RESEARCH HIGHLIGHTS • VISIONS • SCIENCE • TECHNOLOGY

9

Value-driven business in the Cloud

VTT RESEARCH HIGHLIGHTS 9

Value-driven business in the Cloud

Editors: Tua Huomo, Kaarina Karppinen, Pasi Pussinen

ISBN 978-951-38-8127-6 (print)
ISBN 978-951-38-8128-3 (online)

VTT Research Highlights 9

ISSN-L 2242-1173
ISSN 2242-1173 (print)
ISSN 2242-1181 (online)

PUBLISHER
VTT Technical Research Centre of Finland
P.O. Box 1000 (Tekniikantie 4 A, Espoo)
FI-02044 VTT, Finland
Tel. +358 20 722 111, fax + 358 20 722 7001

EDITORS: Tua Huomo, Kaarina Karppinen, Pasi Pussinen
GRAPHIC DESIGN: Tuija Soininen, Kaarina Karppinen

Printed in Kopijyvä Oy, Kuopio 2013

Greetings from the VTT Strategic Research

Cloud Computing clearly represents a significant change in how digital services are delivered, consumed, and produced. There are many examples of current services and solutions implemented with the power of Cloud technology – take for example, Google's search, Spotify's music or Elisa's TV service. In order to build a winning business ecosystem, the Cloud Software Program (CSW) — a DIGILE sponsored-program — needs to ensure that all aspects of the future value chain are taken into account. The Program also needs to have the right insight into the key competitive factors that need to be solved. If a project is successful in these aspects, the results will constitute the new set of rules for the industry, according to which everybody is invited to play.

The Cloud Software Program deliberately chose not to focus all of its attention on the development of the computing and communications technologies required by the Cloud computing, but rather on the most important activities creating the momentum in the Cloud-based business transformation. These include how to systematically create a desired user experience as well as how to enable the implementation of Agile and Lean software processes in service development. Also marketing and communicating the transformation towards the Cloud has been a priority for all the stakeholders. One important communications channel is the Forge Cloud Service Laboratory which was established by DIGILE in 2012 and is focused primarily on Small Medium Enterprises (SMEs).

The success criterion for DIGILE's programs includes validating the scientific level of the work at various milestones by external third-party experts. An evaluation of the Cloud Software Program efforts completed in the summer of 2012 confirmed that the level of the work is excellent and highly regarded. Also the intended business results from the research and work are now becoming visible. The participating companies have begun to change their core business processes for their product and service delivery. Evidence that a healthy business ecosystem is building lies in the launch of the Tekes' funded Finncloud Project (a *spin-off* of the Cloud Software Program), where several companies are developing proprietary products and services using Cloud technologies which are highly innovative and competitive.

From VTT's perspective, the Cloud Software Program is an excellent example of how VTT plays an important role in renewing and transforming companies as well as creates a new ecosystem together with industry-leading companies. It is our belief that our excellence in scientific knowledge and research combined with our solid understanding of business and close collaboration and excellent communications with the industry positions VTT to excel as a driver of transformation in Cloud.

Tatu Koljonen
Vice President, Strategic Research, ICT, VTT Technical Research Centre of Finland
Vice-Chairman of the Board, DIGILE Oy

Greetings from the VTT Business Solutions

As a representative of VTT's Business Solutions, I have had the distinct pleasure of observing first-hand the Cloud Software Program's determined and effective execution from 2010 to 2013. Recognized as an industry-leading program, this has been an ideal project formula for VTT. The research scientists have been able to efficiently utilise their knowledge to solve companies' challenges and to enable companies to reach their goals related to Cloud service business. The numerous business case examples presented in this book describe these innovative solutions.

We have come a long way away from a world where software was sold in traditional, retail environments to today where practically everything from development to sales to leasing occurs through new business models over the Cloud. This change did not evolve in a vacuum nor did it happen in one big step — instead it has happened gradually and in collaboration between parties. I believe the genuine collaboration in addition to the expertise and business understanding has been the key to the success of the Cloud Software Program.

I believe you will find this book to be a very interesting and informative read!

Seija Sihvonen
Vice President, Business Solutions, ICT, VTT Technical Research Centre of Finland

Acknowledgements

VTT's Cloud Software team wishes to thank all the Cloud Software Program partners for their excellent collaboration and active participation. We also wish to express our gratitude to the DIGILE and Tekes organisations, especially to the Pauli Kuosmanen and Matti Sihto for their dedication and support. Special appreciation also goes to the Janne Järvinen, Focus Area Director (FAD) of the Cloud Software Program, who has led the Program over the years with outstanding efficiency and in a very professional manner.

We are most grateful to all the end users who contributed in various co-creation activities, discussions, surveys and evaluations. Without their participation many of the studies described in this book would not have been possible.

For more information about any business cases described in this book, contact the authors: firstname.lastname@vtt.fi

Contents

Introduction

Cloud Software Program
- **DIGILE's (www.digile.fi) Research Program**
- **Funded by Tekes (www.tekes.fi) and the partners**
- **2010–2013: total budget = 62 M€**
- **Partners include 20 Finnish enterprises and 8 research organisations (as of April 2013)**

The state of the Internet has fundamentally changed over the past few years, particularly since the emergence of Cloud technologies. Although this statement is perhaps self-evident today – many would say it is even a cliché – the statement is both true and elusive. What has really happened?

Cloud is often only associated with Cloud Computing technologies. However, it goes far beyond that; Cloud is a powerful combination of technologies, networking, storage, applications, services and ecosystems that facilitates a new generation of digital services for consumers, businesses and the public sector. In essence, for customers, Cloud means "on demand" access to information or services on an as and when needed basis that is cost effective, secure and user-friendly.

The number of Cloud services has exploded in such a way that today the market is clearly a high-growth sector within the Information and Communications Technologies (ICT) marketplace. Many services have found a place in the Cloud and numerous new innovations current exist and will continue to be based on Cloud technologies. At the same time, the transformation from the traditional approaches towards Cloud-based business has resulted in major changes in ICT companies.

DIGILE, Digital business and services in Internet economy (former TIVIT, The Strategic Centre for Science, Technology and Innovation in the Field of ICT), aspires to bring together industry and academia to solve research challenges to increase the competitiveness of the industry as well as the pace of development of Finnish knowledge and expertise. In 2009 DIGILE launched a new Strategic Research Agenda (SRA) that initiated an industry-led research program called the **Cloud Software Program (CSW)**. Initiated in 2010, this four-year program now includes a partner network of 20 Finnish enterprises and 8 research organisations. The CSW is partly funded by Tekes, the Finnish Funding Agency for Technology and Innovation, and has enjoyed a total investment of over 60 M€– making it the largest collaborative research initiative in the field of ICT in Finland.

The development and launch of the SRA and the CSW has been a joint effort by a number of participants from both industry and research. From the beginning it was evident that the "Cloud phenomenon" was beginning to shape not only the technological factors influencing the companies, but also business ecosystems and operating principles. In the Cloud, ICT companies can take advantage of an instanta-

Cornerstones of the Cloud Software Program: Cloud Technology, Business in the Cloud and Operational Efficiency

neously connected world and new markets, but at the same time they need to manage business, people and resources in new ways – all without boundaries. In the CSW, Cloud Technologies, Cloud business and operational efficiency were defined as basic cornerstones for the transformation towards the Cloud. One of the main advances that the combination of these dimensions would generate is a new level and intensity of business collaboration. The rapid scaling of low operational costs combined with the participation from completely new groups of economic players is now being called Cloud business ecosystems.

Strategic Research Themes of the Cloud Software Program: Superior User Experience, Cloud Security and Sustainability

In addition to the overall growth of business globally, more and more companies are competing for customers with the promise of new innovative services with unique experiences. Differentiated services or *superior user experience* was defined to be one of the key CSW's strategic research themes that will lead companies toward more successful business in the Cloud.

One of the fundamental challenges in the Cloud is the loss of hands-on control of systems, application and data security. Many of the current best practice security controls that ICT professionals have come to rely on are not available in Cloud environments, hav-

ing been eroded in many ways or no longer controllable by the companies. The other strategic research theme of the CSW is *security in the Cloud*. The goal was to improve software and system development life-cycle efficiency to drive improvements for more robust security and also to ensure security would support and not hinder companies. *Sustainable development,* the third strategic research theme, is an emerging and strong trend that is driven by the price increases in energy and natural resources, consumer awareness and legislation.

All of the research areas and themes of the CSW are challenging whether viewed together or independently. In the Program, the research questions have been investigated in the context of real-life *business cases*. Thus, in most of the cases, the actual research has been a mix of different research aspects. The research work in the Program has been based on the *Lean Research Approach*, which has enabled iterative and agile way of working as well as extremely effective results sharing and dissemination. The Lean Research Approach is one of the highlights presented in this book.

VTT Technical Research Centre of Finland has been one of the main research partners of the program. VTT's researchers have been working in a number of different business cases in the CSW over the past few years. The research cases have been challenging and have required a solid understanding of software business, processes, tools and methods from a variety of viewpoints. The purpose of this book, *Value-driven business in the Cloud – VTT's Research Highlights*, is to showcase a diversity of cases that VTT has been involved in and to provide practical examples on how companies can apply different approaches and methods.

This book is intended both for readers who have knowledge of software development processes and practices as well as for those who are more interested in the service aspects and an overall value-driven software business in the Cloud. The book mainly targets the following audience types:

- Business and Marketing managers of Internet service providers who are developing new differentiated services and building new competences for service businesses in the Cloud.
- ICT professionals seeking new ways of understanding the many facets of value and their customers in the Cloud as well as individuals responsible for operational excellence and process improvement.
- Researchers, scientists and students at universities and research institutes investigating business, service development and technologies.
- People who are and have been working for the different collaborative R&D programs who want to learn some more about the Lean Research Approach applied in the CSW.

Dr. Tua Huomo
Research Coordinator, ICT,
VTT Technical Research Centre of Finland
Program Coordinator,
Cloud Software Program

Lean research approach

Author
Tua Huomo

The impact of research on industry competiveness requires fast adoption of the research results as well as rapid application of the knowledge. Therefore, in addition to the research challenges and topics, there is also an urgent need for more effective research approaches that go beyond traditional project management. The research should be closely integrated to the business with a focus on the business and scientific benefits as well as support for rapid iteratively shared results and their deployment.

Constant change and new innovations in Cloud have created the need for more effective approaches that go beyond traditional project management models. CWS' adoption of the Lean Research Approach as well as new planning and project management approaches for the research efforts, have allowed the Program to be more agile, more collaborative and more transparent. In addition, the Program has been more successful in achieving its primary goal of developing enablers for globally successful businesses.

There is nothing predictable about the rate of new innovations in Cloud research and business except that the unexpected happens faster than we expect.

The use of collaborative, long-term traditional project planning in some research fields remains useful. However, in the field of Cloud software and services research, the application of the traditional approach is completely inappropriate. There is nothing predictable about the rate of new innovations in the Cloud business except that the unexpected happens faster than we expect.

With multiple partner organisations and multiple cluster projects, effective planning for the Program was vital to its success. Traditionally in collaborative research programs there is a need to set the vision, goals and key results for the Program as well as plan the collaboration between a number of industrial and research organisations. However, as research cannot be insulated from the ever-changing business environment, there was a need for a new way of doing research. This is why the Lean Research Approach was developed and applied in the CSW.

The Lean Research Approach resulted in a focus on the business and scientific benefits as well as an iterative sharing method for the results. With this approach, the Program's activities and results were evaluated against what was happening in the business environment and any changes to the focus, research themes or structure were made when needed. The two main components of this approach include Continuous Planning and the Iterative Sprint Model. The Program's continuous planning (Figure 1) supports key goals through specific actions including:

- Value-driven strategic planning which improves the business impact of the Program.
- Business case planning which maintains a consistent focus on business priorities and resource constraint assumptions.

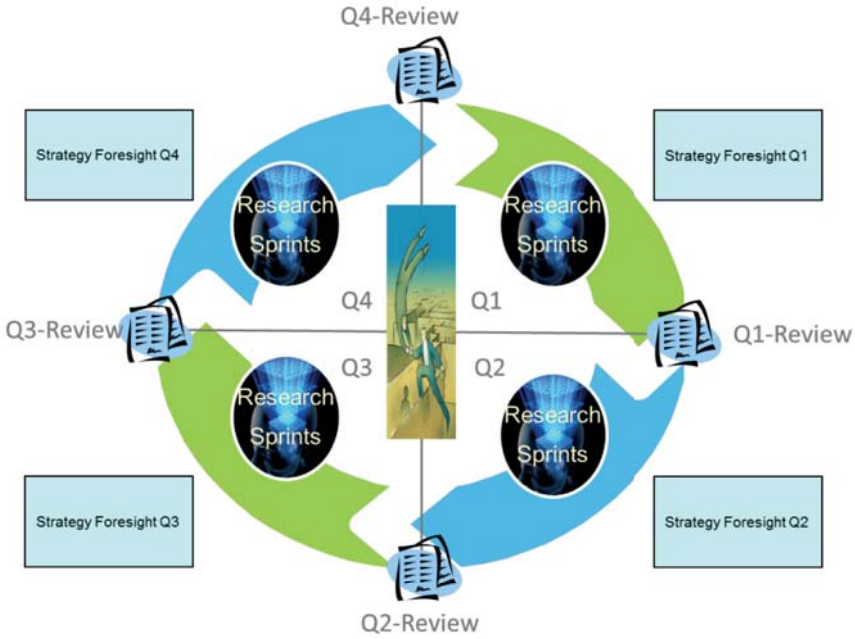


Figure 1. Cloud Software Program's Continuous Planning Approach.

- Transparency and sharing of information which ensures the visibility of the information and results.
- Process discipline, results visibility and accountability which enhances the Program's access to assets and collaboration.

The CWS' primary goal was to solve research challenges around the business cases as defined by the partner organisations. The business cases are strategically important research areas for the industrial organisations and the intended business impact critical for their future success. The work effort on these cases was defined at the beginning of every three month time period, as per the Sprint Approach (Figure 2). At the beginning of each quarter, the research team, comprising of members from two or more partner organisations, plans together a set of defined tasks and outcomes over the next three months.

"We can't make systematic and reliable research within three months!" was the initial hesitation when the three month research Sprint approach was first adopted. However, the Sprint approach facilitated the division of effort which resulted in smaller, more manageable portions of work. More importantly the systematic and validated research methods could not be compromised. The cure for this hesitation was learning how to plan and execute only those actions that achieve positive results that were realistic to do within one Sprint. The Program has defined business and scientific impact goals as well as measurements for each research cluster whereby their progress towards the defined goals is measured quarterly.

