'leisure class', which demonstrates its esteem through leisure.

To a significant extent, different kinds of holiday experiences are devised with different social groups in mind. Converting a range of tourist services into a satisfactory 'holiday' involves a great deal of 'work'. This work involves both the social group itself, which is determined to have a 'good time' within a particular setting, and it involves those selling the services who, to varying degrees, try to guarantee a particular holiday experience (hoteliers, tour operators, restaurateurs, flight attendants,

1 **Post-Fordism (also called Flexibilism) is the name given to the dominant system of economic production, consumption and associated socio-economic phenomena in most of the industrialized countries since the late 20th century (Wikipedia).**

and so forth). One problem, however, with tourist services is that there is a rather unclear relationship between the objects and services purchased and a good holiday experience. This is partly because many of these services involve the production and consumption of a particular social experience which cannot be reduced to the details of a restaurant menu. Moreover, at least part of the social experience involved in many tourist contexts is being able to consume particular commodities in the company of others. Part of what people buy is, in effect, a particular social composition of other consumers, and this is difficult for the providers of the services to ensure. It is this which creates the 'ambience' of a particular cosmopolitan city, a stylish hotel, a lively nightclub, and so on. The satisfaction is derived not from the individual act of consumption, but from the fact that all sorts of other people are also consumers of the service and these people are deemed appropriate to the particular type of consumption in question.

Hirsch [25] argues that much consumption has similar characteristics to the case of suburbanisation, namely that the satisfaction people derive from it depends upon the consumption choices of others, subsequently corresponding with the esteem level of Maslow's hierarchy. People move to the suburbs to escape the congestion in the city and to be nearer the quiet of the countryside. But as economic growth continues, the suburbs get more congested, they expand and, ultimately, the original suburbanites are as far away from the countryside as they were originally. Hence, they will seek new suburban housing closer to the countryside, and the pattern repeats itself once again. A further category Hirsch considers is that of 'incidental social scarcity', that is to say, goods whose consumption yields satisfaction which is influenced by the relative extensiveness of use by others. Examples here include the purchase of a car, which does not lead to increased satisfaction because of increased congestion on the roads as everyone else does the same.

Tourists choose to visit particular places and gaze upon them because there is an anticipation, especially through day-dreaming and fantasy, of intense pleasures either on a different scale or involving different senses from those customarily encountered. Such anticipation is constructed and sustained through a variety of non-tourist practices, such as film, newspapers, television, magazines, records and videos, which construct that gaze. An array of tourist professionals come into being, who attempt to reproduce new objects for the tourist gaze. These objects are located within a complex and changing hierarchy. The hierarchy depends upon the interplay between, on the one hand, competition between different capitalist and state interests involved in the provision of such objects, and, on the other hand, changing class, gender and generational distinctions of taste within the potential population of visitors.

4.4 Travelling with Emotions

For centuries people used to travel only for very practical purposes – to find food, timber or other natural resources, or to flee from wars, famine or tyrannical rulers.

[26] Most of these trips were guided by necessity and fear of the unknown. These very prosaic reasons correlate with the first two levels of Maslow's hierarchy: physical and safety needs. Travelling for pleasure has only been around during the last few centuries and was primarily only done by the nobility. One reason for the emergence of mass travel has to do with the processes of urbanization throughout world, which began with industrialization. Industrialization brought us the means to travel longer distances (railway) and urbanization provided us with the motive, since the cities were dense and becoming more polluted, living conditions were poor and illnesses spread quickly. Health tourism was popular among the nobility earlier, but the late 19th century and early 20th centuries saw the rise of the sanatorium culture to treat tuberculosis or simply to take mud-baths and light exercise. While health tourism in the form of spas and dietary camps is very popular in contemporary times, the emphasis on the physiological seems to be only an excuse. These facilities sell their services through emphasizing the top three levels of Maslow's hierarchy – social, esteem and self-actualization – by inviting you to lift your spirit, relax and be a better version of yourself (and, of course, better than others). Thus, the contemporary tourism industry is almost solely emphasizing the three top levels of the needs hierarchy. Physiological and safety needs of course have to be filled; otherwise, they will become the de-motivators (similar to Herzberg's two-factor theory in Section 2.1.3) that ruin the overall image of your vacation.

Travelling, as mentioned earlier, is first and foremost a social experience. You travel with others or in search of some company. You are side by side with other tourists in hotels or during sightseeing excursions. Esteem is another key need that is fulfilled by being able to travel or by travelling to more exotic or luxurious places. Mass destinations that are too popular become marginalized quickly and the wealthier move on to find more individual and exclusive experiences. However, most importantly, the tourism industry seems to be shaped the most by the needs of travellers who thrive on self-actualization and who are looking for the ultimate peak experience (Section 2.2.3.). The need for self-actualization is very individual and it is difficult to pin down as part of a magic travel recipe that will ensure a rewarding outcome. For examples of self-actualization and instances of innovation, it is better to look at certain demographics, interest groups or cultures. A good example of self-actualization through tourism is backpacking. Although the traditions of backpacking can be traced back to religious quests and hippie travel in the 1970s, this form of travel has gained huge popularity only during recent decades. Again, one might talk about cheap airline tickets, a good European rail network and the development of infrastructure in the form of hostels, camping sites and bicycle rentals. However, the key reason still for why these young people travel is self-actualization. Backpacking is usually done during the years when one becomes more self-assured and independent, after graduating from high school or during university studies, when one is ready to leave home and (middle-class) family behind. Although this description is borderline stereotypical, the key motivating factor, in additional to being with friends

(social need) and sharing your experience with friends back home (esteem need), is to test your independence and abilities of survival, to oppose to your parent's lifestyle, which offers relatively easy living conditions or possibilities for couch surfing, and, of course, to aim for the peak experience. Other tourists look for self-actualization through extreme-sports, some visit music events, for others it is a French wine or gastronomic tour or even a religious and yoga-filled ashram life in the jungles of India.

When talking about trends in the tourism industry, there are several important questions on the horizon. First of all, it seems that the world is running out of new unconnected and unexplored places to see and, following Richard Branson's initiatives, travel (for those who can pay for it) is beginning to move under the sea and to outer space. Secondly, the number of tourists starting to come from non-Western countries is increasing as their living standards rise. At the same time, the non-Western countries that are doing better economically will begin to attract more tourists with new or updated infrastructures, since, at the moment, they are still destinations that cannot fulfil the physical and safety needs of visiting tourists. Thirdly, the amount of time that people spend travelling will probably increase again, as it has been getting shorter and shorter during the last decades. While people often visit one destination only for a weekend trip and do not return to the same location regularly, the current trend in the travel industry suggests that longer periods of travel will soon become the norm again. Staying at a location for a longer period of time, such as a couple of weeks or even months, allows you to get to know the culture and the locals and find yourself in a different kind of a social setting that a quick rampage over a single weekend cannot duplicate.

Also in this case, the self-actualization need is important, as such trips will again be combined with spiritual journeys, education or volunteer work. As mentioned in the previous sections, recent technological advances have been supporting such mixtures of work and leisure. Longer stays also offer another advantage to the ecologically conscious traveller: as air travel and airport hopping are the main ways to rapidly increase one's carbon footprint, the conscious traveller will increasingly seek to enjoy one location for a longer period of time and travel around using modes of transportation that are more environmentally friendly. Finally, it will also be extremely important to be able to use technology on site. Hotels and even city tourist information offices are offering iPads or iPods for visiting guests, which are pre-packed with customized information about suitable routes or nightlife recommendations, while at the same time enabling guests to access the Internet or Skype with friends and family back home. For some travellers, the tourist challenge is to escape from modern technology; for others it is a handy way to get to know the destination with ease.

5 Conclusions

In the previous sections we have discussed the change from products to services, Maslow's hierarchy and other motivational theories, and we proposed a method for service innovation by looking at Maslow's hierarchy of needs and adding the factors of time and place, culture and individual and PESTLE trends that help to segment the market and perceive possible futures. Furthermore, we illustrated the benefits of using such method by focusing on the tourism industry, where it was discovered that although tourism industry covers all levels of needs, it first and foremost addresses the three top level needs of social, esteem and self-actualization. However, it would be impossible to predict future changes or past developments in the tourism industry without also looking at the other factors mentioned in our context-specific method.

Services are dynamic systems that configure people, information and technology and create and deliver values to customers and service providers. Service innovation consists of a service concept and strategy design and the implementation of possible developments in the market segment, which primarily requires a knowledge of customers' needs. The research on and study of Maslow's hierarchy of needs is trying to develop a motivation-level mapping of service and needs. While Maslow's hierarchy of needs has been criticized, it still offers valuable insights into human motivation and, when combined with the other needs theories, it enables us to better analyze human motivation, including consumer behaviour. The method presented here enables the user to understand current consumer needs and, with additional input, it can be used to predict future behaviour. As the future is difficult to predict, a more proper use of the method might be to create scenarios and to be prepared to analyze changes in trends more rapidly. In service creation, sudden changes in surroundings can create chaos, like the Black Swan events. By analyzing the changes through consumer needs, service providers can understand their effects and react to them in terms of the services that they offer.

For creating a service innovation road-map, this study provides a starting point for analyzing people's needs. Further research on the topic could concentrate on more in-depth research on market/needs segmentation, since even the tourism industry appears to be too broad of a segment to analyze beyond generalizations. There is a need to go deeper into more specific niche markets and compare the results between the segments of different industries. For those responsible for service design, a specific model could be made based on the major market. For example, need levels can be modified by separating people into groups based on their age and occupation and by focusing on the motivation-level needs of the most interested market segment. Finding the changes in trends is a challenge that can be solved by data mining on the Internet. Researchers can find out about people's interests through evaluating their actions and by collecting information from social networking services like Facebook or LinkedIn, or they can use search engines like Google to populate the specific hierarchy.

Service innovation based on Maslow's theory is still in its infancy, but we are confident that by adopting a mindset to also think in terms of the needs hierarchy and its further implications, we can accelerate its development and place ourselves in a better position to create and benefit from service innovation in the future.

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2.4 Dynamic Service Design in Healthcare

Harri Heikkilä[1], Meri Kuikka[2], José Luis Peralta[3], Antti Rahikkala[4], Varun Singh[5], Zhe Zhang[6], tutor Aditya Poudyal[7]

[1] Aalto University School of Art and Design, Department of Media, PO Box 31000, FI-00076 Aalto, Finland

[2] Aalto University School of Economics, Department of Information and Service Economy, PO Box 21220, FI-00076 Aalto, Finland

[3] Aalto University School of Electrical Engineering, Department of Automation and Systems Technology, PO Box 15500, FI-00076 Aalto, Finland

[4] Aalto University School of Science, Department of Applied Physics, PO Box 15100, FI-00076 Aalto, Finland

[5] Aalto University School of Electrical Engineering, Department of Communications and Networking, PO Box 13000, FI-00076 Aalto, Finland

[6] Aalto University School of Engineering, Department of Surveying Sciences, PO Box 11200, FI-00076 Aalto, Finland

[7]Aalto University School of Science, Department of Engineering Physics, PO Box 14100, FI-00076 Aalto, Finland

Abstract

This chapter presents a new view on service design that explores the current trends in technology, socio-economics, politics, business and consumer values. We analyze the effect of these current trends on the practice of designing new services. The chapter provides a short overview of the set of conceptual and practical tools existing today and proposes a new process for designing services. The proposed process is called Dynamic Service Design, wherein the service continuously adapts and evolves, based on customers' insight. To verify applicability, we map the service design process of a healthcare startup to Dynamic Service Design. Furthermore, we use Dynamic Service

Design to identify opportunities in three future scenarios. Our conclusions point to a promising use of the proposed process, based on the flexibility of its approach and its rapid reaction to changes in the service ecosystem.