Outcomes of a Sprint could include, for example, a design plan, a method description, a case study report, an analysis report, a journal article, a technical demonstration or a software module. These outcomes are

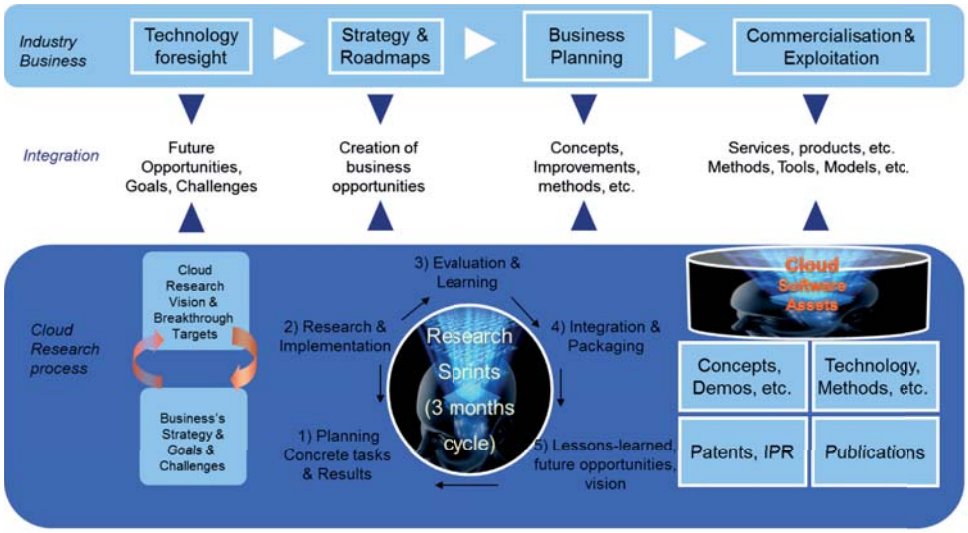


Figure 2. Cloud Software Program's Lean Research Approach.

assets which are stored in the main storage, access and sharing point for the Program's research assets. Cloud Software assets are classified as software offerings (patents, copyrights, IaaS/PaaS/SaaS, etc.), Other Intellectual Property (product concepts, business models, new strategies, etc.), Internal Operational (new tools, processes, techniques, etc.) and External Relationship (business relationships, networks and ecosystems developed, etc.).

At the end of each research Sprint, each team presents the highlights of their work in quarterly review (Q-review) meetings. The main motivation behind the Q-reviews is to ensure the required transparency to achieve the attainments of the greatest business impact or value. The value of the continuous planning process is most visible in the Program's Q-review meetings where key results are presented and demonstrated in the Cloud bazaar. In addition to the bazaar the Q-reviews consist of differently themed workshops, training and coaching events, presentations, strategy discussions, and planning sessions. The outcomes of the continuous planning process are updated to the SRA, which serves as a roadmap for the research work.

The research highlights presented in the following chapters are examples of the industry-driven business cases that have been done in an iterative manner in collaboration with the several CSW organisations.

The Cloud Software Program's business cases are strategically important research areas for the industrial organisations and the intended business impact critical for their future success.

Understanding your customers in the Cloud

Understanding the many facets of value in the Cloud

Authors
Kaisa Koskela-Huotari, Andrey Sirotkin

The word value has been used lately a lot in the discussions related to business and the Cloud. What do we, however, mean by value in this context? How do we understand its nature? The concept of value has been discussed and debated since Aristotle for over 2000 years with various nuances and meanings [3, 4] and still today, different people mean very different things when referring to this concept. So, despite its significance there is a lack of a consolidated or comprehensive understanding of the term value.

Roughly, one can argue that the concept of value has evolved into two quite distinct meanings [3]. Firstly, value is used to portray *'goodness' of something physically external to a person*. This something can be it another person, a product, an activity or anything else. Secondly, the concept of value can also describe *'goodness' as determined by an individual personally and culturally,* and in an ethical sense. Usually in this meaning the plural term – values – is used. To make things even a little more complicated, there can be several different perspectives on the concept of value inside the two different meanings.

Value (of something)

One way of describing the different perspectives on the concept of value (of something) is to differentiate between 1) value-in-exchange, 2) value-in-use and, 3) value-in-context [4, 5, 6].

1. In the value-in-exchange perspective, the focus is on outputs. This means that value is seen as something created by companies in their production activities and

embedded in company outputs such as tangible products. In value-in-exchange perspective the focus is therefore particularly on nominal value i.e. the money paid in the market for obtaining the valuable output. Thus, value is measured by the exchange transaction and is equal to money. In the case of Cloud services this perspective would mean that we would view the available service as valuable on its own and without ever being used by someone. We would be more worried about our sales numbers than how our customers perceived our service – as beneficial or not.

2. The value-in-use perspective provides a very different view on value and value creation. Here, the attention is on the process of use and the focus of value creation shifts from the producer's end to the

customer's end. Hence, value is seen as something that emerges as a person uses or applies a resource provided to him/her by somebody else. Though in this perspective the customer's role as interpreter and determiner of value is highlighted, the role of producer is still important as a co-creator of value. Hence, value-in-use perspective implies that value always emerges in the interactions of various actors who provide resources for one another. For a Cloud service the value-in-use perspective would mean that we would view the service valuable only after someone is using it – for example, to share photographs with family and friends and therefore, perceiving the service valuable for him/her.

3. The value-in-context perspective is closely related to the value-in-use perspective and can be seen as extension of it. In this perspective the focus is especially on the phenomenological nature of value, which means that value is seen as an experience. This experiential view on value implies that the perception of value is not a linear, cognitive process restricted to isolated events of use but an iterative and circular process including both lived and imaginary

experiences as well as individual and collective dimensions. The value-in-context perspective for a Cloud service would mean that we would acknowledge that the value of the service does not remain the same for the individual using in, but that the perception of value constantly alters as the time, place and context of use changes and the perception is influenced by social interaction.

It is important that when tapping into the potential of the Cloud e.g. by providing Cloud-based solution we take into consideration all the different perspectives on value (of something) as they all provide us important information on how we can create solutions that are beneficial both from a business and customers' perspective.

Values as beliefs

A concept of human values is different from that of value (of something). Human values are principles and beliefs that people use to evaluate goodness, fairness and the legitimacy of experiences. Human values are defined in axiological sense. These values are beliefs that people hold in aesthetics (e.g. beauty, harmony, goodness) and ethics (e.g. right, wrong, fair, legitimate).

What makes values especially interesting in business studies is their motivational character. Values are motivational in a sense that they guide individuals' choices and behaviour. Bouldon [7], for example, shows that values represent strong reasons for making choices, selecting modes of behaviour and assessing experiences. Other marketing and sociology scholars, like Kahle [8], Schwartz [9] and Rokeach [10] also argue that values motivate actions.

Although values are abstract concepts, they can be practical in understanding customer experience because values span desire, experience and value. People desire to realise the values that they hold. Their values correspond to goals, desirable ideal states and conditions, and help people assess whether such conditions are attained. A realised value of honesty, for example, would mean that idealized desires for people to be sincere and free of deceit are matched by conditions in the actual world. As a result, by combining the concepts of value and values, the subjective nature of experience can be understood better.

In the Cloud business model the values can provide a platform for creating competitive strategy. Values are enduring concepts and resistant to change even in dynamic environments. The relative stability of customer values can be the vector of differentiation. That is, a strategy in Cloud can be intentionally focused on the perceived value of experience, which is a key differentiation factor. Values, for example, can be used to describe customer desired experiences, which, in turn, can be disseminated throughout the organisational processes. As a result, values can bring together strategy, marketing and development functions in a unified effort of staging an experience that customers will value.

Focus on values has the ability to bring together strategy, marketing and development functions in a unified effort of staging an experience that customers will value.

Owela: Hear what the consumers really think

Authors
Kaisa Koskela-Huotari, Kaarina Karppinen

VTT has worked in close collaboration with F-Secure since the beginning of the Cloud Software Program. One important part of this collaboration has involved gaining a deep understanding of the consumers and their perceptions of digital content and the Cloud as a phenomenon. In the growing trend towards Cloud services, a company needs to differentiate their offering. By engaging in a close dialogue with consumers via VTT's online innovation platform, Owela, F-Secure has been identifying their end customers' expectations, needs and ideas that provide the basis for building a superior user experience of the company's secure Cloud services.

Owela (owela.fi) is an online innovation platform that builds on social media features for co-design activities and open innovation [11]. It was launched in April 2007 by VTT and since that there has been over 70 co-design projects ranging duration wise for one week to several years. Owela enables direct contact, active participation and continuous dialog with end users regardless of time and place. Owela

helps companies to co-design new products and services as well as improve existing ones based on consumer needs and ideas. It supports active user involvement in the innovation process from the first ideas to piloting and actual use. Owela studies are flexible and customisable and can involve for example, online discussions, commenting, blog posting, idea posting, surveys, and chat sessions.

Research

We have conducted one Owela study per year with F-Secure over the last three years. This flexible online method has allowed us for continuous and rich interaction with consumers. The research questions have ranged from understanding consumers' experiences and perceptions of Cloud services via studying the customer value concerning an innovative Internet security solution concept to mapping the desired and expected value as well as the value-in-use related to two F-Secure's actual Cloud services. Some of these studies were combined with other methods such as surveys or focus groups in order to further research specific aspects offline.

Results

VTT's expertise and the Owela online innovation platform have enabled the company to be able to stay in a direct contact with end users throughout the service innovation and design process, benefiting from the rapid user feedback. The studies have been tailored to F-Secure's needs and they have enabled a continuous and rich dialogue between the company and end users.

From F-Secure's point of view, online co-design was seen to be a productive new way of interacting with end users. Directing focus to new topics that may emerge from the user community during a study is usually hard to do with traditional, often quite rigid forms of end user research. Owela enabled defining various research goals during the studies, reacting to feedback, and modifying the goals accordingly. [12]

Owela helps companies to co-design new products and services as well as improve existing ones based on consumer needs and ideas.
It supports active user involvement in the innovation process from the first ideas to piloting and actual use.
Owela helps companies to co-design new products and services as well as improve existing ones based on consumer needs and ideas.

Cloud for the user – anytime, anywhere, anyhow

Authors
Kaarina Karppinen, Kaisa Koskela-Huotari

Cloud services are today's reality, however many typical web users access Cloud services daily without knowing it. For many, the Cloud is a synonym for the Internet. The term Cloud itself is just beginning to reach the awareness of the users.

When beginning to use Cloud services many users do not even recognize the difference between a local service and one in the Cloud. This difference only becomes clear when the user has used Cloud for a while and for some reason either loses the Internet connection or access to their local device. These situations are real eye-openers either in a good or a bad way, depending on the case. However when everything works as it should, people have the freedom not to think about the actual location of their data at all.

The most attractive feature of the Cloud is its anything – anytime – anywhere – with any device aspect.

On the other hand, today's internet users are quite conscious about information security and demand that the services using data of theirs that is sensitive or personal in nature are protected. They also expect the service provider to respect their privacy and want their identity protected over the Internet.

Research — Listening to the users

Our studies focused on users' perceptions towards the Cloud with special focus on content storing and sharing, identity and trust.

"Through the cooperation, F-Secure obtained ideas for new concepts and received valuable insights into consumers' usage and perceptions of cloud services. The results provided by the study were immediately actionable and highly useful to F-Secure."

Ville Nore, Usability Specialist, F-Secure Oyj

Together with F-Secure, VTT conducted both a quantitative survey with more than 3000 respondents [13] and a qualitative study in VTT's online innovation space, Owela (owela.fi), with 47 participants. The web-based survey was conducted in three countries (Finland, USA and Japan) while the participants for the Owela study were selected among the Finnish respondents of that survey. Through this cooperation, F-Secure obtained ideas for new concepts and received valuable insights into consumers' usage and perceptions of Cloud services especially related to security.

Results

Interestingly, our studies showed that if the users have a high motivation towards using a Cloud service, and if they feel that a service offers them good enough value, they are willing to use it regardless of the potential risks. This may be due to the fact that there are relatively few actual serious and widely-discussed security breaches regarding Cloud services. In addition the study participants only come across a few minor negative incidents concerning various aspects of security. Also, it should be noted that novice users feel significantly more insecurity towards the services than the more advanced users. Experience and confidence elevate the amount of perceived feeling of security and trust towards a Cloud service.

User Experience (UX)

Simple functional aspects of a system are not enough for today's consumer. Nowadays it is understood that the interaction between a user and a system is a holistic experience – not only affected by the usability or aesthetics of the system but, also by various social and emotional aspects.

The International Standardization Organisation (ISO) defines user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" [1]. Roto et al. [2] have described this even more clearly – "User experience differs from 'experiences in a general sense' so that it explicitly refers to the experience(s) derived from encountering systems."

There is an increasing number and variety of companies offering diverse services in the Cloud. They have a need to seek new ways to differentiate themselves from their competitors. User experience can be used as a differentiation strategy that provides an opportunity for those companies to gain a competitive edge and provide added value to their Cloud offering. If a company can offer unique experiences for its customers, they can win a sturdy foothold in the competitive landscape.

Benefits of bridging end-users' and developers' worlds

Authors
Ting-Jui Chang, Eija Kaasinen

Users are the best experts of their everyday life experiences, making them great potential sources of innovation. We engaged users in innovating with designers with open access to telecommunication data such as user location, user profile and usage logs that could be utilised in Cloud services. A wide set of scenarios of future services was created and refined with potential users, see examples in Figure 1. The user-driven innovation activities included focus groups, crowd sourcing in an open web lab, and face-to-face interaction in an open innovation showroom.

in defining concrete design requirements. The scenarios also help in gaining mutual understanding between users and designers from different disciplines.

Research

Our case included designers from software technology, hardware infrastructure, telecommunication offering, and business management strategy. The scenarios that were defined together with end users provided a common ground for discussions and modifications with end-users in mind.

Figure 1.
Examples of Open Telco Scenarios.

Figure 2. Ihme Open Innovation Showroom.

Scenarios are the base for designing user-centred technology such as Cloud services. Initial value proposals from the designers were described as scenarios. The scenarios were refined and new scenarios were created with three user-driven innovation approaches [14]:

1. Online crowd sourcing using VTT's Open Web Lab *Owela* (http://owela.fi/), in which the scenarios were discussed and evolved with an online community of potential users.
2. Focus groups were invited for getting feedback on more-concrete value proposals.
3. Face-to-face semi-structured interviews in VTT's Open Innovation Showroom Ihme [15], in Figure 2, where tangible user experiences were designed and demonstrated.

The scenarios were visualized in different ways to facilitate presenting them, gathering feedback and gaining more ideas from users. From the final scenarios, typical use cases were identified. The use cases can be further translated into concrete design requirements which are understandable for developers and business managers.

Results

Open access to telecommunications data would facilitate many kinds of new services. Our experiences show that involving users in the innovation of new services was productive both in confirming and refining designers' service ideas but also in creating totally new service ideas. Direct user-designer interaction in the actual usage context was very powerful as it not only captured ideas but also helped the designers better understand the user's world.

Designing and prototyping scenarios with end-users help bridging the developers' world to the end-users' world.

Customer values – the missing link to designing THE User Experience

Authors
Andrey Sirotkin, Kaisa Koskela-Huotari, Kaarina Karppinen

How do companies distinguish themselves from competitors and help customers perceive the unique value of their services? This question has been central in strategic management for many decades. In Cloud context, however, this strategic function becomes even more urgent. Cloud technology provides opportunity for competitors to begin to provide virtually any service at any time. In the environment where technology is no longer a source of sustainable competitive advantage, the use of customer values for developing an experience is critical to differentiation.

To take the customer values perspective is to describe the problem situation that companies face when targeting customer experiences as differentiation strategy. Values explicitly put strategy in an appropriate social context, in which companies can compete by knowing what experience customers want to have and should have. As a result, differentiation strategy extends beyond immediate description of the market situation. The pleasure of experience is made up of what a person desires to have and what he or she deems important to have. The concept of values at the core of differentiation strategy enables companies to target such complete experiences.

Integration of values in the organisation can also help reconcile the internal needs of different departments with the marketing interests. In many technological companies market orientation is only one aspect of business and other departments may be driven by different and perhaps conflicting interests. Software development, for example, may focus on functional features and standard components, rather than on sales features and custom components. Each part of an organisation justifies its activities based on a set of its own beliefs. The focus on customer values, however, allows a general 'platform' for marketing, product and software development to be built. As a result, organisational processes are adjusted towards one objective.