Keywords: Service Design, Service Design Tools, Services Design Metrics, Service Design Methodologies.

1 Introduction

Over the past few decades, the workforce in industrialized economies is migrating from the primary and secondary sectors to the tertiary sector, or to what is called the *service industry*. This sector has been growing rapidly in recent years and it is now the largest in western economies [1]. The rise in the significance of this area has brought about an awareness of the importance of the well-devised and well-planned execution of services. This is known as "Service Design" [2]. The idea of service design is not recent, where *Design,* is understood as the process whereby the value offered by a service is enhanced, optimized, and made user-centric by various tools and methods. It dates back to the early 80s, where it was a part of the marketing and management disciplines [1]. At the time, service design's role was to recognize the major differences between product and service and apply design as a process to enhance the service's benefits. The most relevant difference between past and present service design is the key role of customers in the creation of value of services, i.e., *value co-creation*. Value co-creation allows the customer to co-construct the service experience to suit their context, and the service design process offers methods to enable this [3].

Today, almost 30 years later, this emerging field has evolved considerably and now service design is a fairly consolidated discipline, with its own set of conceptual and practical tools [1]. However, the process of knowledge building and conceptualizing the paradigms has not produced a single, globally agreed set of conceptual and practical tools. Instead, several terminologies, tools, metrics, processes and methodologies have been proposed and these are being used in different research and industry environments.

We believe that advancements in Information and Communication Technology (ICT) will enable real-time sharing of information, especially between stakeholders, that will encourage a quicker response to needs. The increase in information flow will enable service designers to adapt or evolve the service to meet the customers' needs. We call this process Dynamic Service Design. We identify trends and factors that drive Dynamic Service Design in technology, socio-economic politics, business and industry, and user value and attitude. To study the applicability of Dynamic Service Design, we constrain our analysis of it to its application in the healthcare industry. In our analysis, we first introduce a case study as an example of current innovation in the healthcare service. Secondly, we define futuristic scenarios in the healthcare industry wherein we create favorable circumstances to extrapolate current trends.

2 Background and Theory

This section introduces the basic definitions of service, service design and the associated metrics and methodologies used to compare different service designs.

2.1 What is a service?

Services, like products, consist of hundreds or thousands of components but the difference to products is that service components are rarely physical entities. A service is a combination of processes, people skills and materials that must all be appropriately integrated to result in the 'planned' or 'designed' service [4]. For instance, products are created and "exist" before being purchased and used, whereas services come in to existence at the same moment that they are being provided and used. More simply put, [5] we can define services as the application of competences for the benefit of another.

In the context of *co-creation*, [6] define services as the division of labor and effective co-creation of value, leading to complementary specialization and comparative advantage among participants. Similarly, [7] define services as value-co-creation, configurations of people and technology, value propositions, the connection of internal and external service systems, and shared information (e.g., language, laws, measures and methods).

The common theme running throughout these definitions is the concept of a service being the intangible equivalent of an economic good. Besides many definitions of service, Lovelock [8] has given five explicit characteristics to describe service, namely: 1) intangibility, 2) perishability, 3) inseparability of the service from its provider, 4) the simultaneousness of their rendering and consumption, and 5) variability, as each service is unique.

2.2 What is service design?

The term service design has been defined in several ways. Gummesson [9] defines it as "*the concretization of the service concept in drawings, flowcharts…*". Norling et al. [10] define it as the "*work of specifying an idea about a new service in drawings and specifications*". Others [3] define it as "*the activity of planning and organizing people, infrastructure, communication and material components of a service, in order to improve its quality, the interaction between service provider and customers and the customer's experience*". Service design is then the specification and construction of technologically networked social practices that deliver valuable capacities for action to a particular customer.

Service design can involve artifacts and other things, such as communication, environment and customer behavior. Therefore, managers and designers must make decisions about each service component while designing a new service, or when re-

designing an existing service. From the service organization's perspective, designing a service means defining an appropriate mix of physical and non-physical components that could help innovate improvements to existing services, and/or create new services, in order to make current services more useful, desirable and effective [4]. Service design is a multi-disciplinary field that can integrate different approaches wherein the goal is to discover individual needs and fulfill them efficiently.

2.3 Terminology: tools and metrics

During the evolution of service design as a separate discipline, several basic structures, such as terminologies, tools, and metrics, were proposed to support the conceptual analysis and practical implementation of service design. Service design tools and processes place emphasis on strong social skills, empathy for the user, creativity, and visual thinking [1].

The following is a short table, as in [1], with the most recurrent terminology, tools and metrics used in service design. Not all of them are relevant to different applications, however, several of them have gained importance in the service design area or are frequently referred when talking about service design.

Apart from the table below many more tools are available for service design and the reader is advised not to restrict themselves to these but to look for those best suited to their project. [11] contains an exhaustive list of service design tools and communication methods for supporting the design process.

Table 1. Terminologies of service design.

Terminology	Definition	References
Service Concept	A detailed description of the customer needs that are to be satisfied, how they are to be satisfied, what is to be done for the customer and how this is to be achieved.	[4]
Customer Journey	Consuming a service means consuming an experience, a process that extends over time. The customer journey thus illustrates how the customer perceives and experiences the service interface along a time axis. It also considers the phases before and after actual interaction with the service. The first step in creating a customer journey is to decide its starting and stopping points. The customer journey serves as the umbrella under which the service is explored and, with various methods, systematized and visualized.	[3]
Service Touchpoints/ Service Interface	Service touchpoints are the tangibles, for example, spaces, objects, people or interactions, which together make up the experience of using a service. Touchpoints can take many forms, from advertising to personal cards; web-, mobile phone- and PC interfaces; bills; retail shops; call centers and customer representatives. In service design, all touchpoints need to be considered in their totality and crafted in order to create a clear, consistent and unified customer experience.	[12], [13], [14], [15]
Service Encounter	This is the period of time during which the customer directly interacts with some aspect of the service organization, often in a marketer-controlled environment.	[2]

Front office/ Frontstage	The time and place in which customers come into contact with the service, for example, a website, a person serving you at a restaurant, etc.	[16], [17]
Back office/ Backstage	How services are facilitated inside the organization: for example, the food production chain inside a restaurant that is not visible to the customer. The design of the service may involve a re-organization of the back office activities performed by the service provider.	[16], [17]

Table 2. The tools and metrics of service design.

Tools and Metrics	Definition	References
Service Blueprint	Mapping out a service journey, identifying the processes that constitute the service, isolating possible fail points and establishing the time frame for the journey. Service blueprinting is a process analysis methodology proposed by Shostack. Shostack's methodical procedure draws upon time and motion study engineering, project programming and computer system and software design. The proposed blueprint allows for a quantitative description of critical service elements, such as time and logical sequences of actions and processes, also specifying both actions and events that happen in the time and place of the interaction (front office) and actions and events that are out of the line of visibility for the users but are fundamental to the service. Service blueprinting involves the description of all the activities for use in designing and managing services, including scheduling, project plans, detailed representations (such as use cases) and design plans or service platforms.	[18-20]
Service Ecology	The system in which the service is integrated: i.e., a holistic visualization of the service system. All the factors are gathered, analyzed and visualized: politics, the economy, employees, law, societal trends, and technological development. The service ecology is thereby rendered, along with its attendant agents, processes and relations. By analyzing service ecologies it is possible to reveal opportunities for new actors to join the ecology and for new relationships among the actors. Ultimately, sustainable service ecologies depend on a balance in which the actors involved exchange value in ways that is mutually beneficial over time.	[3], [12]
Activity System Maps	These enable the description of a company's strategic position and identify linked activities. It aims at representing, in a visual and synthetic way, the analyzed or designed activity system at different levels of detail (activity, action, operation). Also, it aims to support the understanding of the relations and eventual internal contrasts among the elements of the activity system (the systemic and contextual approach). Finally, it supports the collective design process, behaving as a boundary object within an interdisciplinary design team.	[21]
Motivation Matrix	The aim of the motivation matrix is the understanding of the connections between the different actors of the system. This is possible due to the elicitation of the motivation of each actor while participating in the system: each expresses what he needs or expects from the service. The motivation matrix is an interesting means of investigating the solution, assuming as it does the point of view of each stakeholder with his own interests.	[22]

System Organization Map	This system map tool is an approach to visualize business ideas. It consists of both a visualization of the solution idea and a map of the general system organization. The map of the general system organization uses icons for actors and processes and lines for links, in the form of material, financial and information flows. A distinction is made between primary and secondary actors. Very short texts in the map act as explanation.	[22], [11]

2.4 Process and components

Reference [1] gives a brief summary of service design processes by proposing a five-phase service design process for companies that includes: *discovering*, *conceptualizing*, *designing*, *building*, and *implementing*. This is similar to the three-phase model that was proposed by Engine *et al.* mentioned [1] and the four-phase model proposed by Mager *et al.* [3]. Reference [13] in turn proposes a six-phase process that begins with *service design understanding*.

Table 3. Different types of service design models.

Service design model	Phases
Five-phase model	Discovering, Conceptualizing, Designing, Building and Implementing
Four-phase model	Discovery, Creation, Reality Check and Implementation
Three-phase model	Identify, Build and Measure

Common to all the models is the concept of co-creation, participatory design and prototyping in the "conceptualizing and creation" phase. These models use a "Reality Check" as a validation tool for comparing prototypes and to gauge consumer reaction. Practically, these models can be implemented within the living labs [23].

2.5 Methodology

Service-oriented design has several useful methods of discovering new service innovations. In service design the designer has to survey and learn the customer's latent and conscious needs [1]. This is where different methods in service design come into play. Satu Miettinen *et al.* have listed 11 different methods in service design research: bodystorming [24], context mapping [25], experience prototyping [26], fieldwork: observation and documentation [27], five whys [28], personas [29], probes [30], scenario-based design [31], storyboarding [31], storytelling [32], and vox pops [33]. A service designer should pick the most appropriate methodology to verify their service design.

3 Dynamic Service Design

Dynamic Service Design is the co-creation of service with the customer in a way that fosters evolution of the service. This can be done through two methods – 1) the service provider integrates the customer into *service discovery*, or 2) the service provider uses the consumer as an active partner in *service delivery* [1]. Dynamic Service Design requires the full collaboration of all the stakeholders, including immersion of the consumer as an active participant throughout the whole process, from discovery to creation and delivery.

Furthermore, to foster radical ideas during the co-creation process, the participants should challenge the incumbent design, and possibly even reframe the initial customer problem. The end result of one cycle of service design should be tangible results that are more than a minor enhancement. Moreover, Dynamic Service Design should be a continuous process that encourages constant iteration. This is further encouraged by advancements in information gathering, exchange and processing.