ViEx method stages:
1) Analysis of customer values in a specific context
2) Identification of dimensions and patterns
3) Development of customer model (personas)
4) Integration of dimensions and personas into organizational processes
5) Evaluation of the acceptance of the ViEx method

Research

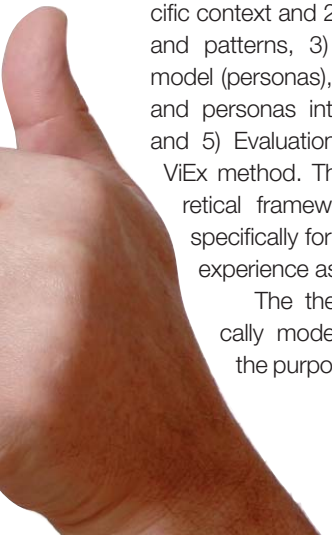
The Values in Experience (ViEx) method is a practical approach for integrating values into experience design. The method was tested in two Finnish ICT companies. The implementation included all the steps of the framework, including evaluation of the results. In practice the ViEx method combines the following stages: 1) Analysis of customer values in a specific context and 2) Identification of dimensions and patterns, 3) Development of customer model (personas), 4) Integration of dimensions and personas into organisational processes, and 5) Evaluation of the acceptance of the ViEx method. The method follows the theoretical framework, which was developed specifically for the purposes of focusing on experience as a differentiation strategy.

The theoretical framework dynamically models customer experience for the purposes of creating an experience offering. The aim was to show the elements of experience and demonstrate a need for aligning organisational process for the development of desired experiences. In contrast to product development, experience cannot be produced in accordance with a specification. Experience is perceived and unfolds at the time of consumption. Therefore, the tradition of product differentiation cannot accurately describe experience differentiation. To successfully compete in a new business environment an organisation must not only have a new concept of differentiation but also adjust its internal processes to become experience-oriented business.

Results

The results of the work were successful for the companies involved. In the case of Tieto Corporation, the use of personas helped generate new ideas for a software product targeted at improving customers shopping experience. These personas and values dimensions were also successfully used by VTT to develop a list of experiences and interpret it for product and service features in a product development case.

In F-Secure the research of customer values contributed to the development of new services. In a subsequent customer studies the results were used to identify which customer groups the participants represented. Marketing messages and product campaigns were influence by the understanding of customer values. Currently the work continues with extending existing services into new areas of customer experience. The integration of results throughout the business processes is expected to influence the company's orientation towards end customers.



Customer stories: An important tool for understanding customer value

Authors
Kaisa Koskela-Huotari, Kaarina Karppinen

Recently F-Secure has made a strategic decision to broaden its product portfolio from "install and forget" type of antivirus solutions towards more active and "everyday use" solutions aimed for digital content storing, sharing and synchronizing via Cloud. Due to this change there was a need to understand and enhance the value proposition of their new Cloud solution – Content Anywhere.

The starting point for this study was the appreciation that the value of a Cloud service is only realised and determined through use

"For us this study was remarkable, because it not only offered immediate improvement ideas, but also gave us deep strategic insights about our customers and their behaviour. These insights we can use constantly, both today and in the future, while improving our solutions to better serve our customers."

Ville Nore, Usability Specialist, User Experience, F-Secure Corporation

by a specific individual and that value is always experiential by its nature. Hence, the main objective of the study was to collect stories to understand the value of the F-Secure Content Anywhere solution as it was perceived by people in their real-life context and use situations.

Research

Sixty people participated in an eight week long study. During this time discussions took place almost daily with the VTT team and with participants in VTT's Owela co-design platform (owela.fi). The participants shared their experiences in the form of stories which offered peoples' perception of value related to the service. This value was collected in three different forms during the stages of the value-creation process: desired value, expected value and the actual value-in-use.

During the first week of the study the participants discussed and wrote stories about their general opinions related to sharing and storing their digital content. In the beginning of the second week the marketing material describing the Content Anywhere solution was presented to the participants, and their initial expectations and thoughts about the service was collected. Finally, the last six weeks were spent in gathering the participants' experiences related to the actual use of the service in real life context with their own devices.

Results

A massive amount of data was collected during the study. That data included over 70 stories, well over a thousand theme-based discussion comments and about one thousand gallup votes. The obtained insights of the study ranged from identifying minor usability glitches to shedding light on some of the fundamental questions related to the value proposition of the Content Anywhere service. Deep strategic knowledge of the expectations and behaviour of people while using online storing, sharing, and syncing services for their irreplaceable content was derived from the data. F-Secure felt that the story-based approach of the study gave them deep strategic insights into their customers and they could use the knowledge yielded from the study immediately and continually into the future to improve F-Secure's solutions to better serve their customers.

Elements to consider in the Cloud Service Business

Gap between B2B buyers and UX service providers

Author
Andrey Sirotkin

Often the success in business-to-business (B2B) business depends on business-to-consumer (B2C) relationships. This is especially true for companies that provide user experience design as a service. The competitive position of such companies largely depends on understanding their customers' customers. In negotiations for a new contract, for example, the knowledge of the buyer's end customers gives an edge over rivals. In B2B to know the client's customers is to know their business. Without such insight the company will struggle to offer services that make sense to the potential buyer because the services fail to make sense to its customers.

B2B organisations re-orient their businesses to know end consumers. The move of business partners to close interactions with the end customer supports Prahalad and Krishnan's [16] observation that B2B and B2C markets converge. One of the drivers of convergence is the changing nature of competitive environment. Particularly the transition from transactional relationship with the buyers to service relationship with customer followed by the design of experience puts certain requirements on the business [3, 16,17].

Research

Although a company's financial streams may reflect B2B operations, they are only one component of a diverse business model, which has a B2C structure. When a company is working with end customers to improve their services, when it educates the end customers, researches their needs and uses feedback to improve customer experience, it looks more like a B2C organisation.

In experience business the convergence between B2B and B2C is even more evident. Businesses recognise this crucial change and transform their processes accordingly. Digia, who wanted to win business for its user experience division, had to do just that. Particularly, it had to learn specifics about the end customers and adjust its communication strategy with B2B partners.

One of the drivers of convergence is the changing nature of competitive environment. Particularly the transition from transactional relationship with the buyers to service relationship with customer followed by the design of experience.

For Digia the objective was to understand what kind of business change is required to enter new market of customer experience. For the purpose of business analysis the company adopted Prahalad and Krishnan's [16] approach to business transformation. The framework emphasises de-risking of the transformation through an evolutionary approach to implementing a change. Particularly, it advocates the development of new competences through a series of experiments. The advantage of this approach is a strong reliance on current competences in constructing new ones.

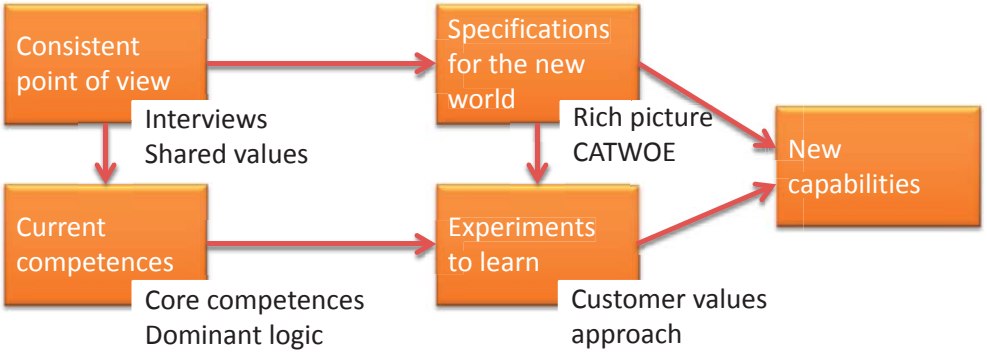


Figure 1. Adaptation of Prahalad and Krishnan [1] approach to transformation.

The first step of this five-step approach (Figure 1) is to develop a consistent point of view. The viewpoint expresses the company's idea of how the value is created in their business area. In the research this was achieved through the analysis of organisational strategic directions. The second step focuses on current competences. In Digia's case Prahalad and Hamel's [18] core competence was used. At this point the gaps between current and desired capabilities begin to emerge. The specifications of the new worldview follow the first two steps and lead to experiments that are aimed at developing required capabilities. The goal of the process is to take the existing business onto a new level of competitive advantage.

The analysis began with a literature review followed by semi-structured interviews with Digia management and employees. The aim of the interviews was to summarise the management's vision of the future of their business and to formulate a collective definition of user experience as it was understood by the company. The interviews evidenced the need for shared understanding of user experience (UX) services for end customers. Soft system methodology (SSM) was used identify problem areas in the business and develop specifications for the new worldview. SSM is a seven-step approach that starts with identifying current situation and follows through to the development of action points to address the issue at question [19]. The methodology allows for other approaches to be incorporated in the process and thus makes the research process more rigorous. Other business tools (e.g. shared values, dominant logic and core competence model) were included to account for Digia-specific business needs. As a result of the analysis the company developed a series of experiments that targeted the development of new competences.

Results

As a result of the research Digia was able to describe and understand its business problem situation. This led to developing coaching methods for designers and sales personal. The management was able to adjust its communication strategy and become more effective in working with corporate buyers. The overall effect of this work was long-term and led to the outline of future business objectives. For instance, plans to study customers' values, development of appropriate business metrics and focus on the required competences were part of the results. This work also contributed to the development of the Values in Experience (ViEx) method described elsewhere in this book.

The benefits of reuse & value-creating assets for enhanced service delivery

Author
Salla Rönkä

The Cloud phenomenon generates a possibility for offering completely new or improved services. As new technologies, products, services and business models are created; the increasing complexity in the technical and business environment becomes a challenge for many companies. How are the relevant value-creating assets that can be reused in the development of new Cloud services found? Customization is costly and will reduce the cost savings obtained with a standardized Cloud solution. Customization can still be completed to some extent if the different

Table 1. Reuse benefits.

1	Time savings
2	Money savings
3	Better quality (iterative testing due to more usage)
4	Easier to find assets and available information about them
5	Knowledge sharing
6	Serving several customers with core solutions
7	Shortened time-to-market
8	Flexibility
9	Developers can concentrate on tasks they prefer
10	Developers can solve tasks for which they lack expertise
11	Standard compatible solutions (if inventory built so)
12	More interaction between teams
13	Increased agility
14	Increased ROI
15	Reduced waste and redundancy
16	Better contribution to organisation's strategic goals
17	Possibility to select the most suitable asset from possible choices

pieces of the service are compatible and the pieces that the customer wants, can be easily put together. The service creation process developed at VTT addresses both the technical and business environment-related challenges from creating the service concept to service maintenance with reusability in mind.

When an organisation develops a service, during the development there is an enormous amount of information produced. Whether the new service is traditional or based in the Cloud, it makes sense to reuse the existing information and components from the previous development projects instead of reinventing the wheel. The value of services is often created in a complex network of individuals. Those who understand the sources of value in a network – the assets – are able to exploit them and as a result, become the winners. The IT assets of any Cloud service are often very context specific, and this creates a challenge for companies to find the core assets that are general enough to be reusable but not too general to render them useless.

Whether the new service is traditional or based in the Cloud, it makes sense to reuse the existing information and components from the previous development projects instead of reinventing the wheel.

Table 2. Reuse challenges.

1	Technology specific assets
2	Slow and complicated storing systems
3	Hard to find useful assets fast (bad categorization)
4	The asset creator is not available for questions
5	People rather talk to people than use inventories
6	People want to create themselves/motivation
7	Management support needed
8	Customer owns the asset
9	Differences between countries and their legislation
10	Possible decreased innovation through reuse
11	Company policy might restrict open source reuse
12	Too much generality
13	Finding what is reusable for storing (measuring value)
14	Projects might become dependent of other projects
15	Security and quality risks through bad reuse choices
16	Understanding , adapting and implementing takes time
17	Maintaining the assets
18	No budget allocated
19	Personnel's availability and level of know-how
20	Organisation infrastructure and reuse maturity

Research

The collaboration partner of this study was Tieto Corporation who participated in the Sustainable Intelligence Service concept development. As this concept, which enables tracking of products' impact on the environment using Radio Frequency Identification (RFID) tags and barcodes, was being developed, the vision was that the concept would be subsequently applied to other industries where Tieto has expertise. On the one hand, many changes are required in order to make the service suitable for a specific industry and different users. On the other hand, there are several similarities that enable reuse. Establishing how reusability was impacting Tieto's service creation increasingly became an area of interest and importance. It was necessary to understand the existing service, identify its assets and map the value network.

The information was gathered through semi-structured interviews. Seven experts in different roles were interviewed in order to collect information from individuals working on different assets of the service. The same people were also asked about value networks, reusability and whether any practices related

to them were in use. This study is explained in more detail in [20].

Results

The number of possible value-creating assets is great. As an example, the identified reusable assets in the case study included databases, data, servers, security architecture, platforms, hardware/equipment, UI/application design, software, standards and licences, open interfaces, people/capabilities, users, processes, documentation and version control systems.

The benefits of reuse uncovered during the research process are presented in Table 1. As the results are considered in greater detail, many challenges are brought to light that require solutions in order to actually benefit from the reuse as an enhancement to service creation. The results show the benefits are impressive but cannot materialize without hard work. Reuse requires investments and commitment from everyone in the organisation and there are challenges that need to be overcome in order to achieve the benefits of reuse. The challenges are shown in Table 2.

The initial challenge lies in creating an inventory of all the assets. The case where every person is using their own solution for asset storage only works if they are the only ones who need to find those assets. If someone else is supposed to use the same assets it is more efficient to store them into a system from where everyone can utilize them. This can be offered as a Cloud service itself.

Quality of service and experience – lost in the Cloud?

Author
Martín Varela

The strong adoption rate for Cloud-based applications has so far been mostly based on the perceived economic advantages. Cloud-based services are often cheaper to deploy and host and they offer greater technical advantages, for example with respect to scalability. The migration of more critical services to the Cloud, however, will not only depend on the economic aspects, but will also be predicated on the Cloud-based solutions being reliable and performing as well as the legacy ones. In this context, understanding the factors affecting the Quality of Service (QoS) and Quality of Experience (QoE) for Cloud-based services will be critical in order for customers to choose the right Cloud offerings and for service providers to differentiate themselves.

Research

Work towards understanding what quality means in the context of the Cloud started in 2010 in close cooperation with EXFO (then Nethawk). The objective of the work was to start a new line of joint research that would ultimately enable EXFO to incorporate QoE models into their existing network products and to create new products aiming at satisfying the QoS/QoE monitoring requirements of Cloud service providers. This was a very ambitious undertaking, given the complexity of the subject studied, but also a large business opportunity, as it pertains to a completely new market.

Interviews done during this work revealed several interesting points about how Cloud service providers currently perceive and deal with QoS and QoE. Among these, the main concern is that quality is a non-tangible, hard to market concept in the context of the Cloud. EXFO has now started integrating QoE-oriented Key Quality Indicator (KQI) into their Brix line of products, with the aim of eventu-

ally providing QoE indicators for several kinds of services. This will allow service providers to more easily assess – and market – the performance of their offerings as perceived by their customers. This work is still on-going both in product development and as R&D in two large-scope QoE-oriented research projects.

The main concern is that quality is a non-tangible, hard to market concept in the context of the Cloud.