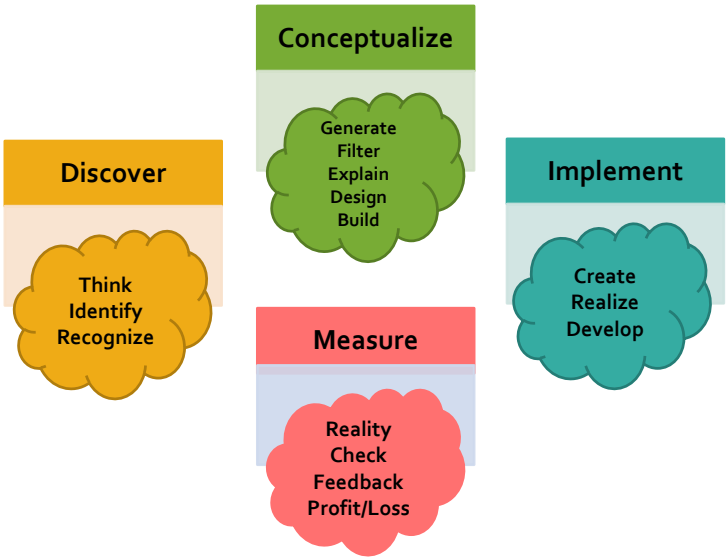

Fig. 1. Service design components.

For the purposes of Dynamic Service Design we can group the different phases summarized by [13], [1] and [3] into components, as shown in Figure 1. These components can include one or more phases, as defined in [1], and are enumerated below:

- **Discover**: this includes thinking, identifying, and recognizing.
- **Conceptualize**: this includes generating and filtering, explaining, designing and building (a prototype).
- **Implement**: this includes creating, realizing, developing the service.

- **Measure**: this includes feedback from stakeholders (reality-check), profit/loss, service experience, and customer behavior.

In Dynamic Service Design, these components are used in a cyclic process, as shown in Figure 2. This produces the effect of constant evolution and is only affected by the feedback. The feedback is gathered continuously as part of measurement. This allows for greater collaboration with the stakeholders. The process attempts to bring agility to service design, by quickly iterating the service design from discovery to implementation. It must be noted that the transition between the phases of the design process is not abrupt, i.e., the design process can move freely back-and-forth between phases. Since, the service is constantly measured, service designers can immediately adapt the service, based on the feedback, or choose to adapt it in the next iteration, based on service strategy. Therefore, we introduce a new phase in Dynamic Service Design called **Strategy**. Strategy helps shape the next iteration of the service. Service designers take market segmentation, competitive differentiation and other market factors into account when adapting the service. These changes can be either incremental enhancements to the service or a radical innovation.

The process is similar to agile software development, wherein features of a product are developed in short (1-7 days) cycles as part of long cycles (30-90 days) [34]. Any service enhancement, or radical innovation, must be broken down into smaller, incremental enhancements so that the designers can get more coherent feedback through the design process and are able to better adapt the service to the customer needs.

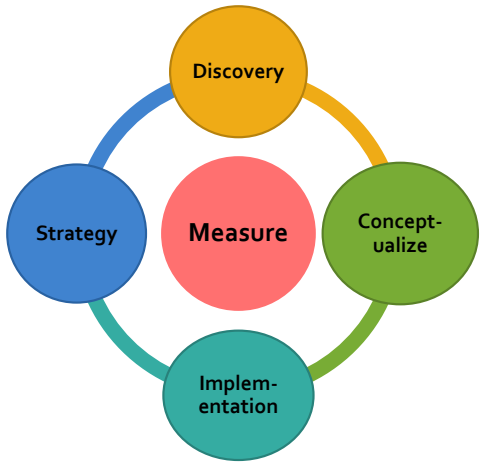

Fig. 2. The Dynamic Service Design process.

3.1 Factors driving Dynamic Service Design

Dynamic Service Design is driven by advancements in technology, changes in the socio-economic and political landscape, performance and trends in business and industry, and also by changes in the values and attitude of the consumer. The factors driving the change in each category is described in Table 4.

Table 4. Factors driving change

Driver	Factors
Technology	• Processing power is increasing • Cost of storage and communication is diminishing • Miniaturization and nanotechnology • Digitization of content • Standardization of content • Centralized control of information is becoming difficult
Socio-Economic and Political	• Globalization is continuing • Democratization is increasing • An aging population in the industrialized world • A shift towards knowledge industry/economy • Social differences are widening • Increased amounts of information and choices
Business and industry	• The effect of patents on developing countries • A shift towards monopolies • Improving price/performance ratios • The value of information and knowledge will increase • The exchange of information between components in a value chain will increase towards improving efficiency
User values and attitude	• Individualism will increase • Health concerns will increase • The importance of family and friends will increase • Environmentalism is making people more aware of their surroundings • An increase in technology adoption and the need for mobility/ communication

3.2 Enhancing the service design principle to Dynamic Service Design

Based on a subset of Mager's [3] basic statements for service design, we can create a simple framework for Dynamic Service Design, as listed below.

1. *Envision* the service as a product – for the purpose of service design.
2. *Focus on the customer* – by diving in to their world and exploring their emotions, experiences, observations and problems; this helps in building a better product because it helps describe the service better.
3. *Connect the dots* – the service experience starts well before the customer interacts with it, because the services are embedded into larger systems of relationship and interactions, and the designer needs to monitor the changes in user-expectation and user-behavior during the customer journey.
4. *Usability* – this is the paramount reason for the success or failure of a service. The service must survive multiple contacts with the customer, while maintaining customer satisfaction.
5. *Evolvability* – services should aim for reproducibility but should also be flexible

to incorporate changes. These changes may come about from learning about the customer (behavior, experience, satisfaction) or through the process of developing the service with the stakeholders.

3.3 Scenario-based methodology

For the analysis of Dynamic Service Design, we employ the methodology of scenario-based analysis [1]. The scenarios are textual, illustrated, acted, or filmed stories of people performing in different contexts. The aim of scenario-based design is to foresee how different people could act in service usage situations, thus visualizing the main service concept for the stakeholders. Scenario-based service design is a cost-effective and versatile service design method, allowing designers to evaluate the tasks and practices for all the stakeholders in context and to suggest changes according to design outcomes.

4 Case-study: Laastari

In this section, we ascertain the validity of Dynamic Service Design (discussed in Section 3) to the service design process used for a start-up in the healthcare sector. We interviewed Ville Öhman, CEO of Laastari Lähikinikka, Finland. He graduated from the Helsinki School of Economics in 2002 and also holds an MBA from the University of South Carolina. Since graduation Öhman has worked as a consultant in the healthcare sector. Laastari Lähikinikka brings retail healthcare clinics to drugstores and malls. It provides customers with easy and convenient access to healthcare while maintaining a cost-effective structure.

We evaluate Laastari's service design by mapping it to Dynamic Service Design, as described in Section 3. The following subsections are arranged to match the phases of Dynamic Service Design, namely; Discover, Conceptualize, Implement, Strategy and Measure. The sub-sections also give insight into the factors driving change in healthcare.

4.1 Discover

"Get into the circle ASAP, to find out what your customers really want"

Retail healthcare clinics are increasingly popular in the USA, at drugstores and malls. Retail clinics are a radical attempt to respond to consumer needs for which the existing healthcare system does not provide options. The business idea of a retail clinic is to offer a fast, cost-effective and conveniently located service for minor and everyday health problems. Öhman finds it odd that, until now, nobody in Finland has done anything about it (providing easily accessible healthcare), even though there have

been lots of complaints about rising costs in healthcare.

Laastari is the first business to utilize this concept in Finland (See Figure 3). It caters for minor health problems, such as the common cold and non-severe acute illnesses like nausea or ear-pain, and can administer vaccinations, etc. By restricting the service to the most common illnesses the service maintains a cost-effective structure and therefore it can provide the service at half of the usual price.

Fig. 3. The Laastari Service Concept utilizes malls as a service touchpoint.

Fig. 4. A Laastari kiosk is a small healthcare unit, consisting of basic diagnostic equipment and tables, instead of computers, for data input and exchange.

4.2 Conceptualize

"Small is beautiful"

Healthcare is a high value market segment and the average person needs to see a doctor for common illnesses at least twice a year. The main aim of the kiosk service is to provide an easily accessible service that targets these particular consumers' needs. Laastari clinics are small but customer friendly. A customer can enter a kiosk without any prior appointment and the treatment takes, on average, 15 minutes. Figure 4 shows a standard kiosk.

The nurse in a shopping mall kiosk diagnoses the patient and sends the prognosis to a remote-centre, where a doctor immediately reviews it and writes a prescription. If necessary, kiosks are also capable of video-conferencing so the customer can directly consult with the doctor.

4.3 Implement

"You had to change everything"

In January 2011, the first pilot clinic was opened in city of Kerava, Finland by Laas-

tari. The experiences from the Kerava clinic made it possible to downscale the space needed from 45 m^2 to 25 m^2 for the next clinic in Lahti, Finland.

An important challenge for implementing healthcare services is the official industry regulations. Öhman sees traditional healthcare as a heavily protected and cost-inefficient industry that has a traditional way of doing things, with lots of interest groups involved in making any change hard. A new entrepreneur has to deal with the ambiguity in regulations in order to start-up.

Even though Laastari looks simple – it looks like small cafe or meeting place – behind that is a massively re-designed and effective back-end. Moreover, for the service to truly succeed, it requires a lot of changes to the current system, such as, changes in the division of work between doctors and nurses, greater transparency for the customer, so that they have better understanding of their health, reform of regulatory laws, etc. Öhman stresses that it requires a lot of work before such a new type of service can become medically compliant in Finland.

4.4 Measure

"Ride the trend, but adjust your service"

Laastari did not do any initial customer testing, because it is hard to test something that does not exist. In the case of novel services it is important to implement an initial service and adjust the service based on the feedback from that service. Öhman suggests that it is not imperative for a service provider to get the service right the first time but that they must iterate the design process until they get it right.

Laastari sees a big trend towards people being increasingly concerned about their health. From the outset, people have been outsourcing their healthcare to professionals without thinking about it, but this is going to change in the near future, as people want to control and access this information themselves.

Information security already exists for banking technology and can be easily developed for healthcare too but the lack of a regulatory policy, coupled with the lack of practical use-cases, makes user-privacy a stumbling block in standardizing healthcare records. However, Öhman feels that the hesitation towards online health information is similar to that for online banking in the 90s.

4.5 Strategy

"Go International as soon as possible"

Laastari is planning to succeed by redesigning the whole process. Without a total redesign, there is no possibility for a new cost structure, which in turn is a prerequisite for a new market. Laastari aims to go international with the concept; there are lots of resources that have been allocated to standardize the service and customer experience.

5 Scenarios for the Future

A suitable method for predicting how services are performed in the future is to build scenarios. In this section, we use Dynamic Service Design to formulate three future scenarios for healthcare that better suit the customer in order to understand the circumstances that will create opportunities. Dynamic Service Design extrapolates current trends in order to identify new scenarios, based on opportunities in: human resource management (i.e., division of work between nurses and doctors), medical process (i.e., better diagnostic technologies) and patient information (i.e., electronic medical records). These opportunities affect all the stakeholders in the healthcare industry and require explicit changes in healthcare regulations.

5.1 Nurses Are Able to Write Prescriptions

"Anne is a busy mother of three who suffers from recurring migraines. During a trip to the supermarket with her children, she realizes that the stress of the shopping experience is about to launch a migraine attack. She looks through her handbag for her usual medication, but realizes that she has run out. Fortunately she spots a kiosk clinic in the shopping center near the supermarket, and sees a nurse who is able to renew her prescription immediately. The prescription is renewed without delay, as a recent legislative change allows nurses to write prescriptions without the need to consult a doctor. Anne gets her medication, the migraine attack is prevented and Anne and her children are able to continue their shopping trip."