Results

At this stage it is still early to quantify the impact of the research carried out, as fundamental research in the domain is still being done. Interestingly, the work done has attracted the interest of non-ICT domain companies – both Finnish and international – working with Cloud-related technologies and for whom the quality aspects are key in order to, for example, offer meaningful Service Level Agreements to their customers. Among the business domains concerned, there is taxi dispatching and transport logistics and information brokering. More information about this topic can be found in [21], [22], and [23].

Critical to cloud services — security, privacy and trust

Authors
Reijo Savola, Arto Juhola, Ilkka Uusitalo

The Cloud service paradigm creates a set of major security and privacy risks which can potentially harm Cloud-based service businesses. As Cloud services reduce the amount of hardware, software and their management from the user's perspective, the monitoring of security-related risks also becomes more difficult. Issues such as software and code updates, security practices, vulnerability profiles, intrusion attempts and security design – all are important factors for the determination of the security posture of a Cloud service.

Research

The study, more depicted in [24] and [25], was based on the interviews of experts representing a prominent segment of Finnish industry and academia, dealing with or contemplating Cloud services. Altogether 24 persons were interviewed.

The results offer a view into the collective opinions of the profession and, based on that foundation, provide an analysis of the needs of security, privacy and trust measurement in the Cloud. Furthermore, research directions for metrics development are discussed based on the interviews.

Results

According to the expert interviews, transparency of security and privacy practices and controls deployed is important in Cloud services. Transparency can be implemented by utilizing appropriate security, privacy and trust metrics, designed based on common agreements. Development and selection of metrics for security, privacy and trust is a challenging task. Metrics should be meaningful, clear and should have value to their users. Assurance of security control effectiveness and correctness are seen important. The following areas highlight the most pressing issues requiring further research and cooperation between different stakeholders in these fields.

A. Transparency of practices and controls

The lack of transparency of security and privacy practices and deployed controls during the operation of Cloud services is a major concern in the assessment of risk. Accordingly, the results of the expert interviews reiterate the Cloud Service Users' (CSU) strong need to obtain sufficient and credible evidence from the Cloud Service Providers' (CSP). Enough transparency is seen as a prerequisite for trustworthy Cloud services. Obviously, appropriate security, privacy and trust metrics are needed to establish common agreements that could enable enough transparency. This calls for cross-disciplinary research addressing security, business, technology and cognitive

The most pressing issues in the field of Cloud security, privacy and trust:

- **Transparency of practices and controls**
- **Meaningfulness, Clarity and Value of Metrics**
- **Effectiveness and Correctness of Security Controls**

sciences, and involvement of different stakeholders connected to Cloud services.

However, many interviewees noted that since the end-users and small enterprises cannot be expected to be involved in the complexities of the analysing the gathered evidence, and because providing differing kind of evidence for a multitude of customers places a heavy burden on the CSPs, there is a need for a trusted party acting on behalf of these customers.

B. Meaningfulness, clarity and value of metrics

Security, privacy and trust metrics development is a challenging task – the metrics should be meaningful, clear and their value should be provable.

VTT's earlier work [26] investigated the criteria for the feasibility of utilizing security metrics in software-intensive systems. In this work, a collection of 19 of the most important security metrics quality criteria were selected. The results from the interviews of the present study fit well to the results of [26], emphasizing especially meaningfulness and usefulness of metrics. The meaningfulness requirement is pronounced in security-related measurements, and does not have such an important role in similar activities, such as software measurements.

C. Effectiveness and correctness of security controls

According to [27], the main objectives of security measurement can be divided to three categories: (i) effectiveness of security controls, (ii) correctness of security controls, and (iii) efficiency of security controls. The interviewees clearly emphasized the two former categories over the third one. This is expected, because the interview group consisted of security professionals who are concerned about the adequate security level. Metrics related to the efficiency of security controls, from the other hand, investigate the effort and expenses devoted to security-related activities.

D. Holistic thinking and collaboration

In the interviews, we found that functional aspects were given a bit more emphasis than non-functional aspects and holistic thinking. This is probably due to the strong engineering background of the interviewees. It is evident, that more holistic thinking and especially collaboration between business, technology and security experts is needed.

Challenges in Combining Cloud, User Experience and Security

Cloud has opened up many new possibilities and advantages both for companies and individual users. There is a need to balance security and the user experience aspects of the service. While the users expect their Cloud service to be secure they do not want that to ruin their experience.

The trust between the service provider and its users plays a major role within the Cloud. The operator or another service provider needs to keep their customers' data safe, secure and private — or they will quickly be out of the business. Cloud service consumers store large amounts of personal, and sometimes sensitive, data on the service providers' servers and do not always realise the potential security and privacy threats that could result. A survey done in June 2012 (3191 respondents in three countries) demonstrated that customers see security as a very important factor when using Cloud services. For many people, the security of a Cloud service is even more important than the ease of use or good functionality. Interestingly, the survey also indicated that the most significant factor influencing the creation of trust is the ease of use. The possibility to use a service in one's own language was another important factor that has a positive effect on trust.


Operational excellence
for the Cloud

Lean Thinking

The capability of an organisation to benefit from new technologies and business opportunities is dependent on its ability to adapt the entire organisation to the change. Lean thinking is seen as a key approach which proactively responds to the issues and opportunities of the ever-changing business and technological environment. The roots of the lean paradigm started well in the past (e.g. [32]), but at the end of 1990s Womack and Jones [28] widened the scope of lean thinking from lean manufacturing to lean enterprise. They presented the lean thinking principles which include identify value, map the value stream, create flow, establish pull, and seek perfection.
Lean thinking manifests itself like a philosophy, which needs to be seen as a journey and as a mind-set that governs how one looks at the business and processes. Applying lean principles in an organisation clearly requires a big, long-lasting change [28]. The transformation needs both top-down and bottom-up approaches, i.e. both strategy-oriented and operations-oriented approache.

Variability

Software product variability is characterised as an ability to change, configure, customize or extend software artefacts for a specific context [38]. The need for software product variation comes when companies aim to build products and services that often differ from each other's support of individual customers or different market segments [39]. Variability management deals with managing variation in both time and space dimensions [40]. The variation in time means that software products and artefacts evolve over time. In the space dimension, software is used and varied in multiple contexts at the same time [41].
Product variability is not a new topic in ICT but it is becoming significant again in today's highly customer-oriented markets. Challenges related to product variability can also be identified in Cloud business cases (Transparent enterprises). Companies are tackling the increasing demands to create new product variants, but at the same time they need to find the balance between the positive and negative impacts that the new variant will bring during its life cycle. The creation of a new variant causes costs, risks and complicates the product management, and therefore, it is highly important to reach a comprehensive understanding of various drivers, benefits and risks that are involved. To support successful variability decision-making it is necessary to combine the understanding from several viewpoints, e.g. from company's strategic and operational environment, customer and market segmentation, current market conditions, future business prospects and from the product development processes and technologies used.

Operational excellence for the Cloud

The current business environment is very unstable and dynamic which is causing Information and Communication Technology (ICT) companies to improve their readiness for change. ICT companies need to align their operations to the ever-changing environment and adopting agile and lean development practices. This adoption has encouraged organisations to change the way they execute product and service development as well as how they conduct business.

Lean thinking, which aims at creating value and eliminating waste (e.g. [28]), has been introduced in several industries and currently it is also evident in software development [29, 30]. Lean thinking is anticipated to help companies in the challenges created by the changing business environment, and thus, strengthen the companies' capabilities.

The rapid product delivery of products to customers with appealing new features, ever evolving sophistication and a large degree of technical complexity combined with a big number of stakeholders involved in the development process, requires greater visibility and openness throughout the different levels of organisational structure. This is necessary in order to keep these projects on track. Transparency is about openness and accountability in all areas of the business. In today's economy, transparency is more important than ever, as companies are forced to strictly manage costs and resource utilization.

Moving to agile and lean approaches has led to continuous and iterative product development. Also, the willingness of managers to continuously improve transparency (the visibility of information) has led to an environment of more streamlined process structures. The strategy process begins to align towards a more value oriented and continuous basis. Therefore, organisational strategic or financial plans are not created on an annual basis anymore. Instead, the strategy changes with customer and market needs, product development execution and with the identification of new opportunities. Focusing only on annual goals is no longer sufficient. The environmental conditions of many enterprises are often so unstable that annual plans require updating several times in the course of a business year [31]. All these changes also have an impact on planning. The need for continuous planning arises, which refers to a planning process that is dynamic and that links strategy with execution under continual change.

Lean thinking principles include identifying value, mapping the value stream, creating flow, establishing pull, and seeking perfection.

Transparency is the ability of all stakeholders in a system to see all the details.

Continuous planning means constantly on-going planning practices.

Software product variability is about an ability to change, configure, customize or extend software artefacts for a specific context.

Value stream mapping leads to successful lean transformation

Author
Raija Kuusela

The growing momentum behind Cloud-based solutions has created many opportunities for change in the Information and Communication Technology (ICT) industry today. The main challenge for companies is that customers pay for processes that they perceive to add no value or to be unproductive. Inefficiency is viewed as the main factor that limits a company's ability to leverage the economies of scale necessary for Cloud deployment. Lean Thinking is seen as the key approach to proactively improve productivity and efficiency of operations.

Tieto Corporation is building a comprehensive Cloud Services portfolio and helping its customers to transform towards Cloud-enabled business. By adopting Lean Thinking, Tieto is identifying the needs and implementing the plans to remove inefficient and unproductive efforts from its operations. A Lean transformation will result in the identification of critical process improvement areas, improved processes leading to higher efficiency and economies of scale, a process and methodology for Lean principles and a platform for organisation learning and core competencies development. For Tieto, improved customer satisfaction is the desired end result.

Research

To implement Lean Thinking principles in companies, VTT has built several modules including: Lean Induction, Lean Analysis and Value Stream Mapping (VSM).

Lean Induction workshops will provide an introduction to Lean principles, methods and tools. Lean Analysis uses SWOT and brainstorming as the methods in workshops. Lean Analysis aims at the identification of critical process improvement areas and concrete improvement actions for them which lead to more efficient processes and practices. Value Stream Mapping workshops pursue improved processes by eliminating identified inefficiencies. All this will lead to increased productivity, efficiency, and effectiveness. Lean Analysis and Value Stream Mapping both support organisational learning and core competencies development by implementing lean principles in the work environment.

Value Stream Mapping is one of the central techniques in organisations' transformation towards Lean. In its essence, VSM is a technique of mapping each individual step in production for example, *from customer request to completed product*. VSM aims to identify those steps in the production that create customer value, do not create customer value but cannot be removed from the current production environment (Type One Waste) and those that are non-value adding activities that can be eliminated immediately (Type Two Waste). VSM serves as a tool for identifying wasteful activities in the process and visualising the actual work process conducted [42].

"We feel privileged to be learning about Lean Thinking and to begin adopting the principles within our team. The workshops led by VTT were very effective. I look forward to working with VTT on the next steps as well as sharing our experiences along the way."

Ville Puntanen – Service Development Manager, Tieto

In VSM, two separate streams are drawn; one indicating the current process and another indicating future process with reasonable amount of waste removed. In addition, concrete actions for removing the Type Two Waste are planned. The execution of the plan is followed. The VSM session is not a process that is conducted only once since they follow the philosophy of Kaizen (continuous improvement) which is an important aspect of Lean.

It is essential that identifying waste and creating the corresponding actions in order to remove it is not limited to one particular bottleneck alone. In Lean, the improvement of the process as a whole is one of the central cornerstones of the approach.

Results

In early 2010, Lean Analysis was conducted for the Tieto Sustainability Intelligence Development Team (SI team). The Lean Analysis workshop identified several process improvement areas and themes (e.g. time management, processes in general, building exceptional teams) that were identified for further investigation and development.

Several workshops and planning meetings were conducted with the team including in total five VSM workshops, and three follow-up meetings in between. With Lean Analysis the current status of the team's all work processes and practices were viewed through Lean principles in order to identify the most urgent improvement areas; Lean Analysis acts as a starting point for VSM workshops. With VSM wasteful activities in the processes were identified and concrete actions for removing waste were planned, i.e. improvement plan was created. The execution of the improvement plan was followed in the follow-up meetings/workshops. The SI team's most important and most topical processes for improvement that were analysed via VSM were requirements management process, implementation process and sales process.

Running VSM workshops and follow-up meetings indicate that SI team is continuously improving their processes and changing the underlying assumptions, which relates to double-loop learning. It also includes questioning and modification of existing norms, procedures, policies, and objectives. In the workshops and meetings, the team members considered whether the prevailing rules, processes and practices worked for them or should they be changed. VSM is a method to execute double-loop learning.

The team members claim that they have benefited from the workshop results and the team considers VSM as a useful method, which has helped the team to improve their processes. VSM makes the problematic points concrete and visible.

Organisational learning unlocks lean and Cloud transformations

Author
Raija Kuusela

Today, companies are seeing the Cloud phenomenon challenge their product and service development as well as their business and revenue models. Many companies are in the middle of a transformation in order to benefit from the opportunities that the Cloud offers. At the same time, interest in lean thinking has increased in industries and research communities. The Lean paradigm has been assessed as a potential way to help companies pursue greater efficiency and better organisational performance.

Cloud is the driver that forces companies to respond to its challenges; in other words, companies start Cloud transformation. Lean thinking is a powerful means to contribute in the change; that is, companies conduct lean transformation. Cloud and lean transformations are major things for companies in order to maintain or gain competitive advantage. The whole organisation must be involved in the exercise, which promotes organisational learning. According to [43] effective leadership, strategic positioning and organisational goals and objectives are crucial factors in facilitating organisational learning, but a time factor needs be considered as such initiatives can only take effect after a period of time. Moreover, organisational efforts need to be integrative; all forms of learning should be integrated into the work processes [43].

Cloud and lean transformations are major things for companies in order to maintain or gain competitive advantage. The whole organization must be involved in the exercise, which promotes organisational learning.

Research

This study was done in collaboration with Tieto Corporation. Semi-structured individual interviews and workshops were used as data collection methods. Six development team members and seven leadership team members were interviewed. The workshops with the development team (in total about ten members) were organized in order to introduce lean methods such as value stream mapping (VSM) and to identify improvement ideas for the team's work processes.

The data from the workshops was collected and documented as well as validated by the team members. The researcher's role was to facilitate

knowledge transfer of the lean methods and tools and to observe the development team during the transformation.

Results

The research confirms that single-loop, double-loop and triple-loop learning takes place in the case company. By definition, single-loop learning means incremental learning or following the rules. In the case company rules, guidelines, and process descriptions exist. The case unit followed the processes and guidelines as far as they served the team best. In that sense, it can be argued that single-loop learning happened.