In this senario, due to the demand for creating more practical and cost-effective ways for utilizing the healthcare workforce, nurses are granted the right to prescribe medication through a legislative change. The change affects several actors in the healthcare network: patients, doctors, nurses, administrative staff and pharmaceutical employees, to name a few. For patients, the greatest impact of this is the reduced number of medical visits required to receive medications in common cases, such as when antibiotics are required to treat common illnesses. This improves patient access to medicine, but also has the side effect of the less trained nurses having a less broad knowledge of medicines they are prescribing than doctors. This increases the risk of misdiagnosis. Consequently, the range of drugs that nurses are able to prescribe under what circumstances needs to be carefully evaluated in order to minimize risk, liability and lawsuits.

For nurses this means an increase in workload and responsibilities, as some of the work previously carried out by doctors will be passed on to them. On the other hand, the workload of doctors will be reduced, giving them more time to deal with complex cases. This is also more cost-effective.

One potential problem experienced by pharmaceutical staff is that of less trained nurses prescribing medicine that they are unfamiliar with in inappropriate dosages.

For example, the amount of prescriptions asking for the textbook value of a drug (for example a certain number of micrograms) rather than an easily administrative dose, such as a single pill, increases. This causes problems for patients, who then have to break up pills into fractions, and for pharmacists, who are unable to offer the prescribed active ingredients in easily administered doses.

Using Dynamic Service Design in the previous scenario, *Discovery* takes place when a new opportunity is identified, here based on a change in legislation or regulation, leading to the case in which nurses are able to write prescriptions. Once this new opportunity is recognized the *Conceptualize* stage starts. Here, a plan is developed to take actions based on the opportunity presented above, looking to offer customers a better and faster service in prescribing the needed medicine and, for the service provider, obtaining the economic benefits that a less bureaucratic and time consuming procedure may offer. Following this, in *Implementation*, the devised plan in the previous stage is taken into to the real world. At this stage the real costs of implementing the design are taken into consideration and accounted for. Any possible issues, such as an overload of work for the nurses or legal liabilities, are considered and solved. Finally, in the *Measure* phase, a reality check for all stakeholders in the systems is realized, wherein the satisfaction of the customer and the benefits to the service provider are evaluated and taken into account in preparation for the next iteration of the cycle.

5.2 Dramatic Advances in Diagnostic Technology

"John is a professional football player from South Africa. A Finnish premier league team signs him up before the new season kicks-off. Since arriving in Finland, he has suffered from infectious diseases. Having had something of a wild youth, and knowing that in South Africa HIV is a very common disease, he starts to expect the worst. He decides to go to the public healthcare clinic to have an HIV diagnosis. He explains the situation and his background to the nurse, who fetches a lab-on-a-chip device designed for HIV diagnosis. The nurse explains that the chip measures the number of CD4+ T lymphocytes from a blood sample. The nurse injects a droplet of John's blood onto the chip, which gives the diagnosis in 20 seconds: negative. John sighs with relief as the nurse explains that John's immune system has not yet adapted to the local viral- and bacterial strains. After spending only ten minutes at the clinic, John is back in his car, driving home."

Once in a while a great breakthrough in technology can create so much value that it revolutionizes an entire field of business. In healthcare, that breakthrough may well be microfluidic lab-on-a-chip systems [35] that, which can diagnose several diseases from one single sample of blood or urine. A well designed lab-on-a-chip does not require an expert operator and is robust enough to be used in most of the remote locations of the developing world [36]. These chips have one or several micrometer-

sized channels and one single chip may be smaller than a fingertip. The sample can, for example, be divided into different kinds of channel in which specific diseases can be characterized, for example optically or chemically [35].

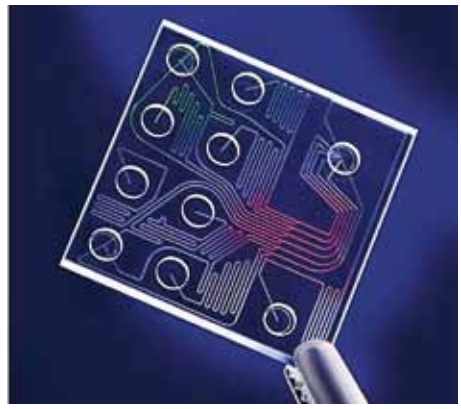

Fig. 5. Lab-on-a-chip manufactured by Agilent Technologies

In the near future, this technology could dramatically change how laboratories in healthcare facilities work. Being able to analyze samples in a matter of seconds, when in an ordinary laboratory the same analysis takes several hours, would save time and cost for both the laboratory workers and customers. When the technology becomes prevalent it could easily be mass-produced, which would reduce the production costs [36].

Use of lab-on-a-chips could be taught to nurses with simple instructions: operating the chips would only require taking a blood or urine sample and the chip would signal the result in an easy and clear manner. The laboratory staff could concentrate on more demanding diagnoses and recycle and refit the used lab-on-a-chips. Using lab-on-a-chips tests the patient would get an accurate diagnosis from the nurse, resulting in successful treatment.

This kind of technology could enlarge patient treatment capacity in both public- and private healthcare. It would ease the extent of work exhaustion amongst medical staff and lower treatment costs. Lab-on-a-chip technology could open up new profit opportunities by allowing a company to expand the business segment with especial benefit to kiosk clinics. Combining this factor with the idea of nurses becoming permitted to write prescriptions, with the possibility to discuss with a doctor who could confirm the analysis, would be a winning combination.

The service design cycle in this scenario begins with the *Discovery* phase; the innovators recognize the opportunity presented by a new, revolutionary product. Next, in the *Conceptualize* phase, the restructuring plans of the healthcare sector are started. The emphasis is on educating the nurses in lab-on-a-chip usage. This kind of technology also has an impact on the tasks and workload of laboratories and their laborants. This change has to be evaluated and measures have to be taken to reorganize laboratories for this new situation. The resultant restructured healthcare sector should result in improved customer- and employee satisfaction as well as increased financial benefits. The *Implementation* phase includes performing the planned changes from the previous stage. The last part in the first cycle is the *Measure* phase, wherein the benefits and drawbacks are analyzed and the reality check for all the stakeholders is performed.

5.3 Technological Solutions in the Healthcare Process Management

"Mika has visited a kiosk healthcare service several times in Finland. He has his medical record stored in an electronic medical record system. He is on a business trip to China and, during the trip, he gets the flu and a bad ear infection. The doctor in China does not speak English and does not know his medical history, such as allergies to medicines, etc. The Chinese doctor makes an on-line medical record request to the Finnish healthcare service and receives it immediately."

Health informatics is information technology that combines information science and the healthcare system. It refers to the resources, devices and methods that are used to optimize the acquisition, storage, retrieval and use of information in the healthcare service process. Medical information is collected, stored, and managed using medical software tools. In general, medical software can be grouped into following categories: monitoring software, medication pumps, analysis software, expert system and therapy delivery software [37]. Health informatics software, such as electronic medical record system, can be used to store, retrieve and modify patients' medical records [37]. At the moment, most healthcare services use their own electronic medical record software to record patient healthcare information. It does not allow information exchange between different healthcare service centers. In the future, it would be possible to standardize the format of patients' healthcare information so that it is exchangeable.

Dynamic Service Design could be used to design a medical information exchange system service. If, in the discovery process, service design professionals found that, from the customers' point of view, there was a need for a medical information exchange service in the scenario. Service design professionals would start to think what kinds of service could solve this kind of a problem. In the creation process, they might decide to create an information exchange service, so that a patient's health record can be sent to any other healthcare centre in the world in PDF format. In this process, service design professionals would have to research the relevant hardware and software that would be required to implement the information exchange service, as well as considering information standardization issues. After the research had been completed, they could make an information flow design. The measurement process would have to take place during this process. It would include the measurement of feasibility, competitor research, profit research, and customer feedback. If all the measurements gave positive results, the design process would move on to the implementation process, otherwise it would go back to the discovery process. During the implementation process, technical experts would implement the service and test the service product. The measurement process in this stage would include a usability test. In the strategy design process, service design professionals would have to conduct market research and decide how and when to adopt this service. Finally, they would

measure the service based on a competitor's similar service in order to find the weak points of the service.

Medical software innovation, especially open source medical software innovation, will create a great chance for improving information exchange services in the future. For instance, open source electronic medical record software could be used instead of other types of healthcare software. The drawbacks to adopting an information exchange service are the necessary charge involved and customer privacy issues. Many people want to keep access to their health information as restricted as possible. Therefore, the security issue has to be considered in the process of designing the information exchange system. For instance, the Privacy Act does not deal with the question of ownership of medical records in Australia [38]. Generally, the health service provider who creates a medical record owns that record and the patient only has access rights to the record [38]. Health service providers can charge for providing access to medical records under the new private section provision. The fee will basically include the costs of photocopying or of the labor involved [38]. Information exchangeability will benefit the healthcare service; for instance, it will help doctors make correct decisions without having to have prior knowledge of a patient.

6 Conclusions

This chapter presents a new method for the dynamic implementation of service design, which is mainly enabled by the easy access and quicker processing of stakeholders' information. In particular, we analyze its application by evolving pharmacies into kiosk health clinics. The key lesson learned from the case study is that every service design must iterate the service many times, in an agile manner, evolving the service in response to customer feedback. While they do not formally use Dynamic Service Design, Laastari's service design maps directly to it. One of the biggest challenges for kiosk health clinics is that everything needs to be built from the ground up, in order to avoid falling back into the traditional cost and service structure. To adapt the service for the modern customer, the healthcare industry should reconsider technologies (IT, medical), spaces (hospitals, pharmacies, malls), division of labor (nurses, doctors), etc. The opportunities shown in the three scenarios not only require explicit changes in healthcare regulations but also affect many stakeholders, i.e., more responsibilities for nurses, greater demand for specialized doctors, increased liability for kiosk health clinic's owners and modification to the curriculum of nursing and healthcare technicians.

The fundamentals of service design state that its goal is to give customers "what they want, the way they want, when they need it". Since customers are unique, knowing "what they want" and "the way they want" is a challenge. To better suit the customer's needs, the service provider should co-create with the customer, or use other ways of gaining meaningful insight into their behavior. Inputting this information to Dynamic Service Design creates a more pleasing and prompt service that makes it eas-

ier to provide the service "when they need it". We believe that using an adaptive and dynamic process to devise or design services is one definite way of achieving that goal.

One word of advice to service designers is to break a complex feature into simpler parts, so that the service can be adapted quickly, based on early feedback. However, the smaller/simpler parts should not be trivial and must already bring some value to the customer. We also recommend to the service provider that they should not lose their core values in trying to satisfy all customers' needs and that they should evaluate the potential benefits of any change in the service provided, using adequate metrics.

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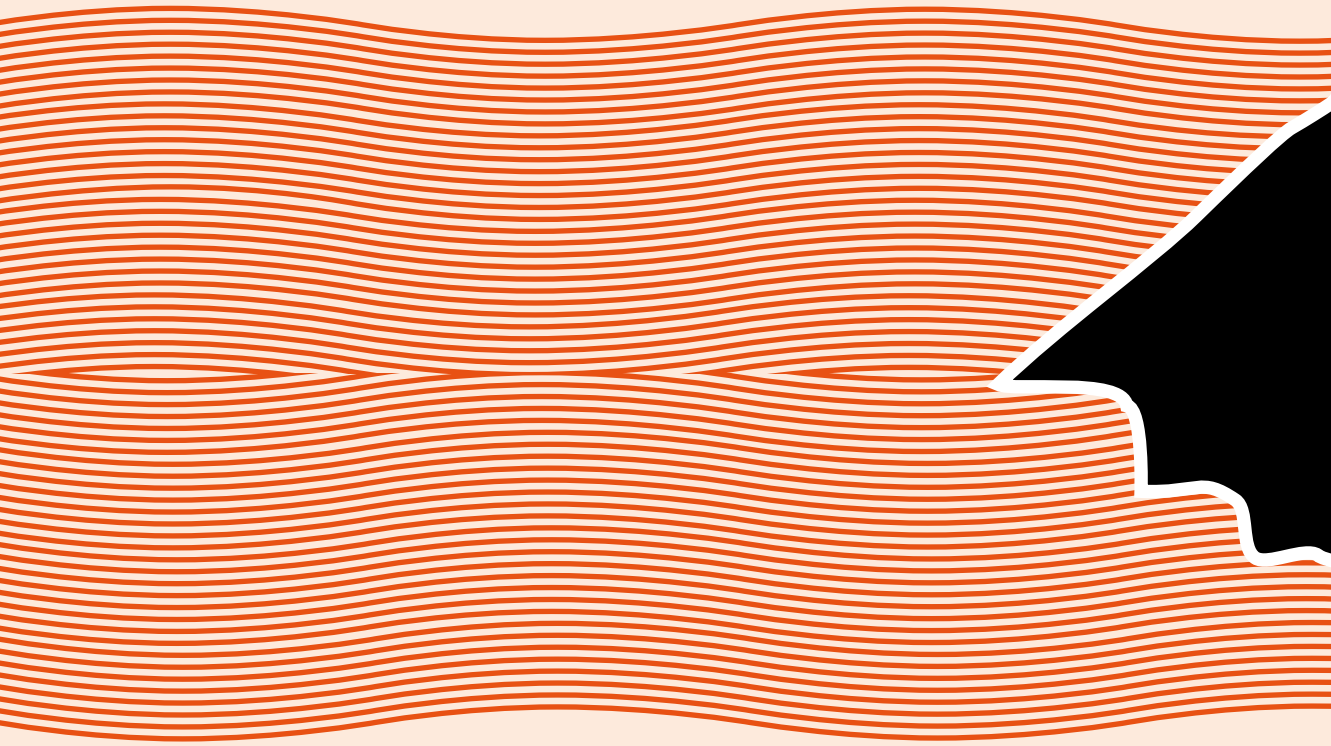


Appendices

1 The Bit Bang People

Management

Neuvo Yrjö – Bit Bang and MIDE leader
Professor and Research Director. Ph.D. in Electrical Engineering from Cornell University. He is former CTO of Nokia Corporation. He has been National Research professor at Academy of Finland and visiting professor at University of California, Santa Barbara.

Artimo Annika – MIDE Admin Assistant
MA from Helsinki University Faculty of Arts, major in Nordic Languages minors in Communication Sciences and Social Psychology. Has also studied Behavioural Sciences, and worked with for ex. product PR.

Ylönen Sami – MIDE Project Manager
Dr.Tech., in Automation Technology from Helsinki University of Technology.

Elina Karvonen – MIDE Project Worker from March 2011 onwards. MSocSci from University of Jyväskylä. Major in Political Science, minors in European Integration Studies, Economics, Business Studies and Gender Studies. Also studied in University of Latvia and in Aleksanteri Institute's Master's School in Russian and East European Studies. Has worked abroad with e.g. export promotion.

Tutors

Kuikkaniemi Kai – Project Manager in Helsinki Institute for Information Technology, Network Society research. Managing two projects, one focusing on playful biosignal adaptive social games and applications, and the other one on spaces with public display. MSc Industrial Engineering and BA in Motion Picture Production. Current research themes computer supported collaborative play and work, and adaptive multimodal applications.

Nangini Cathy – A postdoctoral scientist at Aalto´s Brain Research Unit. University background is in physics, with an MSc in geophysics and a PhD in medical biophysics. Scientific interests also includes education and media communication, written newspaper articles in both Canada and the US, and also produced two television pieces for the Discovery Channel during a summer internship.

Poudyal Aditya - Electrical Engineer, postgraduate studies at Department of Applied Physics/Renewable in the field of energy systems in emerging economies, focusing on the energy services issues in rural to urban transition. Has studied the rural electrification also in the field in Nepal.

Ramkumar Pavan – Bachelor's degree in Electrical Engineering from the Indian Institute of Technology, master's degree in Bioinformatics from the TKK. Currently works as a researcher at the Brain Research Unit in developing and applying advanced computational modeling and signal analysis methods for neuroimaging data.

Participants

Amin Parth - Indian, Masters in Computer Science Thesis topic: Future mobile networks, Spectrum sharing, Cognitive Radio. Interests: Tennis, swimming, reading about market trends, economics, flying kites.

Buda Andrea - Italian, M.Sc. in Computer Science, PhD candidate in the Department of Engineering Design and Production. Thesis topic: Simulation data and process management. Interests: Robotics, driving sports, swimming, action movies.

Christophe François - French, M.Sc. in Computer Science / Post-grad in Product Development and Systems Engineering. Thesis topic: Automated synthesis of conceptual design solutions. Interests: Biking, hiking, avanto, music (listening), movies.

Qu Zengcai (Eric) - Chinese, M.Sc. Space Science and Technology, Luleå University of Technology and TKK, PhD student in Electrical Engineering, Aalto University. Thesis topic: Energy efficiency control of electric drives. Interests: Calligraphy, swimming, skiing & skating, photography.

Parkkinen Juuso - Finnish, Field of study: Bioinformatics, Supplementary field: Computer and Information Science. Thesis topic: Probabilistic multi-source models for chemical systems biology. Interests: Skiing, ultimate frisbee, photography.

Peralta Cabezas José Luis - Chilean / Brazilian, M.Sc. Electrical Engineer (Major: Automation & Robotics; Minor: Medical Imaging Processing), Thesis topic: Energy efficiency in bipedal walking. Interests: Sports (football, volley & rock climbing), dance, music & theatre.

Grišakov Kristi - Estonian, B.A. in Art Research, M.A in European Urban Cultures (POLIS programme). Doctoral Studies in Urban and Regional Planning. Courses: Urban Renewal Studio, City in Crisis, Methodology and Scientific Communications. Thesis topic: Possibilities for ICT enforced urban planning of border-crossing regions. Interests: Cinematography, tennis, gastronomy.

Račkauskas Simas - Lithuanian, Ph.D. student in the Department of Applied Physics, nanomaterial group. Thesis topic: Synthesis of metal oxide nanostructures. Interests: Basketball, snowboarding, guitar.

Hatami Zagros - Canadian, B.Sc. Electrical Engineering, MA Industrial & Strategic Design
Thesis topic: Facilitating effective user co-production in digital services. Interests: Art & culture, ceramics, skiing.

Heikkilä Harri - Finnish, M.Sc. in Sociology & Communication Science. Graphic designer UIAH/kk. Usability studies at TKK. Thesis topic: Usability and graphic design / eReading. Interests: Audiobooks, cinema, badminton, cooking, transparent user interfaces, (tech) history.

Hyvämäki Tapani - Finnish, Ph.D. student in Control Engineering and Information Technology.
Thesis topic: Testing bayesian networks and clustering methods in maintenance fault detection. Interests: Gym, swimming, skiing, dancing + many kinds of outdoor activities.

Kiravuo Timo - Finnish, M.Sc. Computer Science, TKK. Thesis topic: Security of large ethernets. Professional interests: computer security and internet technologies. Other interests: Outdoors pursuits (backpacking, kayaking, sailing, skiing).

Korolyuk Anna - Ukrainian, M.Sc. Theoretical Physics. Thesis topic: Ultracold Fermi atomic gases. Interests: Social organisations and NGO, science journalism, entrepreneurship as way of life, dancing, joga.

Kuikka Meri - Finnish, M.Sc. (Econ) in Information Service Management, B.Sc. (Econ) in Business Technology. Thesis topic: Social media as an instrument of change. Interests: Technology, travel, sports.

Lyytinen Tatu - Finnish, M.Sc. (Econ) 2008/ PhD (estimated 2013) Thesis topic: Distributed business models for mobile services in low-income segments in emerging markets. Interests: Languages and intercultural studies (Spanish/Portuguese), capoeira, soccer.

Ojanen Pia - Finnish, M.Sc. in Computer Science, 21/60 of D.Sc. Level courses completed.
Thesis topic: Facilitating strong ties in online environments. Interests: Abyssinian cats, dancing, pilates, photography, electronic music, cooking, good food & wines, Social Network Services.

Rahikkala Antti - Finnish, Master's thesis in Industrial Physics, Minor subjects in Chemistry, Mathematics and Theoretical physics. Thesis topic: Block copolymer nanoparticles in drug delivery. Interests: Floorball, football.

Rahman Mizanur - Bangladeshi, M.Sc. Sustainable Energy Engineering 2006, PhD student at the Department of Energy Technology. Thesis topic: Rural electrification in developing countries: Sustainable solutions to environmental and social challenges. Interests: Touring, reading.

Raitio Tuomo - Finnish, Ph.D. student in the Department of Signal Processing and Acoustics.
Thesis topic: HMM-based speech synthesis. Interests: Nature, science, technology, philosophy, reading, diving, biking, snowboarding.

Rinne Timo - Finnish, MBA (Henley), M.Sc. Econ (HSE), PhD studies (24 credits), mainly research methods. Thesis topic: Organizational and management capabilities in small technology firms within the service business. Interests/hobbies: Forestry, physical exercise, studying/research, family activities.

Singh Varun - Indian, Product Development, Global IP race, Operator Business, Future Internet, Protocol Design. Thesis topic: AMUSE: Adaptive Multimedia Environment. Interests: Growth startups, technology, gadgets, photography, travel.

Sivill Leena - Finnish, Lic.Sc.(Tech) TKK, 2003
Thesis topic: Energy management in industry: Role of energy performance measurement. Interests: Violin playing (member of the Polytech Orchestra), sailing.

Tokola Henri - Finnish, M.Sc. in Computer Science (2008), PhD studies: Courses from Mechanical Engineering, System Analysis and Computer Sciences. Thesis topic: Online optimization and production planning. Interests: Spending time with my child, research, reading.

Zhang Zhe - Chinese, Bachelor in Environmental Engineering, Tampere Polytechnic, Masters in Geoinformatics, Department of Surveying, TKK.
Master's thesis: A spatio-temporal population model in alarming, situation picture and warning system. Interests: Swimming, movies.

2 Bit Bang Guest Lecturers Fall 2010 – Spring 2011

Aaltonen Petri, Partner, Perfecto Ltd
"Team Cooperation"

Aho Esko, Executive Vice President, Corporate Relations and Responsibility, Nokia

Brown David, CEO, Canatu Ltd

Colagrossi João, President Services, Metso
"Metso's services business. Mining and Construction Technology"

Harald Bo, Head of Executive Advisors, Tieto
"Towards a Real Time Economy in the Single European Market"

Hurri Pasi, CEO, BaseN

Kallasvuo Olli-Pekka, Chairman of the Board, Nokia Siemens Networks

Keränen Seppo, Senior Consultant, Finpro

Ketola Tuomo, Service Designer, Palmu Inc.
"Designing Services"

Kivinen Lauri, CEO, The Finnish Broadcasting Company YLE

Kuo Jay, Professor at the University of Southern California
"Paradigm Shift in Modern ICT Era and ICT-enabled Web Services"

Kyösti Veijo, Managing Director, Cesim Ltd.
OnService Business Simulation Game 13.10-24.11.2010

Lehti Eero, Member of Parliament, Entrepreneur

Poudyal Aditya, Researcher at Department of Energy Technology and Tutor at Bit Bang 3
"Reflection from Bit Bang 2"

Salmi Timo, CEO Entetrainer Ltd.