The team under study is continuously improving their processes and changing the underlying assumptions, which relates to double-loop learning. It also includes questioning and modification of existing norms,

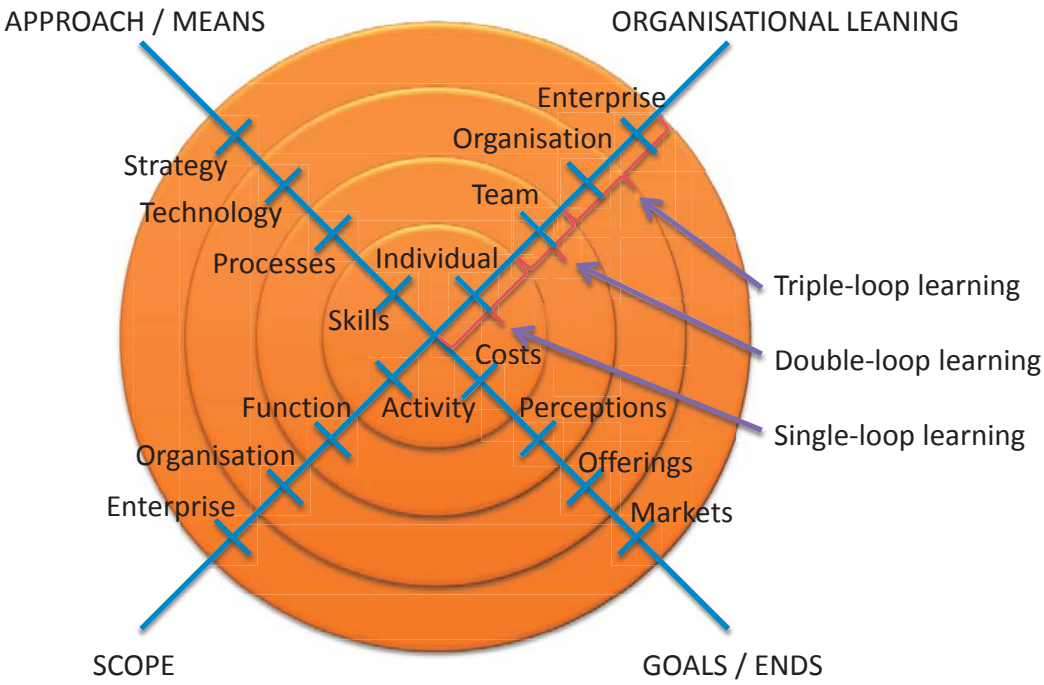


Figure 1. Revised transformation framework.

procedures, policies, and objectives. In the workshops and meetings, the team members considered whether the prevailing rules, processes and practices worked for them or should they be changed. Value Stream Mapping (VSM) is a method to execute double-loop learning.

Triple-loop learning addresses the question whether people really have the opportunity and competence to participate in making well-informed choices in the process of discussing and managing issues that concern them. On the one hand, the team members say that the team has the option to function as a spearhead project, which gives them the opportunity to create their own way of working. On the other hand, the leadership team members say that the strategy is being modified to better respond to the changes in the business environment and that the transformation is expected to create new spearhead projects to develop new Cloud services. They continue that change in culture and behaviour is anticipated as well. All this leads to the study's claim that triple-loop learning is occurring in the case company.

Thus, single-loop, double-loop and triple-loop learning take place on individual, team and organisational levels. Further, the link between single and double-loop learning is strong, but the link between double and triple-loop learning needs strengthening in the case company. Concerning the research question "How does organisational learning relate to an organisation's transformation?" the study suggests complementing the transformation framework of Rouse [33] with the organisational learning framework of Yeo [43] which will result in a revised transformation framework (see Figure 1.), which

introduces *organisational learning* as a new dimension.

The revised transformation framework highlights the importance of organisational learning as the new perspective in transformation. The revised framework illustrates the levels of learning in relation to the size or progress of the transformation; when a large company – like the case company – is transforming, it is necessary to align the whole company to the change and to acknowledge that the change will be a long-lasting effort. This also confirms the statement that organisational learning takes a long time (e.g. [43]). According to Yeo [43], strategic positioning of the organisation and organisational goals and objectives shall be clearly set out, when directing organisational learning, which applies also for transformation and is visible in the framework as *the goals or ends* and *the approach or means* axis. This study and the results are described in more details in [44].

Continuous planning – a critical element of agile and lean development

Authors
Tanja Suomalainen, Raija Kuusela

Given the current business environment of instability and constant change, information technology product and service organisations are increasingly adopting Agile and Lean development practices. This adoption has encouraged organisations to change the way they execute product and service development as well as conduct business. The changes created by the requirements of Agile and Lean transformation have led to continuous and iterative product development.

The adoption process increases the willingness of managers to continuously improve transparency (the visibility of information) to support decision-making in the organisation which has led to an environment of more streamlined process structures and continuous competency development. Also, the strategy process begins to align more towards a value oriented and continuous basis. The end result is that organisational strategic or financial plans are not created on an annual basis anymore. Instead, the strategy evolves with customer and market needs, product execution and with the identification of new opportunities.

For many companies, the world seems to be moving too fast to plan even one year ahead. By focusing simply on annual goals; management risks navigating the enterprise in the wrong direction due to its failure to take important information beyond the fiscal year's end adequately into account.

Continuous planning is about seeing planning practices continuously, not just as part of a once and annual top-down event [37]. In this research, continuous planning is discussed from the perspective of agile and lean organisations. Continuous planning can be considered as an agile-lean practice in itself, due to its requirement for iterations to revise the plans and to get feedback. In order to achieve continuous planning, organisations need to be capable of changing their operations and adapting their mind-set towards continuous planning and transparency — throughout the whole organisation.

Research

The study focused on continuous planning, which is a relatively new and not yet a fully studied field of research, especially from the perspective of Agile and Lean software product or service development organisations. The main goal of the research was to report what current methods and practices exist to support continuous planning. The findings presented in this study aim at defining continuous planning in agile-lean organisations and increasing the knowledge about it for both science and industry.

From industry viewpoint, this study aimed at increasing the knowledge regarding continuous planning in order to assist companies in developing their own continuous planning practices and processes. From scientific perspective aims were to increase the body of

knowledge in the area of continuous planning while also identifying future research opportunities.

Altogether three case studies were conducted, in which data was collected via workshops, meetings and interviews as well as through the analysis of company specific internal memos. The case studies were based on experiences of three companies: Elektrobit (EB), F-Secure, and Tieto. All of the case companies are large, Finnish-based companies with more than 1000 employees. Both EB and Tieto offer IT products and services and F-Secure offers data security. In addition, all of the companies had transformed their organisational practices starting with agile method and further complemented it with a lean approach.

Results

A research framework for continuous planning (presented in the Figure 1) was created based on the current literature. The purpose of the research framework is to help to structure and present the research results. The main elements of the continuous planning framework are defined as follows: organisational planning, strategic planning, and business planning, and the implications of continuous planning. All of these elements are vital and tightly related to each other; organisational planning defining organisational level and the time frames of the plan, strategic planning forming the overall plan of the organisation and business planning giving the budgeting frame to the plans. Companies developing or improving their continuous planning processes and practices

should take all the elements of continuous planning into account and see how adopting continuous planning in a wider perspective can yield great benefits through the organisation.

It was uncovered that continuous planning is not commonly applied throughout the entire organisation; it may only involve a certain level of planning. Continuous planning in agile and lean organisations commonly relates to release planning, whereas this research sheds light on a wider perspective than that. One of the cases focused on strategic and financial planning, the second one on project and team level planning, and the third one on team level planning, which also involved business and project level planning.

Continuous planning is about creating and revising plans as needed, which happens typically more often than the traditional once a year. Based on the empirical findings the long-term plans were completed looking three years ahead. At the strategy, business, or project level the plans were reviewed quarterly, and on the team level the plans were reviewed biweekly or weekly. Despite that continuous planning was considered commonly as a short-term planning, it did not remove the need for long-term planning, since e.g. strategic, business, market and portfolio plans

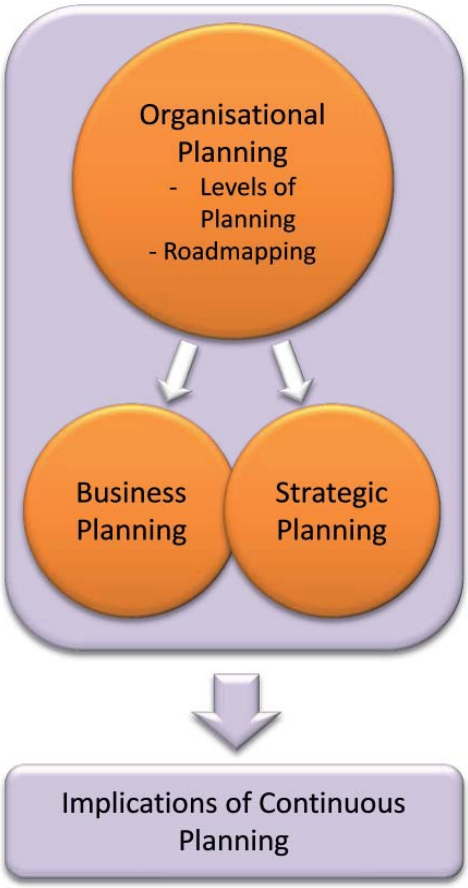


Figure 1. Research framework for continuous planning.

had to be considered all the time at the background or at the higher levels of the enterprise. Furthermore, the implications of continuous planning reveal that companies need to consider other aspects related to continuous planning as well such as leadership, transparency, competency development, and ways of working in order to enable and succeed in their continuous planning efforts. Also, it is clearly evident that the strategic importance of continuous planning is likely to increase in the future because of the relentless changes that organisations are facing, which will have also a strong impact on planning practices and processes. This study and its results are described in more details in [45].

Continuous Planning

Continuous planning is about seeing planning practices continuously, not just as part of a once and annual top-down event [37]. Continuous planning can be considered as an agile-lean practice in itself, due to its requirement for iterations to revise the plans and to get feedback.

Rickards and Ritsert [31] point out that even though organisations are expected to have continuous planning practices, e.g. quarterly rolling forecasts and budgets, only a minority of enterprises use them. Hence, they suggest using rolling planning, i.e. continuous planning, instruments instead of traditional, static tools. These instruments propose that environmental changes trigger planning instead of the financial year and thus, plans are adjusted according to internal and external events. Planning should be understood as a continuous process and plans should also include future-oriented elements like sales funnels as well as measures of market potential and sales effectiveness. Also, the effects of strategic initiatives should be quantified and linked with operational planning and business drivers [31].

In order to achieve continuous planning organisations need to be capable of changing their operations and adapting their mind-set towards continuous planning and transparency — throughout the whole organisation.

The big 8: The challenges towards lean transformation

Authors
Raija Kuusela, Susanna Teppola, Tanja Suomalainen, Tua Huomo

Given the current business environment, many enterprises consider a transformation in order to benefit from the opportunities and to respond to the challenges of the ever-changing business environment. At the same time, interest in Lean Thinking has grown in industries and research communities. The Lean paradigm is being assessed as a potential means to help companies pursue efficiency and to increase customer value.

This research was conducted in order to shed light on how contemporary ICT companies are progressing in their lean transformation; what are the biggest challenges, how they have planned the transformation, what steps they have taken so far, how long they anticipate it will take. The research lists eight challenges identified in five global ICT companies' lean transformation journey. The findings are then mapped to the Lean Transformation Framework [46].

Research

Five case companies were chosen to represent large global ICT companies. The interviewees of the case companies were chosen based on their possibility to see the progress of the transformation in the whole organisation under study. The interviewees were leaders or persons very deeply involved in the execution of the transformation.

Semi-structured individual interviews were used as the main data collection method. Six persons from the five case companies were interviewed utilising the transformation framework modified from Rouse [33]. In that framework, the goal or ends of transformation can range from cost efficiencies to fundamental changes in markets, the approach or means of transformation can range from upgrading people's skills to major changes in strategy, and the scope of transformation can range from work activities to the enterprise as a whole. The ends and means influence the scope of transformation. In the interviews, the transformation framework was used to anchor the interviewees' descriptions of their transformation efforts in relation to their approach, goals and scope, i.e. what is the extent of the transformation, what organisational levels they focus on, and at where they aim. This way, the researchers were able to create a more precise understanding and firmer interpretation of each case company's transformation.

Although each case company was different from others, the interview results indicate that the case companies are wrestling with the same eight challenges during their journey towards lean transformation.

The analysis of the interview data focused on finding challenges in lean transformation. The interviewees were asked what the biggest challenges in the transformation were. Additionally, the respondents talked about their experiences in the transformation more widely, which follows the semi-structured interview method. The interviewees communicated some challenges,

Table 1. Identified challenges towards Lean transformation.

	Challenge and description	Transformation cycle
1	Continuous communication at all organisational levels as a success factor in the transformation. Proper communication leads to openness, trust and transparency in an organisation, which all are seen also as attributes of organisational culture.	Overall
2	Strategy was a topical issue in this research. Strategy is the general plan to achieve the organisation's goals. At the same time when the interviewees as managers/leaders communicate strategic decisions and managerial messages further in the organisation, they also expect management commitment and support from their superiors. Big changes, such as lean transformation, are part of the organisation's strategy. When executing a company's strategy and plans, management commitment and support to employees are crucial things. Then also collaboration with all organisational levels is vital in order to pursue goals consistently.	Origin in strategic alignment, effect overall
3	Customer value seems to be an emerging topic today and appeared as an important concept in the interviews. Lean thinking highlights the importance of customer value in parallel with removing waste. Additionally, there is a growing need amongst the companies to better understand how to increase customer value in their products and services. However, the interviews revealed that the definition of customer value was not very clear yet in their companies. Customer value was seen as one of the most important focus areas in the future.	Origin in business alignment
4	Organisational structure seems to be one of the enablers of successful transformation. All the case companies had changed their organisational structures at least to some extent. Lean transformation was not the only reason for the changes, though, but also other reasons to achieve better efficiency and effectiveness existed. One of the case companies had removed several levels in their organisational structure with the goal of achieving more efficiency. This challenge was not articulated clearly by the interviewees. However, they implicitly brought out that right organisational structure assists the transformation. Moreover, all the case companies had recently conducted changes in their organisational structures.	Origin in organisational alignment
5	Organisational culture and more precisely changing the culture, in accordance with the lean transformation was seen as a very important and even a mandatory element in the success of the change. Employees' attitude, mind-set, willingness to change and contribute to the change, and thus changing the organisational culture was seen as the biggest challenge in this research. Changing organisational culture is a long-lasting activity, which was well recognised by the interviewees.	Origin in organisational alignment, effect overall
6	Leadership plays an important role in a change, which was evident also in this study. Good leadership leads to empowerment and involvement of people in the transformation; it helps employees to find new ways of doing things and to take responsibility of their doings. Leadership is also called as coaching, which characterises the leader's role well.	Origin in organisational alignment, effect in implementation
7	Continuous learning is one of the cornerstones of lean thinking and it was very strongly visible also in this research. The interviews indicated that making mistakes and learning from them is important. Learning from workmates and learning from other companies was highlighted as well. Continuous learning is a company-wide challenge.	Implementation
8	Transparency is seen today as an important antecedent for successful operations in ICT companies. Transparency is linked to most of the things listed in this chapter. Good transparency in an organisation helps at all levels and all directions of the organisation. In the context of transformation, transparency through the whole organisation helps to see the progress of the change and thus motivates employees. The case companies discussed transparency as an important topic and also as an improvement area for the future.	Overall

such as communication, very clearly but many additional challenges came up in an indirect way, and were interpreted by the researchers. Both the directly articulated and indirect latent challenges were mapped to the lean transformation framework based on [46], renamed, grouped and classified into eight main challenge areas.

Results

As a result, the research describes the lean transformation stories of the studied five case companies based on the interview data; how the companies have planned the transformation, what steps or phases they have identified, what they have achieved so far, how long they anticipate the transformation will still take, and the biggest challenges they have identified.

Each company is different from others and practices cannot be copied from one company to another. However, the interviews indicate that the case companies are wrestling with similar challenges. The clusters of the identified challenges are shown in Table 1, where they are also mapped to the cycles of lean software enterprise transformation framework [46].

Transparency: The best enabler for value creation

Authors
Susanna Teppola, Raija Kuusela

Currently, technology companies are forced to adjust and adapt to rapid changes in their markets, where business opportunities can significantly alter in a short period of time. Transparency, both inside and outside of a company, has become an important precursor for successful operations in today's technology industry. With better transparency, companies are improving control mechanisms and decision-making in order to be able to react more rapidly to market changes and opportunities. With a focus on transparency, greater business benefits can be gained through better performance management which delivers real business value and reduces the risk of unwanted behaviour [47].