3 Course Literature

Barringer, Bruce R. & Ireland R. Duane (2010) Entrepreneurship. Successfully Launching New Ventures. 3rd edition. Boston: Prentice Hall.

Bettencourt, Lance A. (2010) Service Innovation. How to Go from Customer Needs to Breakthrough Services. New York: McGraw-Hill.

Bit Bang II. Energising Innovation, Innovating Energy. Yrjö Neuvo & Sami Ylönen (eds.) 2010.

4 Study Program in India

January 9th – 15th 2011

Sunday, January 9th 2010
06:25 Arrival at Indira Gandhi International Airport for transfer to a domestic flight to Bangalore

12:35 Arrival at Bangalore Airport
Hotel in Bangalore:
The Chancery Hotel
10/6 Levelle Road, Bangalore

14:30 Lunch at the Colours Hall

16:00-17:30 Finpro presentation by Ms. Ambika Oberoi, Senior Consultant at Finpro India
Venue: Colours Hall, The Chancery Hotel

Monday, January 10th 2011
07:30 Departure from the hotel

09:00–10:30 Meeting with Mr. Ravi Dasgupta, Head of HR at Biocon, and Mr. A.S. Manjunath, Manager (Admin.) at Biocon
Venue: 20th KM Hosur Road, Electronic City, Bangalore
www.biocon.com

12:00–14:00 Meeting with Mr. Vesa Törmänen, Head of Life Tools R&D at Nokia India Pvt. Ltd.
Venue: 'Lal Qila 3001 Room' #2B, Mercury Block, Prestige Tech Park, Sarjapur, Marathahalli Ring Road, Kadabeesanahalli, Bangalore
www.nokia.co.in

15:30–17:30 Meeting with Prof. Swami Krishnan, Corporate Communications at Indian Institute of Science
Venue: Dept. of Management Studies, Malleshwaram-Yashwantpur,
Chuwdayya Road
www.iisc.ernet.in

18:30 Arrive at hotel

Tuesday, January 11th 2011
07:15–07:45 Check out from hotel

09:00–10.15 Meeting with Mr. Manan Bhatt, SVP External Relations at Avesthagen Ltd.
Venue: Discoverer, 9th Floor, International Tech Park, ITPL-Whitefield, Bangalore
www.avesthagen.com

11:30–14:00 Meeting with Prof. Swami Krishnan from Corporate Communications and Prof. T.K Srikanth from R&D at Sasken Communication Technologies
Venue: 139/25 Ring Road, Domlur, Bangalore
www.sasken.com

14:00 Departure for Bangalore Airport for flight to Delhi

20:05 Arrival at Indira Gandhi International Airport, New Delhi. Airport pick-up by coach arranged by Finpro.
Hotel in New Delhi:
Hotel Jaypee Vasant Continental
Basant Lok, Vasant Vihar, New Delhi

Wednesday, January 12th 2011
09:45–14:00 Meeting with Mr. Dinesh Sharda, Head Mktg. Communications Asia Pacific at Metso Minerals (India) Pvt. Ltd., Bawal facility
Venue: Plot #177-178, Investate, HSIDC Growth Centre, Bawal, Dist. Rewari, Haryana
www.metso.com/in

14:00 Meeting at the Kingdom of Dreams, Great Indian Nautanki Company Ltd.
Venue: Auditorium Complex, Sector 29, Gurgaon, Haryana
www.kingdomofdreams.in

Thursday, January 13th 2011
9:30–11:00 Meeting with Mr. V. K. Malthora at Maruti Suzuki India Ltd.
Venue: Nelson Mandela Road, Vasant Kunj, New Delhi
www.marutisuzuki.com

11:30–13:00 Meeting with Dr. Saugata Mukherjea, Senior Manager at IBM India Pvt. Ltd. (India Research Lab)
Venue: 'Mandap' Conference Room, Hotel Jaypee Vasant Continental
www.ibm.com/in/en

13:00–14:00 Lunch in Conference Room, Hotel Jaypee Vasnan Continental

15:00–17:30 Meeting with Dr. Surendra Prasad, Director at the Indian Institute of Technology, Delhi (IIT-D)
Venue: Department of Electrical Engineering, Hauz Khas
www.iitd.ac.in

Friday, January 14th 2011
08:30–10:00 Lecture by Mr. Gerard de Nazelle, Chief Operative Officer of Polygenta Technologies
Venue: 'Mandap' Conference Room, Hotel Jaypee Vasant Continental
www.polygenta.com

10:00–11:30 Meeting with and presentation by Mr. Juha Pyykkö, Counselor at the Embassy of Finland
Venue: 'Mandap' Conference Room, Hotel Jaypee Vasant Continental
www.finland.org.in

14:30–16:00 Meeting with Mr. N. Sivasamban, VP – Telecom and Ms. Yogita Dasgupta at Tata Consultancy Services Ltd.
Venue: CMC Board Room, 5th Floor, PTI Building, 4, Parliament Street, New Delhi
www.tcs.com

18:30–21:30 Closing Dinner
Venue: 'Mandap' Conference Room, Hotel Jaypee Vasant Continental

Saturday, January 15th 2011
07:00–07:30 Check out from hotel

07:30 Depart for Indira Gandhi International Airport for flight to Helsinki

14:50 Arrival in Helsinki

Contacts Finpro India
Ms. Anna Erkkilä, Senior Consultant & Head of Trade Center – Mumbai
Ms. Ambika Oberoi, Senior Consultant, Finpro India
Mr. Sudarshan Itkyal, Market Analyst, Finpro Mumbai

5 India Study Tour Reports

Summary of Sunday 9th January – 14th January

January 9th

Finpro

The contrast between western and eastern cultures could be felt immediately after our arrival to Bangalore. The day before, we were wearing our winter coats due to minus 5 degree frost, but now everyone had t-shirts on in the +26 heat in the sun.

Bangalore is often called the Silicon Valley of India. It happened around twenty years ago when companies started to come here, and now there are a lot of firms specialising in IT, electronics, and research & development (including biotech). We visited a few of them during the next two days, but our study tour started with the presentation of Ms. Ambika Oberoi, Senior Consultant from Finpro India.

India is a very specific country for doing business. First, there are a huge number of young people, who in a few years will become a powerful working force. Now one-half of the population of almost 1.2 billion is under the age of 25. Secondly, English is one the official languages (the other is Hindi), which helps for communication. And, thirdly, 70% of the people reside in rural areas. This implies that a lot of people have access only to a mobile phone, but not to a computer.

The village entrepreneur model is an example that demonstrates the peculiar properties of business in India. In a rural country, the majority of inhabitants are involved with agriculture. The level of education and IT skills among them varies a lot, so it is difficult to directly disseminate knowledge useful for farming. So the solution is an e-agriculture kiosk, one for each village or a few villages.

The kiosk includes a computer with an Internet connection and powered by solar batteries. The operator, an educated farmer trained in IT, must be well chosen from the local population. The kiosk operator provides villagers with access to needed information, which includes data about weather, animal husbandry, local price for crops, new technologies, governmental subsidies, and consultancy with experts. Also very popular is exchange of socially important information, such as job search, communication with friends and relatives, matrimonial advertisements.

The entrepreneur, kiosk operator, has a duty to maintain the equipment and to disseminate important information to villagers. He earns percentage on services and gains prestige in society. Preliminary estimates indicate that an investor in this business makes his money back within a year.

Ms. Oberoi also gave a few useful tips for Europeans entering the Indian market. First, it is very important to choose local partners. One common mistake is when a foreigner starts a partnership with someone he met only once at a party. It is significant to learn more about a partner and his/her background. The second new experience is the need to communicate a lot more than Europeans do with each other.

"Indians just love to communicate," said Ms. Oberoi. The last intercultural difference is the level of initiative. In India, people respect a hierarchy, and it is very unlikely that they will suggest a bright idea to their boss.

Finally, Ms. Oberoi invited Finnish companies who are considering starting a business in India to use the service of Finpro. The fast growing Indian market can be a great opportunity both for settled companies and for start-ups.

January 10th

Biocon, Bangalore

Our visit to Asia's largest biotech company, Biocon, consisted of two parts: a corporate presentation followed by a question and answer session, and a visit to an insulin production facility on the corporate campus.

The company was founded in 1978 by microbiologist and brewery science graduate Kiran Mazumdar as an enzymes company, which was later divested into novozymes and generic formulations and now describes itself as a company specializing in branded formulations and new drugs. Biocon is currently the world's fourth largest manufacturer of insulin and staffs over 5,000 employees.

India's patent system was changed from a process based model to a substance or compound based model in 2005. This played an important part in Biocon's development as well as for the rest of India's pharmaceutical industry. The company started focusing on discovering new substances rather than new production methods for existing compounds, leading to an increased need for risk management. The risk involved in new molecule discovery is much higher than the risk in process development, as approximately 1 out of every 30,000 molecules researched has the potential to become a new medicine. The discovery and validation of new substances is not a simple process, taking 7-12 years on average to complete, so the company has to consider market development as well. At the time of our visit, the company was working on developing products aimed at entering the market in 2018 at the earliest, and projects undergoing clinical trials included fast-acting insulin analog, oral insulin, and psoriasis medication. The current focus of the company is on chronic illnesses rather than infectious diseases.

Biocon is an umbrella group covering Syngene, Biocon Research Ltd, Clinigene, Biocon Biopharmaceuticals, Axicorp, and several alliances. The company's employee profile includes pharmaceutical and biotech backgrounds as well as bioinformatics and information communication technology (ICT), chemistry, and manufacturing. ICT professionals are needed because robotics is a driving engine behind molecule testing. A few decades ago, a good laboratory could test 500 molecules a year, a number which automation has helped increase to 250,000 per day. The recruitment and re-migration of Indian expatriates working in countries like the United States is a growing trend, as the demand for highly skilled labour and business know-how is increasing.

The company is currently positioning itself as both a pharmaceutical company (small molecules) and a biotech company (big molecules and more complex diseases), as the market for pure pharmaceutical companies is dwindling. According to the Dr. Shenoy, one of the reasons behind this is that pure pharmaceutical companies are viewed as slow moving, while biopharmaceutical companies are perceived as being closer to the cutting edge. Collaboration with other industry players is a must, as it provides information exchange and facilitates innovation. Biocon also does not have the capital needed to take new drugs to market and needs global partners to achieve this.

Biocon takes corporate social responsibility seriously, providing education grants, sanitation programs, and medical micro-insurance at a cost of 10 INR/month to the community. The general atmosphere in the company, as well as that in the Indian economy in general, is one of optimism fuelled by a high growth rate and a strong "we can do this" attitude.

Nokia Research Center, Bangalore

Nokia's Bangalore R&D Center serves the Indian market. While Nokia's strategy is to have only global products, local markets require variations to the global product. As India is huge and very diverse, there is no single "Indian market". India can be roughly described as having three segments:

- A young, somewhat affluent urban population in large cities considers the phone a functional fashion statement. Mobile phone penetration in cities with over 100,000 inhabitants is close to 100%.
- Small town dwellers have adopted the phone as a functional tool and business enabler. This "aspiring population" takes advantage of the technology, and sellers of door-to-door services have begun to let customers reach them by phone.
- Rural India, living in villages, has poor penetration and the lack of literacy is a further challenge. At the same time, this vast and poor underclass represents a huge potential market.

The Indian market has its own challenges. For example, there are many local operators and their pricing structures differ, so customers prefer multi-SIM phones that let them use different operators for phone calls and Internet access. Fixed Internet penetration is poor, so the mobile phone serves as an Internet terminal, too. Competition is tough, including illegal copying of telephones and phones that do not conform to telephony standards. However, Nokia has an excellent brand image in India and is generally considered one of the most trustworthy companies.

Part of our visit focused on the Nokia Ovi Life tools, which are targeted to the vast rural poor segment of the Indian economy. The aim of these services is to provide customers with information that assists them in farming (such as market and weather information), education, and entertainment.

Ovi Life Tools are a challenge to design. Packet data is not available or is too expensive for the customers, thus the service is based on SMS technology. Available handsets are from the low end of the market, costing 15-20 euros, and the customers can afford to pay less than one euro per month for the service (the rough price quoted to us was one rupee per day, which is about two euro cents).

The prevalent optimism in India was present here, too, and while the rural population was seen as a potential source for profit, the Life Tools were also seen as a way to help the people rise out of poverty. Education and agriculture-related information can help the poor help themselves.

Indian Institute of Science – IISc, Bangalore

We visited the Indian Institute of Science, Bangalore (IISc) on Monday afternoon. Our meweting consisted of three presentations. Professor M. H. Bala Subrahmanya presented the history of the department of management studies, Dr. Prameshwar P. Iyer told more about the university, and Mr. Anand Talwai described entrepreneurship issues in the India.

Department of Management Studies

The department of management studies was founded 1948 by J.N. Tata. Traditionally, it has focused on public sector, economic planning, and small scale issues. They have two general focus areas: technology management and business analytics. Technology management focuses on research and development issues in management, whereas business analytics uses operation research methods to analyse systems. The department has 5-10 faculty members. Since its founding, there have been 106 Ph.D., 42 M.Sc., and 293 M.Tech graduates from the department. The department has several postgraduate research programs. The normal program takes 6 years, and it is funded by a grant (300 dollars/month). There is also a 3-year college and 1-year R&D program for company executives. The number of researchers varies from 6 to 8.

Indian Institute of Science

The Indian Institute of Science was founded in 1909 by the famed industrialist, Jamsetji Tata. In his vision, the IISc should implement applications for benefit of Indians. Nowadays, it is typically ranked higher than any other Indian university in world rankings. As a visitor commented, “even the trees seem to be intelligent here”. The institute focuses on research, learning and training, continuing education, consultancy work, and entrepreneurship. It has two faculties: science and engineering. The faculty of science consists of the departments of biology, chemistry, mathematics, and physics. The faculty of engineering consists of electrical engineering and mechanical engineering. There are 1,880 male and 470 female students. The number of researchers was 1,700. The faculty has 323 academic persons and 124 science persons.

An interesting feature of IISc is the four year B.Sc. program, in which all students

study same subjects the first year and a half, and only at the beginning of the fourth semester, the "free electrons" select their majors.

Entrepreneurship was discussed and, as is typical for India, facts and counter-facts were found. While India is known for its entrepreneurship, there is also a strong "get a degree, get a job" mentality, as parents guide their offspring to select a secure future for themselves. Also, the concept of "necessity entrepreneurship" came up, as people are sometimes forced into entrepreneurship by the lack of employment.

Entrepreneurship in India

IISc alumni Mr. Anand Talwai has had an interesting personal journey, from satellite technology via Wipro to starting his own companies with friends. He exemplifies the stereotypical Indian returning entrepreneur, making his career in the Silicon Valley and is bringing the benefits back to his home country. It should be noted that India's technology entrepreneurship really got started only in 1991 with the liberalization of the economy.

Mr. Talwai's latest involvement is with a start-up called NextWealth, which implements a model for distributing work to rural areas and disabled persons. The first projects have started and provide employment by providing IT-related and educational services to foreign and local customers over the Internet. Mr. Talwai was very enthusiastic about this social entrepreneur model, where the target is not only to make a profit, but to provide work and education to the people.

As for the challenges to entrepreneurship in India, Mr. Talwai stated: "Money is available. Matching the right money to the right entrepreneur and the right idea is the thing."

January 11th

Avesthagen Ltd.

The Bit Bang group departed from the hotel at 7:45 a.m. for a meeting with Avesthagen Ltd. Due to a massive traffic jam on the local highways, the meeting was delayed, but we finally arrived at the destination, the International Technology Park, east of Bengaluru. Mr. Manan Bhatt, the senior vice president of external relations, kindly welcomed us to the meeting.

Avesthagen was founded in 1998 by Villoo Morawala-Patell, who is the current chairperson and managing director of the company. Since then, Avesthagen has grown to a globally recognized system biology company with a business model focused on the convergence of food, pharmaceuticals, and population genetics. The convergence of these areas aims at continuous innovations in predictive, preventive, personalized healthcare. The business model is based on combining IP and product development through in-house research and collaborations. The shares of Avesthagen are internationally owned, mostly in the USA, UK, and India.

Avesthagen has four strategic research units. The science and innovation group

develops technologies through collaborative R&D. It is the main driver in the creation of the company's IP. Their work includes research on population genetics, cancer stem cells, molecular diagnostics, and natural drug discovery. The BioNutrition group focuses on developing scientifically validated bioactives from Indian medicine plants for prevention or treatment of degenerative conditions such as diabetes and obesity. The idea is to utilize thousands of years of knowledge and move from chemically generated medicines to plant-based medicines. The BioAgriculture group focuses on developing environmentally adjusted crops for global environmental challenges and sustainability. The BioPharmaceuticals group focuses on medicines that have a high barrier entry in production or market.

Interestingly, Avesthagen collaborates with the VTT Technical Research Centre of Finland in Oulu. A stunning aspect of their strategy is the punch line, "predictive, preventive, personalized healthcare", which summarizes the development of medicine and healthcare in the future. Their aim is to move from the paradigm of today's functional foods to medical foods in 2012, and in the future to nutrigenomics, taking into account the effect of food on gene expression. In summary, Avesthagen is a solid, fast-growing company aiming at future medicine.

Sasken Communication Technologies

Sasken provides R&D services in the area of communication technologies combining near-shore and off-shore strategies. Off-shore R&D outsourcing benefits from cost, scale and talent and near-shore provides proximity and trust. However, the company named the most important future direction is to change its business model from providing cost benefits to a sharper focus on high-end R&D services in the value chain. The Bit Bang group got a very warm welcome, and discussion was interactive throughout the session. Four key learning can be drawn from this visit.

First, a company needs to operate globally while at the same time understand local markets. This is done with local features and the use of local talent. This creates major challenges to manage its operations. Second, the ICT industry is very volatile and quickly changing. A company has to follow and react to global technological developments to be able to provide high standard R&D services to its customer. This was named the second big challenge for the company. For this reason, the product development life cycle needs to be reduced - sometimes from several months to weeks or even to days. Third, we discussed open and collaborative innovation and how Sasken balances between cooperation and competition, as some companies can have dual roles. Non-Disclosure Agreements (NDA) as well as mutual respect was named as a key factor. A 3 to 6 month cooling period is required many times from employees when Sasken works with different companies in similar projects. R&D services require much closer cooperation with the core business of the client's company than, for example, business process outsourcing does. Fourth, cultural issues were discussed between Finns and Indians, which gave insight to the Indian working culture. Prof. Krishnan offered the example of Indians always believing that bananas are curvy, but

if Finns decide that bananas are straight, they will build straight bananas.

January 12th

Metso Minerals at Bawal

Metso defines itself as a "global supplier of sustainable technology and services for Mining, Construction, Energy, Metal Recycling and the Pulp and Paper industries." Metso's eight business lines are organized into three segments: Mining and Construction Technology (MCT), Energy and Environmental Technology (EET), and Paper and Fiber Technology (PFT). Metso operates in more than 50 countries, including India and China. Unlike in China, where the PFT segment is the main focus, in India, the main activities of Metso are concentrated on the MCT business. This is due to India's growing economy, which demands increasing investments in the country's infrastructure and industrial development.

Metso's presence in India started in 1992 and now the company operates in nine locations across India, mainly in the Mining and Construction Technology segment (about 646 employees), Energy and Environmental Technology (about 145 employees), and Paper and Fiber Technology (about 30 employees). The company's good reputation in India constitutes an important asset in the Indian market, which highly appreciates their brand image. This is also exemplified by Metso's Bawal products where acquired old brand names such as Nordberg still stand out.

Metso Minerals has a manufacturing unit in Bawal (Haryana), located 100 km southeast from the city of Delhi. The Bawal factory produces portable crushing plants, vibrating equipment, slurry pumps, lamella thickeners, and magnetic separators. The factory has been in operation since 1998 and currently employs around 200 people.

The Bit Bang 3 team was welcomed by Dinesh Sharda, head of marketing communications in Asia Pacific, two Bawal directors, and Julius Mäkelä, an engineering team leader from Finland who has worked in India for 1.5 years.

Metso's challenges in India mainly relate to the strong growth of the Indian economy, the subsequent lack of appropriate infrastructure, and the general lack of environmental technology know-how. For example, every manufacturing facility has to be self-sustained in terms of energy because the electric grid suffers from regular power shortage. The regulatory diversity between different locations in India also poses challenges to business expansion, e.g., there are heavy land-use restrictions.

Metso is now expanding its manufacturing and localised R&D operations to the city of Alwar, Rajasthan, located about 100 km south of Bawal. Metso Park in Alwar is Metso's single largest green field investment anywhere in the world, providing employment opportunities for about 700 people. Metso Park will initially focus on meeting the growing demands for the company's products and services in India. It will also cater to the company's demands across the Asia Pacific region serving as Metso's third engineering hub, after Helsinki and the U.S., for its global operations.

In recent years, Metso has been paying increasing attention to its services business focusing on providing performance instead of merely supplying machines and equipment. As Dinesh Sharda explained, "a crusher is a crusher, a mechanical machine; the differentiator is the service." Metso's service business has doubled since 2001 to EUR 2.2 billion, accounting for 35% of its net sales. This service orientation was also evident in Metso's activities in India, positioning itself as a life-cycle service provider enabling better results and performance with a smaller environmental impact.

January 13th

Maruti Suzuki India Ltd.

SUZUKI MARUTI
Count on us

"Let's make PMS[1] our way of life"

On Thursday morning, we went to visit the Maruti Suzuki factory. Maruti Suzuki India Ltd. is a partial subsidiary of Suzuki Motor Corporation of Japan and is India's largest passenger car company, accounting for over 45% of the domestic car market.

It was a pity that we did not have time to make any questions; that's understandable when you must produce a car every 16 seconds. From what we saw during the video, the numbers of this company are impressive: they currently produce 4,500 cars per day and around 1 million cars per year. In total, they sold over 8 million vehicles. Besides these numbers, it was interesting that the actual automobile crises have had no influence on them; they constantly grow every year. It was only in 2008-2009 that they had a very small decrease in sales, one that cannot be considered a crisis. The reason for these good results is simply the increasing quality of life in India and the consequent need for "comfortable" mobility.

The factory that we visited produces cars mostly for the local market and for Asia. In Europe, they export around 400,000 cars a year, all branded as Suzuki. The cars exported are basically the same except for the airbags, the right-hand drive, and a different exhaust.

What we saw in the factory was a complete assembly line. From start to finish, a car takes 12 hours to produce, and 6 of those are for the painting process. It was interesting that the Japanese partner exported not only the working method but also all the machinery and equipment.