Research

The purpose of the study was to clarify what drives software intensive companies to be more transparent, how transparency appears in organisations and what elements create transparency. Also the typical challenges of transparency were studied with the focus being at the operational level of organisation. VTT's approach in this study included interviews with three companies; Tieto, Elektrobit, F-Secure as well as workshops and web surveys within the Cloud Software Program's operational excellence working community (CoP).

The Lean theory describes transparency as the most important 'spur of perfection' and it defines transparency as the ability of all stakeholders in a system to see everything, making it 'easy to discover ways to create value' [28].

The study consisted of four phases:

1. Literature study and preparation of interview questions
2. Five industrial interviews in three case companies
3. Two web surveys for industrial partners participating in the CoP (19 respondents representing seven companies)
4. A workshop for CoP partners to analyse and evaluate the results of the steps 1–3.

Results

The study revealed that transparency is seen as an important enabler for better coordination and decision-making in companies as well as a tool for improving operative actions. With transparency companies target better awareness of the overall situation of the development, which gives them good indicators to make better decisions and to respond faster to changing markets.

As a result, the study identified four important perspectives in transparency in ICT companies: strategic, organisational, business development and software engineering perspectives. These perspectives have their own targets and missions within companies but they all share a common topic — how to pay attention on actions that are relevant for the business.

Four cornerstones in organisational transparency were identified in the study: Leadership, Stakeholder's voice, Organisational Culture & Trust and Governance. These elements are the basis for successful implementation of transparency and they all should be aligned in order to reach the benefits of transparency.

The study presented the typical challenges of transparency at the operational level, which take place in the horizontal direction within the organisational structure. Transparency seems to work better in the vertical direction, especially concerning transparency inside a single project. The largest number of challenges seems to appear at the functional level where enterprise level business targets must be combined with practical R&D work.

The cornerstones of organisational transparency:
1. Leadership
2. Stakeholder's voice
3. Organisational Culture
4. Trust and Governance

Transparency

Transparency is about the visibility of the overall picture of development work, such as the clarity to see all aspects of the status of development, product management, business targets, resource utilization, etc. which supports decision making in a company's operational activities. Klotz and Horman [34] define transparency as the recognition of status and the facilitation of common understanding and communication in an organisation. Drucker and Maciarello [35] define transparency as it relates to the human factor; expanding the concept to include trust and organisational culture, which both create the basis for human openness to share information.

Lean theory describes transparency as the most important 'spur of perfection' and it defines transparency as the ability of all stakeholders in a system to see everything, making it 'easy to discover ways to create value' [28]. Limited control (visibility) over how product development is progressing in a company can cause product failure in meeting customer requirements, being late to market, or exceeding the targeted cost [36]. Therefore, the aim of transparent organisation is to facilitate peoples' awareness of the information that is relevant in the business sense.

Less waste means better communication in agile development projects

Author
Mikko Korkala

Agile software development (e.g. Scrum [48] and Extreme Programming [49]) and Lean Software Development [29] as development approaches both emphasize effective communication which is often a bottleneck particularly in distributed development. Improving communication in agile software development mainly focuses on general level recommendations, such as the use of different communication tools and practices. In order to provide companies with a more detailed tool for improving communication, this study discusses using waste (a central element in Lean Software Development) identification as a means for identifying the bottlenecks in communication. The study provides a concrete approach for companies in order for them to improve communication in their distributed development efforts.

For the academia, this study introduces additional wastes that are related to communication. The study also adds to the

knowledge considering communication in the context of globally distributed agile software development. For industry, this work identifies communication related wastes that are potentially present in their distributed agile efforts as well as means to remove them. Even though these particular wastes may not be present in a company, the concept of using the identification of non-value producing elements in communication can help companies to remove waste from different phases of their projects.

The concept of using the identification of non-value producing elements in communication can help companies to remove waste from the different phases of their projects.

Research

The study was completed during 2011 within a medium-size North American software intensive organisation implementing a product that was developed in three sites with a maximum travelling distance of 11.5 hours between sites. Two of the sites were located in North America and one in India. One of the North American sites included all the key project members responsible for steering the project. The data was collected using several data collection techniques including; informal discussions, onsite observations and participation to meetings, documentation and finally through 12 interviews with the identified key personnel of the project. The collected research data was analysed against Media Synchronicity Theory [50].

Results

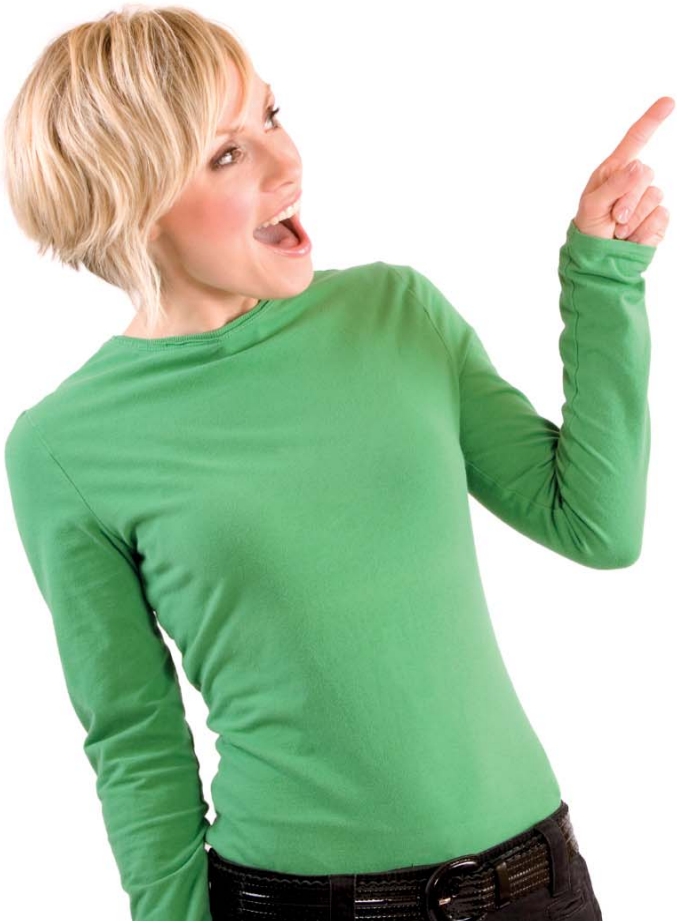
The study indicated that using the concept of waste in the context of analysing communication in the global development environment can reveal hurdles in communication and consequently, solutions for mitigating their effects. Waste does not necessarily threaten the success of the development effort itself, but finding the non-value producing communication elements and finding solutions for removing them can improve productivity. Different sites communicate actively with each other using various communication tools. However, in this particular case, effective and active collaboration within the lead site was a major success factor. The key personnel tested the product increments between two to three times per week at the main site and communicated any possible issues to the rest of the development organisation. This effectively ensured that the product was implemented to meet the requirements set to it and solved any misunderstandings stemming from communication.

Better productivity through agile user experience design

Author
Minna Isomursu

Collaborators:
Petri Voltti (Nokia), Markku Halonen (Nokia)

Several challenges have been identified in integrating user experience (UX) design and related activities into agile software development. These include finding a balance between up-front interaction design and integrating interaction design with iterative coding [51], discarding usability testing because of urgent development goals of sprint cycles [52], and lack of professional usability [53]. Traditional usability methods are often judged too heavy and slow to be integrated effectively into agile ways of working. The need for more simple and low-cost methods has been recognized [54]. Examples of proposed methods include Rapid Contextual Design [55] and Discount Usability Engineering [54].



The results contribute to the knowledge of how to increase the productivity of software development through better integration of UX work into agile working practices.

Research

The study explored the difficulties that can arise in adopting agile working practices specifically the integration of the work of UX designers with other software design practices during the lean transformation process. The results are based on a case study where the lean transformation process of one particular company is explored. The case organisation Nokia represents a company whose software intensive products are developed in globally distributed team for global consumer markets. The data were collected through: 1) documentation analysis and 2) semi-structured interviews. The interviews were organized in the context of a wider process assessment, focusing on the assessment of the status and problems related user experience design practices in the context of lean transformation that was on-going in the organisation.

Results

The results contribute to the knowledge of how to increase the productivity of software development through better integration of UX work into agile working practices.

The results indicate that the transformation process in the organisation had been successful in bringing UX design into central role in development process. Increasing productivity of software development through better integration of UX work with lean software development activities would require 1) more agility in prevailing UX design practices, 2) synchronization of UX work and software development and 3) strong UX leadership (more details in [56]).

Applying Cloud technologies for business

VTT Cloud

In order to better understand the opportunities and challenges in Cloud infrastructure, a system called VTT Cloud was built on a Dell PowerEdge hardware and an OpenStack open source Cloud computing platform. VTT Cloud is an Infrastructure-as-a-Service system, capable of hosting KVM virtualized operating systems and applications within. Other leading Cloud systems were also tested for application deployment, including Google App Engine and Eucalyptus Cloud. Selected popular Software-as-a-Service application programming interfaces were studied for building experimental web mash-ups. Some of the most promising 3rd party technologies to research included Google Maps, Twilio telephony, Dropbox storage, and Text-to-Speech services. An important aspect of the technical research was how to utilize and integrate the Cloud services to be used from mobile devices and tablets. For this rich user interaction, the client-side technologies such as HTML5 were studied as a gateway between mobile devices and Cloud services.

Applying Cloud technologies for business

Operating an information technology business no longer requires purchasing a dedicated computer to host services or hiring a full-time technical administrator to maintain the server computer. Affordable, virtualized platforms, hosted on leased computer hardware and supporting demand-based scalability, have created new opportunities to deploy and utilize applications from the Internet. Cloud technology research in the Cloud Software Program concentrates on applied research in infrastructure and platform domains.

Goods Spotter: Empowering consumers to choose wisely

Authors
Timo Urhemaa, Alain Boyer

The Goods Spotter business case brought together Tieto and VTT to collaborate on the design and prototype of a goods and product information platform. The main goal was to leverage Tieto's Sustainability Intelligence Platform and deliver valuable and relevant information to consumers via an intelligent mobile application. Not only does this platform empower consumers to make educated buying decisions in the sustainable and green marketplace, it also establishes an indirect communication channel between them and the producers such that the latter can tailor and improve their offerings.

According to a survey by VTT, nearly 70% of consumers study product information carefully. More than 60% of respondents would like to have more detailed product information in the purchase situation and more than 75% would like better opportunities to compare the features and source materials of different products [57]. Since a large majority of consumers want access to detailed product information to support their purchasing decisions, there is an opportunity to address that need while also connecting the consumers with manufacturing, retail, advertising and marketing stakeholders. To achieve this, the Goods Spotter product information platform must engage the consumer by providing up-to-date product information via videos, images, web links and news feeds. To provide extra value, the consumer can also view feedback and ratings, provided by other consumers, as well as customize the flow of information based on his/her values and interests.

Since a large majority of consumers want access to detailed product information to support their purchasing decisions, there is an opportunity to address that need while also connecting the consumers with manufacturing, retail, advertising and marketing stakeholders.

Research

Work on the Goods Spotter product information platform evolved through several phases as ideas and user experiences matured. At the start of the project, the main focus was to study how Augmented Reality could be used to visualize product information [58]. The next phase consisted of designing a user experience and implementing a prototype mobile client and server platform to visualize product information of consumer goods. Towards the end of the project, the scope of the mobile application was expanded from only targeting goods in a retail environment to providing information on places and events as well.

Results

The main deliverable of the project was a polished and fully functioning prototype of a Cloud-based product information platform (see Figure 1). The client application was built on the iOS platform and published in the App Store in June 2012 by Tieto. The server com-

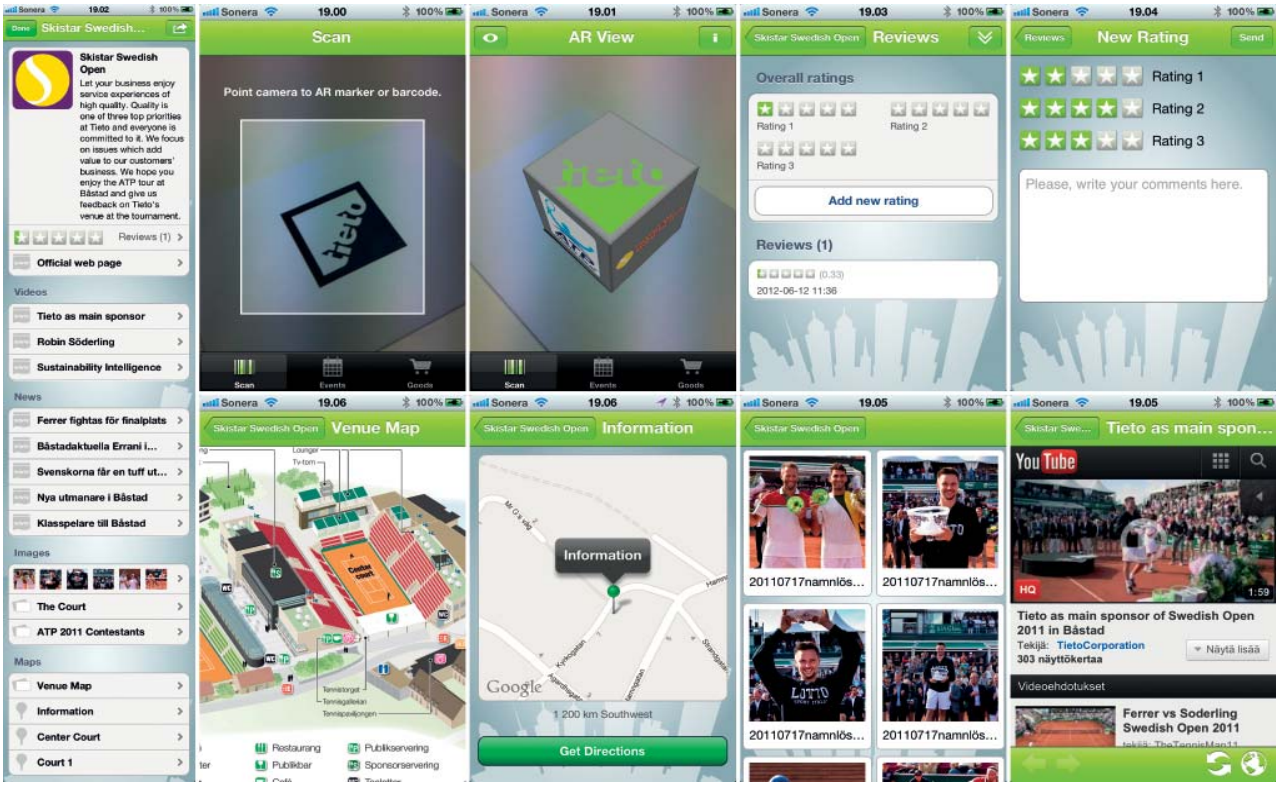


Figure 1. Screenshots of the Goods Spotter mobile application.

ponent was deployed to the Amazon Web Services Cloud at the same time.

The most valuable finding of the research work was the realisation of the importance of product or event data. Although the type and format of the data is a major requirement for such a system, it is even more important to consider the source of this data. After a lot of thorough discussion it was clear that the presence or absence of product information will affect the design and evolution of the user experience of the application. For example, if the database is initially empty, the entire application shifts into a platform for collecting data via crowd sourcing and rewarding users for submitting information on products or events. On the other hand, if the database contains product information from producers beforehand, the main focus of the application is easier to define and only concentrates on serving this information to the user in an innovative and useful way, thus increasing the value to the end-user and lowering the barrier to entry.