Like all the other companies that we visited, Suzuki Maruti is involved in some social program, particularly vocational training and health care.

1 **PMS – Production Management System**

IBM India Pvt. Ltd. (India Research Lab)

"... and machine will talk to man, and answer questions."

Back at the hotel, Dr. Saugata Mukherjea, Senior Manager from IBM India (India Research Lab), gave a talk about IBM research and their current activities in India. IBM has expanded a lot, being the second largest IT company in India. Current priorities in India include infrastructure services, contact centre innovation, industry solutions for mobile space, and global delivery framework. IBM has established 11 research labs worldwide. The first IBM research lab in India was founded in 1998 in Delhi, followed by second lab in Bangalore in 2005.

IBM research is active in several fields. The current trend is to move towards a service-oriented model and integrated solutions. The research focus is more on solving business problems, but exploratory research is conducted as well. IBM in India is competing on innovation, not price. Fifty percent of the workers have doctoral degrees from respected institutions. IBM also collaborates with academic institutions. Research ideas emerge both top-up and bottom-up, while the company regularly defines the context of "Big Bets".

Current activities were elaborated with examples. Many of them were based on information analytics: a machine competing with humans in a quiz show, social network analysis, text and speech analysis for screening and evaluating resumes, trends, and language skills. IBM research is also developing mobile web solutions for enterprises and emerging markets. They are aiming to develop a spoken Web, in which users can create, consume, and browse audio content using speech.

Indian Institute of Technology, Delhi (IIT-D)

"To get to IIT is a lottery"

On Thursday afternoon, we visited the Indian Institute of Technology (IIT) in Delhi. We were hosted by Dr. Basami Bhaumik and her colleagues, who gave us a good

overview of IT Delhi and its operations. IIT Delhi is part of the IIT group, which consists of 15 independent engineering and technology-oriented institutes of higher education throughout India. IIT in Delhi offers both undergraduate and postgraduate programs in 13 departments and 11 multi-disciplinary centres in several fields of engineering, mathematics, physics, chemistry, etc. In addition to these departments and centres, three schools of excellence are established in the areas of biological sciences, information technology, and telecommunication technology & management.

The undergraduate program takes an average of four years and the master's program takes four plus 2 years. Only one out of 60 applicants gets accepted at IIT. Annual tuition is 25,000 rupees and about one-third of the students receive scholarships.

Postgraduate programs include different master's programs and doctoral programs. Some of the master's programs are sponsored by industry as well as many of the laboratories in IIT. Postgraduate students, especially PhD candidates, often participate in contracted research projects where the client is a private or public organization. IIT receives the most of the funds from the government (80%) and a minority from the private sector (20%). The doctoral program takes 4-5 years to complete on average. 214 doctors graduated from IIT Delhi in 2010.

Indian PhD graduates who live abroad are gradually moving back to their home country. A professors' salary in India is modest compared to many other countries. Only Indian-born PhDs can apply for permanent professorship in IIT and other universities in India. Foreign PhDs can apply for a maximum 5-year professorship.

Alumni activities have recently started within IIT Delhi. In total, over 30,000 engineers, technologists, scientists, managers, and entrepreneurs belong to the IIT Delhi alumni. In addition to arranging meetings and reunions, the IIT alumni association has contributed to IIT operations by providing student/faculty/research awards, scholarships, and financing infrastructure in the IIT Delhi campus area.

After an interesting presentation of IIT Delhi activities, we visited three laboratories at the Bharti School of Telecommunication Technology and Management (computer, wireless, communication labs).

January 14th

Polygenta Technologies Ltd

Polygenta Technologies Ltd processes used plastic bottles into polyester and other polymers that are used as raw materials, e.g., for bottles and clothes. Their competitive advantage is a unique chemical process that allows them to use any kind of used plastic bottles without having to separate different types of bottles beforehand. The process can also handle dirty bottles, making it especially valuable in India. Polymers produced by Polygenta are 100% recycled, making them very attractive. The main customers of Polygenta are soft-drink companies and sports clothing companies.

There is a worldwide need for this kind of solution because there are not enough raw materials, such as plastic, to support billions of people with western-style con-

sumer habits in the future. More efficient recycling of existing materials is thus vital for sustainable development.

In addition to having an environmental cause in their business, Polygenta has also become a highly successful company. It acts as an example of a company where an entrepreneurial spirit has combined advanced technology with a promising business opportunity and is able to both create value and participate in sustainable development.

Although Polygenta's business fits well in India, it has faced many problems. Energy supply is a big issue, as the production plants require a lot of energy. Corruption is also an issue that has to be dealt with daily. There seems to be many things India must improve if it aims to become a true economic superpower.

Embassy of Finland

The main goal of the Embassy of Finland in India is to promote the interests of Finland, and the Finnish people and companies in the country. Their work is to create and maintain good relationships to Indian politics and different authorities, and act as a communication channel between Finnish and Indian actors.

One key element in the Embassy's agenda is trade promotion, which in practice means monitoring and reporting business and legislation development in India from a Finnish perspective. If, for example, they recognize possible problems for foreign trade or market entry, they can contact local authorities and propose changes. They can also act as a part of EU, thus having more power. In developing countries such as India, it is also important to facilitate access to local officials for Finnish companies.

The representative of the Embassy describes India's business environment as diverse, versatile, demanding, and culturally rich. According to their words, India is the place to be in this decade, as both the political and economic role of the country is increasing rapidly. Finland has also succeeded in this, having a much bigger presence in India than expected for its size. An especially promising direction would be to develop business targeted to the rural areas of the country.

The main problems and obstacles for business include technical barriers to trade, a complicated tax system, restrictions for foreign investments, and corruption. High inflation and a complicated bureaucracy are also problems the government should deal with soon.

Tata Consultancy Services Ltd.

TaTa is a worldwide company which has operations in every major international market. The presentation was divided into three parts: Operation IT environment in India, entrepreneurship in India, and an overview of TaTa company. The presentation started with the introduction of the India economic and IT environment.

The Indian economy is growing fast. In 1990, India was a closed economy, but during the last decades, India GDP has grown about 8-10%. India is experiencing 20%+ growth at the top of the income pyramid. Household expenditure on communications is expected to increase from Rs 1600/year in 2005 to 15000/year by 2025.

All of these facts show that there are huge business opportunities in India.

India has the following strengths for creating a successful business.

1. Lower cost of delivery. Labour is cheaper than in European countries. Therefore, India can serve as a centre, delivering products and technology to other countries.
2. High-calibre talent pools. India has high-quality education, which means that one can hire talented people at a lower cost compared to Europe or the U.S.
3. Robust process
4. Business environment and infrastructure. India is growing very fast, and the business environment and infrastructure is also developing.
5. Growing Indian market. India has a big population and it is still growing fast. India is already a big market by itself.
6. Transforming clients business
7. Global footprint
8. Focus on sustainability

Entrepreneurship in India can be divided into four levels. At the first level, the entrepreneurship focuses on agriculture and other activities, such as crop production, plantation, forestry, fishing, etc. In the second level, entrepreneurship focuses on trading services such as wholesale and retail trade, hotels and restaurants. In the third level, old economy or traditional sector entrepreneurship is introduced. Finally, in the fourth level, the entrepreneurship is focusing on emerging sectors which include knowledge intensive sectors such as IT, Finance, Insurance and Business services. India is emerging as the one of the big centres of entrepreneurship.

TaTa group is India´s largest business group, which produces 5.4% of India's GDP. TATA has seven business sectors with operations in over 80 countries. TaTa is the largest employer in the private sector in India with more than 363,000 employees. In January 2011, it had a market capitalization of USD 100 billion. The TaTA group companies are TaTa Steel, TCS and TATA Communication, TATA Power, TaTA Chemicals, Indian Hotels, and TATA teas.

6 OnService Business Simulation Game

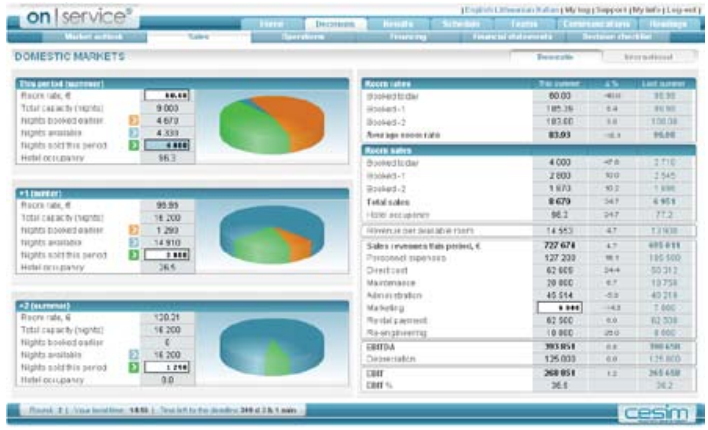
The course trained their entrepreneurial skills with six rounds of the game (Oct 13–Nov 24 2010).

cesim
PRACTICE MAKES PROFIT

on | service

Cesim OnService, services management simulation for educational institutions.

Cesim OnService simulation is designed to give students the opportunity to practice with the key success factors that are relevant to any service business in small and medium size enterprise (SME) environment. Teams' goal is to manage the overall operating, market, and financial performance of a service business in competitive markets with seasonal variations in demand and economic conditions.



Human resources management, capacity management, investments, service quality, pricing, and marketing are the key decision-making areas in the simulation. Teams will also be faced with strategic decisions, such as expanding their operations to a new market area. As an outcome of the simulation exercise the students will develop a good sense of how the different parts of the business interact and what are the financial implications of the various operational and marketing decisions. In addition, students will gain invaluable experiences in team-work and problem solving.

OnService simulation business case is built around a small family hotel, with about 1mEUR in annual sales in the start. Each simulation market consists of 3-12 teams, with 2-5 members in each. The number of parallel simulation markets is not limited, making it possible to utilize the simulation for any number of students in the class.

Teams' success is measured by both operational and financial key indicators, including occupancy rates, average room rates, profit per room, customer satisfaction, market shares, employee satisfaction, profit per employee, net profit, return on capital, and earnings per share. The ultimate indicator in the simulation is the return to the shareholders, which consolidates all the key success factors into one measurable criterion that can be used to compare the performance between the teams.

Like any other Cesim simulation, OnService is completely web-based, so there is no need for downloads, setups, or separate applications. The simulation is provided with a learning management system allowing the instructor to create courses with just a few clicks, as well as supervise the course and monitor students' performance through an easy-to-use WWW interface.

Bit Bang – Entrepreneurship and Services was the third multi-disciplinary graduate course for Aalto University doctoral students. A total of 24 students were selected from the six Aalto University Schools to participate in a two-semester course. The objective of the course was to teach the students teamwork, multidisciplinary collaboration, global perspective, industry and business foresight and scenario building. At the same time, the doctoral students were encouraged to take novel and even radical views.

During the fall semester, the students studied different aspects of future entrepreneurship. The topics of the semester were knowledge-based, service-oriented and augmented entrepreneurship as well as small entrepreneurs in global niche markets. In the spring semester, the course concentrated on service as science, dynamic service design, disruptive service innovations and service innovations based on Maslow's hierarchy of needs. The joint publication contains eight chapters, each produced by a maximally diverse group of six post graduate students.

The Bit Bang post graduate courses are organised by Aalto University's *Multi-disciplinary Institute of Digitalisation and Energy (MIDE)*. The earlier Bit Bang books are freely available from the MIDE web site.

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