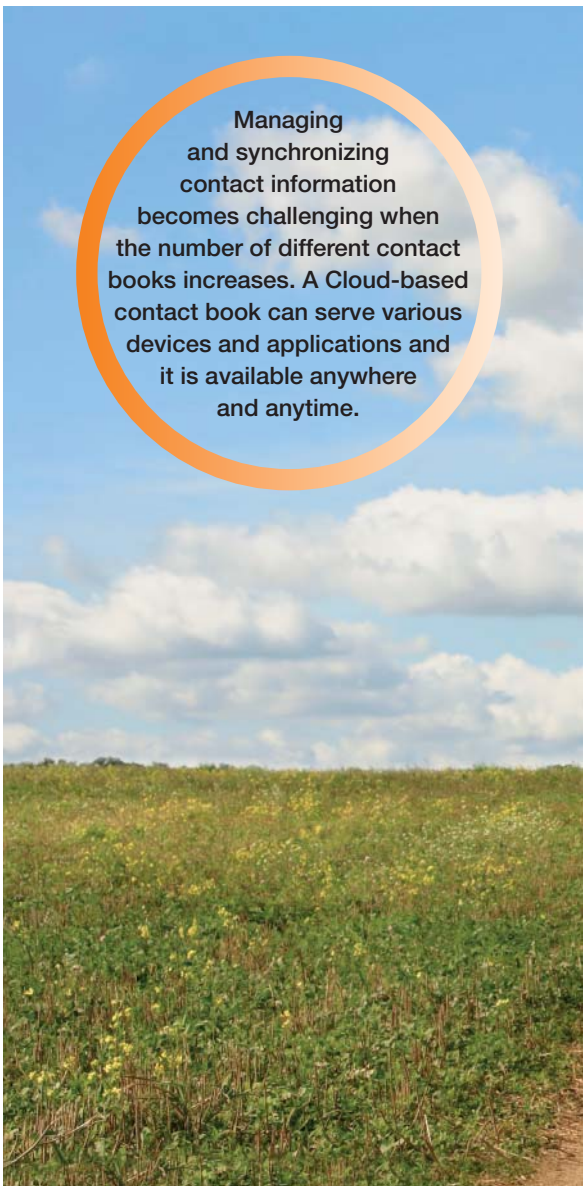
Cloud-based contact management: The answer to managing contacts any place, any time on any device

Authors
Minna Kulju, Maini Williams, Eija Kaasinen, Aleksi Rinta-Kauppila

The number of devices and services that are used for communication purposes is increasing. In some cases the user's presence is applied to navigate the growing communication paradigm. For example Fogarty et al. [59] used different cues to indicate presence, for instance sensing near-by speech that may indicate that the user is occupied in a discussion. Oulasvirta et al. [60] used location and time spent in the location, user-selected alarm profile, recent manipulation of the phone and number of known and unknown BT phones in the environment as presence cues. In addition to the user's presence information, the user's context also affects whether the user is reachable and capable to receive calls or messages. Jung et al. [61] have described a context-enhanced system that allows the sender of the message to define the context in which the message will be delivered to the recipient.

Research

The aim was to create a Cloud-based contact book, which would be extremely easy-to-use and give a highly valued user experience. To reach this goal VTT co-created the contact book concept with potential end users. The idea creation was started in workshops and in a focus group interview. Key ideas were gathered and written as scenarios and presented in an online living lab – Owela – where users could comment and develop them further. After the ideation activities the contact book concept was launched. A user interface (UI) prototype was built on mobile phone platform followed by usability testing and some modifications before retesting.



Results

The idea of a universal Cloud contact book is powerful as it may indicate the availability of people and help in selecting the preferred communication channel thereby simplifying and achieving the most appropriate initial method to make a connection. The presence or availability information was seen to be an important feature for a future contact book even though it is cumbersome because of multiple variables affecting to it. Different user identities impact the availability to different contacts and the preferred communication methods associated with them.

An ideal future contact book makes contacting smooth and easy; the user just gives a name and the contact book knows how to contact that person. This would point towards automatic connection to preferred contacting method between users. The chosen identity can be used to determine who can reach the user and with which method of communication. That identity does not reveal user's private information like location or context for others; they only can see by which communication method the user is available.

Vehicle services opportunities benefit from the Cloud

Author
Jukka Ahola

The development in mobile connectivity, information technology and Cloud increasingly affects the cars and vehicles in our everyday use. A significant part of the vehicle software monitors and controls the steering and engine system functionality. By harnessing the power of Cloud analytics and mobile communications in vehicles the utilization of the vehicle sensor data can open up a multitude of unique and innovative vehicle diagnostics services for various stakeholders. These stakeholders in the remote vehicle diagnostics may include manufacturers, car dealers, owners, after-sales, R&D and other interested parties.

The proof-of-concept demonstrates a remote vehicle diagnostics system that can be added to most modern cars easily, without custom installations, and the data can be gathered and analysed in the Cloud.

This research is of interest to those system integrators and analysts that see cars and vehicles as the new source for business intelligence and social data. This proof-of-concept shows that it is possible to build a Vehicle-to-Cloud system by utilizing ordinary off-the-shelf products and commonly available software solutions. The proof-of-concept demonstrates a remote vehicle diagnostics system that can be added to most modern

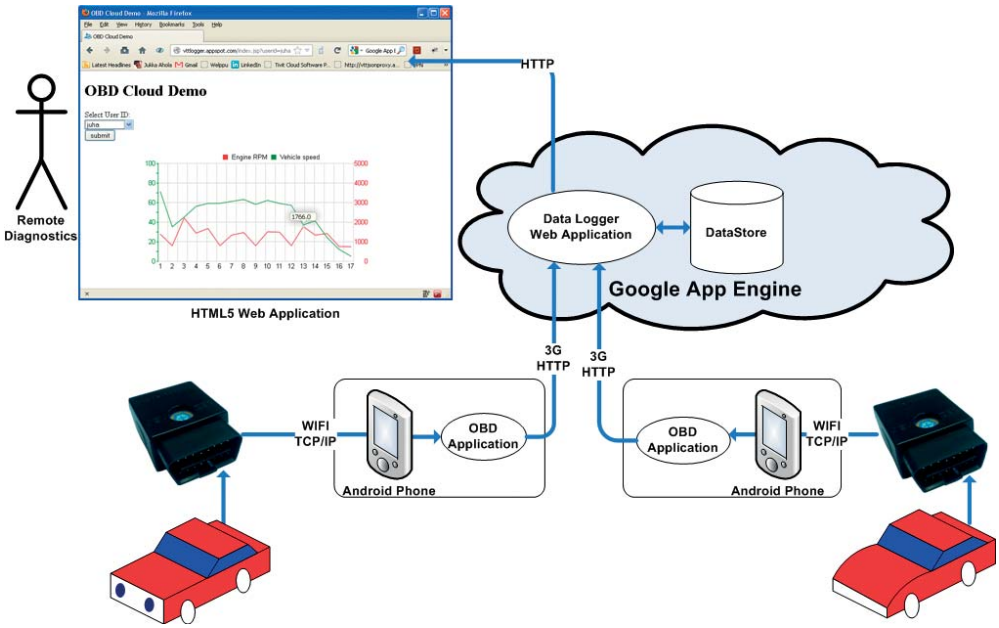


Figure 1. Remote Vehicle Diagnostics system.

cars easily, without custom installations, and the data can be gathered and analysed in the Cloud.

Research

The diagnostics data was collected from the car engine by using on-board diagnostics tool OBD-II with a Wi-Fi capability. OBD-II tool was configured to connect to an Android device with its Wi-Fi-tethering setting on. Android device communicated with the OBD-II tool by using a program that communicated with the OBD-II tool. The communication with the OBD-II tool was utilizing serial connection commands through TCP-IP socket connection. An Android application developed, for this research project, then collected the measurement data and submitted it to a Cloud-based application hosted in the Google App Engine domain. The Cloud application stored the data and implemented an HTML5-reporting functionality to represent the collected and analysed measurement data. The system is illustrated in Figure 1. This proof-of-concept system was built to demonstrate a Vehicle-to-Cloud system, capable of collecting individual vehicle diagnostics data and analysing the data as a whole in a massively scalable Cloud system.

Results

The Vehicle-to-Cloud proof-of-concept is a technology enabler that can potentially create new business opportunities in the vehicle services domain. The goal was to identify any technology risks and opportunities to support the future product and service offerings in remote vehicle diagnostics. Currently the business driven by the vehicle data analysis is dominated by the leading car manufacturers. However, the remote vehicle diagnostics could be an opportunity to a broad-minded company or a partnership to challenge the vendor specific market leaders of today.

Augmented Reality creates the WOW effect in the Cloud

Author
Sanni Siltanen

In Augmented Reality (AR), the user's view is enriched with digital information. For example, 3D models are added to the user's view (see Figure 1). AR is a profound visualization technique for situations where user's perception of the environment needs to be enhanced [62].

Helping people to understand 3D environment

People often struggle with understanding 3D structures and dimensions, for example when interpreting 2D drawings such as floor plans or town plans. People particularly have trouble in understanding the relationship between the plans, current situation and existing environment. Plans used in interior design are traditionally presented as layouts on 2D floor plans, but with augmented reality the plans can be visualized in 3D – allowing a more real view of the plans and space. In this research we focused on special challenges arising when applying AR in interior design.

Research – Interaction with the environment

A 3D model of a new virtual object (e.g. a piece of furniture) is often available. However, in order to be able to interact with the environment, a model of the real environment is needed as well. In this project we studied computer vision and 3D reconstruction approaches for modelling the walls and floor of a room. This information ensures that the virtual space has same dimensions as the real room and the furniture is always placed inside the room. The existing pieces of furniture overlapping with virtual ones constitute another challenge in AR interior design. If the user wants to replace existing piece of furniture with a new one, the AR applica-

Figure 1. Augmented Reality: Virtual furniture has been added to the image.

Augmented Reality uses Cloud-based applications that analyse user actions and application's perceptions of the environment, and process the digital information.

tion should be able to do so. For this purpose, we developed texture synthesis method for removing real piece of furniture virtually.

Results – Cloud based augmented reality service

In order to be able to present additional digital information, the application needs to analyse user actions, perceptions of the environment, and process the digital information stored somewhere else. All this can be done effectively in the Cloud.

A Cloud-based service can handle all information processing and data storage and stream only necessary data at each moment to user's end device. The information can then be displayed in an appropriate way to create a wow effect (see Figure 2).

This study was done in cooperation with Vivid Works Ltd. The research is still on-going and continues until the end of 2013. The developed methods for improving interaction with the environment are beneficial for indoor AR applications and will be applied in real products in the future.

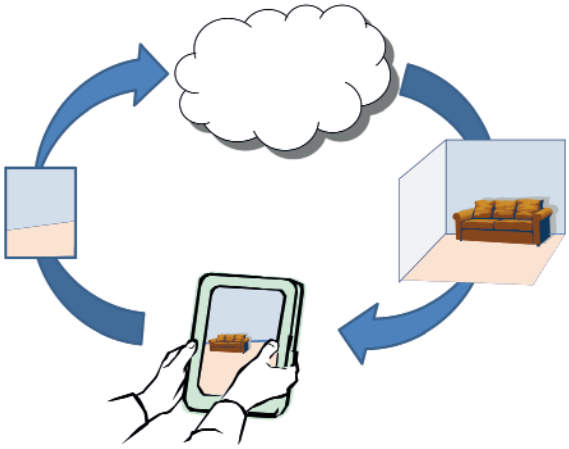


Figure 2. A Cloud-based augmented reality service concept: The user's images are uploaded to the Cloud service, 3D processing is done in the Cloud thereafter the augmentation is send back to the user.

Augmented Reality (AR) technology improves a user's perception on an environment by overlaying information into the user's view. It enables exploring the world in a new and intriguing way. For example, we can see the location and navigation instructions to the closest restaurant overlaid with a real-time image on our mobile phone's display, or the augmentation system may show us planned construction projects or a future building in the real environment. The trick in AR is to create an illusion of the co-existence of real and virtual objects (see figure below). This is done by deducing the user's location and orientation and then aligning the virtual environment accordingly.

AR applications use two main approaches for getting a user's location and orientation; the computer vision approach utilizes camera images and analyses the users movements based on what it sees, whereas a sensor-based technologies approach utilises information gathered from various sensors (GPS, digital compass, inertial sensors, etc.).

Augmented reality concept; a virtual couch is added into the user's view.

A liquid experience: The need for the user interface to flow between devices

Authors
Jussi Ronkainen, Kaisa Koskela-Huotari, Timo Urhemaa

The current range of smart mobile and desktop devices, including living room devices such as TVs, has made it necessary for Cloud service developers to create applications for many platforms and devices that range in size and capabilities. This is time consuming and requires specific expertise for each device.

As a consequence, cross-platform software development kits have recently become popular with the promise of rapid decrease in development time. In reality, cross-platform development has its challenges due to the multiple running environments, limited debugging abilities, limited code execution speed, and tool chain diversity.

An increasingly popular cross-platform development approach is to use the devices' web browser as the platform and to implement the program logic and UI as a web application using HTML5, JavaScript and CSS3 as the lingua franca. The application then only requires a thin native wrapper to enable distribution over application marketplaces and to access device resources such as the address book, camera or GPS. Ideally, applications should only need to be written once and they should then run on any device with little modification.

The "code once, run everywhere" approach aims at a single codebase that will run on any device with minimal or no modifications.

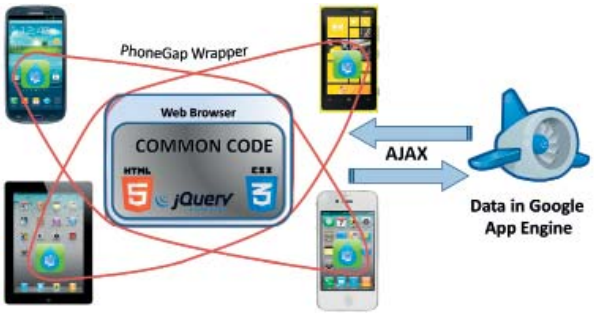


Figure 1. The client/server structure.

Research

We chose to implement a cross-platform demo application on a service idea that was based on insights gathered in VTT's previous studies about the meanings and perceptions people attach to digital content. According to our concept, people do not wish to share and store digital photos but actually share and relive their memories, which emphasizes the need to comment on the photos.

We utilized the PhoneGap framework, which wraps HTML5 applications to a native application, and deployed the demo on iOS, Android and Windows Phone 8 platforms. Each platform had a platform specific part and one common codebase for application UI and logic. Our first challenge was to establish version control for each platform, while incorporating the common codebase as a subproject in each.

We used the Google App Engine (GAE) as a backend system, because of its easy-to-use tool chain, good documentation and cost free use in small projects. The final challenge was then to design and implement the application UI and logic. The user interface was

built on the jQuery Mobile framework. The client/server structure of our demo application is depicted in Figure 1.

Results

We found PhoneGap to be fairly simple to use and with its native plugin interface, to have good potential as a common platform for native-like applications. HTML5 application development proved out more difficult than native development with vendor-preferred tools such as Xcode for iOS, Eclipse/ADT for Android, or Visual Studio/SDK for Windows Phone. Mainly this was due to insufficient on-device debugging abilities for HTML5 applications. Also, since HTML5 applications are not compiled but rather interpreted by the browser when they are run, it is harder to spot programming errors during implementation.

On the whole, the "code once, run everywhere" concept worked very well for our application on the chosen devices. From program logic and UI layout point of view the differences between devices were negligible, and the few platform specific definitions in the common code were limited to style sheets.

However, at times we found the application to fall short of native applications in terms of UI responsiveness. There were also some notable differences in UI effects such as animated page transitions on different platforms. HTML5 applications are heavily dependent on the JavaScript component libraries used, so the selected library will have a major influence on the UI – not only the general appearance but performance as well.

Cloud developers' reality

Consumers have quickly grown to expect their content to be available anytime and anywhere, using any available device. As a consequence, Cloud services are often targeted specifically at mobile devices while other means of access (PC client, web page) are offered as a surrogate for the mobile application. A few years ago the trend was exactly the opposite. From a service developer's point of view, this device heterogeneity is challenging. In addition to the wide range of screen shapes, sizes and resolutions the application potentially needs to support, there are many varieties of mobile, desktop and living room platforms to consider, such as smartphones and tablets, PCs, gaming consoles, smart TVs, and set-top boxes. Each platform has its specific development environment and support tools, programming language(s), operating system architecture, UI components and design guidelines, support libraries etc. In practice, building a native application from scratch for each platform requires a lot of expertise and resources. A wide range of device support can be gained via browser applications. HTML5 has built-in support for touch devices and it is expressive enough for creating complex applications. It also provides easy access to web resources. However, browsers have limited access to device capabilities, while users are accustomed to polished applications that integrate seamlessly with their device, without having to launch a browser. Cross-platform Software Development Kits (SDKs) offer more platform integration. They come in different flavours depending on their targeted application types, supported platforms and programming languages, and provide access to device capabilities, well-designed UI components and libraries, and tools for writing and debugging high-performance compiled code. Device support can be maximised by combining cross-platform SDKs with HTML5-based development.

Flowd: A demonstration in new service delivery in the Cloud

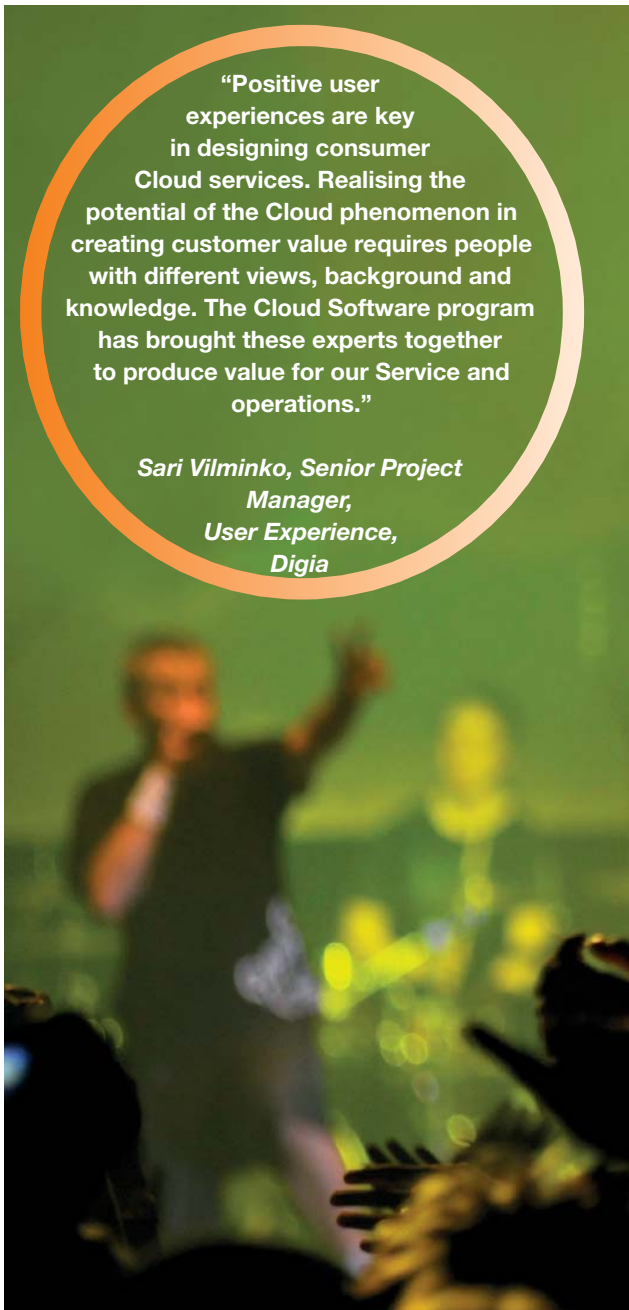
Author
Raija Kuusela

Flowd – the social network for music lovers – is Digia's first Cloud service targeted to the consumer market. Flowd (www.flowd.com) was created both for business and learning purposes. Through Flowd, Digia's research and development efforts are boosted in an environment with a fresh business context. The main user groups are music artists/groups and their fans, but also club organizers and record labels. The business model of Flowd is to provide artists with the ideal tools for developing and nurturing their fan relationships. This will, hopefully, lead to greater sales of their music and merchandise from which Flowd will receive an affiliate fee.

Started at the beginning of 2010, the goal of Flowd was to create a service with two important differentiators compared to other competing services: 1) a more appealing user experience and 2) communication tools for end users. The final Flowd service offering was launched in December 2010 which enabled a research and development environment with a valid business context.

Research

The Flowd analysis was to examine how Digia developed a new Cloud service targeted to the consumer market. The focus is on the company's internal development process in creating the service with the intended customer value. The theoretical basis in the study is on New Service Development (NSD), Cloud service, customer value and customer involvement. The research questions were:



- What are the success factors of the NSD process?
- What are the organisational antecedents of the NSD?

VTT conducted the retrospective research in 2012, when Flowd had been on market for more than one year. The study started with semi-structured interviews of seven Flowd development team members. The interviewees' roles were senior project manager, graphic and interaction designer, marketing expert, web designer, server designer, IOS application designer, and Android application designer. The interview data were analysed by the VTT researcher and the analysed data were complemented and validated by the interviewees in two workshops, where also the development process was described.

Results

The results of the research included the proposal of new service development process success factors as well as organisational antecedents of new service development. The findings and their validation by the literature is described below:

- **Employee involvement and employee expertise** were clearly visible in the case unit. The Flowd team showed very strong commitment and productive teamwork with the members being experts in their own fields and trusting each other.
- **Appropriate level of formalization** is needed in the NSD process. However, in turbulent environments it is more beneficial to implement non-formalized approaches [63]. This was the case also with Flowd team. The used processes were the same as in previous projects; however, they were tailored to be more flexible and suitable for the team. The team realized that when innovating and developing a brand new service it required also new non-standard ways of working. The team tailored their own working practices to support their agile way of working.
- **Management measures** promote the success of development projects in terms of the support of innovation, risk-taking or nurturing an innovation friendly attitude [63]. The Flowd case is an instance of management support in the case company where the project was started as

a spearhead project. In Flowd project management support was evident as the team was allowed to work independently and freely and to modify their working practices and processes.

- **Customer involvement** is said to have a positive impact especially in the area of generating ideas and in the development process, but even a negative impact on the "radicalness of innovations" [63]. Customer perspective was highly considered in the Flowd team during the whole development process.
- **Market orientation** concerns understanding consumers' desires and is especially important for the identification of market opportunities in idea evaluation and the test of developed concepts [63]. In the Flowd case, market orientation seemed to be one of the most critical topics. The team said that the launch preparation – how to launch, where to launch, when to launch — was crucial for the success of the service. It was also critical to consider, where to focus the marketing.
- **Synergy of internal and external environments** determines the success of NSD [63]. Good contacts from music industry were very important to Flowd development as they helped the team to understand what consumers expected.
- **Cross-functional involvement** is a success factor that has an impact during all development phases [63]. This is also the case with Flowd team. The team used Scrum (Agile method) which fosters the idea of a cross-functional team including developers, an architect, a user experience specialist, a graphics designer, a project manager, a product manager and a marketing expert.

Organisational success factors of new service development are as follows :

- **Market orientation** is the most prominent success factor the NSD process [63]. For the case company market orientation was important especially because it was the first time that the company entered the consumer market with a new service.
- **Technology** was identified as an organisational success factor by [63] as it appears as an enabler of developing and delivering new services. One of the strengths of the case company is its knowledge of many technologies and of different industries.
- **Knowledge management** is about gathering and sharing useful information internally and externally [63]. In the case study, the interviewees said that they have lot of knowledge in the company and in Flowd team.
- **Organisational culture** and especially the learning culture, was recognized as a very strong factor in this research. The personnel of the company are committed to work and to continuous learning. One interviewee highlighted that continuous learning is a characteristic of an individual employee and the whole company. In the case company, organisational culture includes innovativeness, flexibility, agility, willingness and the capability to develop.

In addition to the success factors, the development of a process description was created. The research confirms the importance of understanding customers' desired value during the development phases. Customer involvement in new service development also emerged in this study. The research results create a solid and favourable starting point for the development of future Cloud services.

Conclusions

Over the past few years we have witnessed how the Cloud technology has rapidly evolved and many companies have transformed their business towards global, value-driven, business in the Cloud. At the same time, the state of the global economy and especially the ICT sector has been turbulent. Governments and enterprises continue to struggle to inject positive momentum and effectuate growth. No different from other countries around the world, the Finnish ICT sector continues to face challenges as we prepare for 2014. So what has been the role of the Cloud Software Program (CSW) in Finland?

The Cloud Software Program has been an impressive consortium — truly an outstanding example of cooperation and co-innovation in Finland.

The Cloud Software consortia has achieved great results and generated real business value for many companies. Some of the examples are presented in this book. In addition, we believe that the CSW partners have formed a unique innovative and collaborative ecosystem in Finland. This signals companies to venture forth into a new digital economy where they can create and capture new value in fresh ways, spark new products, services, processes and businesses and most importantly, create new rules and opportunities for competitive advantage and breakthrough outcomes. Moreover, we believe that the CSW journey leads beyond traditional research projects to seamless innovation and collaboration, beyond well-aligned R&D processes to agile and lean innovation approaches, beyond an annual planning mentality to a focus on sustainable growth and value driven business, and finally, beyond cross-functional project teams to ecosystem wide innovation networks.

To conclude, the Cloud Software Program has been an impressive consortium — truly an outstanding example of cooperation and co-innovation in Finland. It has been a great pleasure to be part of it for the whole duration of the program.

Dr. Tua Huomo
Program Coordinator
Cloud Software Program 2010—2013

References

[1] ISO 9241-210. 2009. Ergonomics of human system interaction – Part 210: Human-centered design for interactive systems (formerly known as 13407). Geneva, Switzerland: International Organisation for Standardization (ISO).

[2] Roto, V., Law, E., Vermeeren, A. & Hoonhout, J. 2011. User Experience White Paper: Bringing clarity to the concept of user experience. Result from Dagstuhl Seminar on Demarcating User Experience, September 15–18, 2010.

[3] Ng., I.C.L. & Smith, L.A. 2012. An Integrative Framework of Value. In Vargo, S.L. & Lusch, R. F. (eds.) Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing. Review of Marketing Research, Vol. 9. Emerald Group Publishing Limited. Pp. 207–243.

[4] Vargo, S. L., Maglio, P. P. & Akaka, M. A. 2008. On value and value co-creation: A service systems and service logic perspective. European Management Journal, Vol. 26. Pp. 145–152.

[5] Chandler, J. D. & Vargo S.L. 2011. Contextualization and value-in-context: How context frames exchange. Marketing Theory, Vol. 11. Pp. 35–49.

[6] Helkkula, A., Kelleher, C. & Pihlström, M. 2012. Characterizing value as an experience: implications for service researchers and managers. Journal of Service Research, Vol. 15. Pp. 59–75.

[7] Boudon, R. 2001. The origin of values: Sociology and philosophy of beliefs. New Brunswick, New Jersey, USA: Transaction Publishers.

[8] Kahle, L.R. 1996. Social values and consumer behavior: Research from the list of values. In Seligman, C., Olson, J.M. & Zanna, M.P. (eds.) The psychology of values: The Ontario symposium, Vol. 8. Mahwah, NJ: Lawrence Erlbaum Associates, Pp. 135–151.

[9] Schwartz, S.H. 1992. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. Advances in Experimental Social Psychology. Vol. 25. Pp. 1–65. doi: 10.1016/S0065-2601(08)60281-6.

[10] Rokeach, M. 1979. Understanding human values: Individual and societal. The Free Press: New York.

[11] Näkki, P. & Koskela-Huotari, K. 2012. User Participation in Software Design via Social Media: Experiences from a Case Study with Consumers. AIS Transactions on Human-Computer Interaction. Vol. 4. Pp. 128–151.

[12] Karppinen, K., Koskela, K., Magnusson, C. & Nore, V. Experiences of online co-creation with end users of Cloud services. Proceedings of 13th IFIP TC 13 International Conference on Human-Computer Interaction, INTERACT 2011. Lisbon, 5–9 September 2011. Lecture Notes in Computer Science. Vol. 6949 LNCS (2011). Vol. 4. Pp. 446–449. DOI: 10.1007/978-3-642-23768-3_54

[13] Karppinen, K., Koskela, K. & Koivumäki, T. 2011. Usage of Cloud Services – A Survey

for Consumers in USA, Japan and Finland. Proceedings of the 1st International Conference on Cloud Computing and Services Science (2011), pp. 305–308.

[14] Chang, T-J. & Kaasinen, E. 2011. Three User-Driven Innovation Methods for Co-Creating Cloud Services. Interact Conference Proceedings.

[15] Kaasinen, E., Koskela-Huotari, K., Ikonen, V., Niemelä, M. & Näkki, P. 2012. Three approaches to co-creating services with users. 1st International Conference on Human Side of Service Engineering, San Francisco, USA, 21–25 July 2012.

[16] Prahalad, C. K. & Krishnan, M.S. 2008. The age of innovation: Driving co-created value through global networks. McGraw Hill: New York.

[17] Pine II, B.J. & Gilmore, J.H. 1998. Welcome to the Experience Economy. Harvard Business Review, Vol. 76, Issue 4. Pp. 97–105.

[18] Prahalad, C.K. & Hamel, G. 1990. The Core Competence of the Corporation, Harvard Business Review, Vol. 68, Issue 3. Pp. 79–91.

[19] Checkland, P.B. 1990. Systems thinking, systems practice. John Wiley & Sons Ltd.: Chichester.

[20] Särkelä, S. 2012. Service Creation based on value-creating assets: The case of reusable cloud solutions. University of Oulu, Department of Computer Science and Engineering. Master's Thesis. 65 p.

[21] Hoßfeld, T., Schatz, R., Varela, M. & Timmerer, C. 2012. Challenges of QoE Management for Cloud Applications. IEEE Communications Magazine, Vol. 50, No. 4 Pp. 28–36.

[22] Le Callet, P., Möller, S. & Perkis, A. (eds.) 2012. Qualinet White Paper on Definitions of Quality of Experience. European Network on Quality of Experience in Multimedia Systems and Services (COST Action IC 1003).

[23] Martín Varela & Jouko Sankala. 2010. Understanding Quality Issues in the Cloud. White paper for the DIGILE Cloud Software Program.

[24] Savola, R.M., Juhola, A. & Uusitalo, I. Towards Better Cloud Service Transparency by Security, Privacy and Trust Measurements. AICT2010 – 4th International Conference on Application of Information and Communication Technologies, Oct 12, 2010– Oct 14, 2010, Tashkent, Uzbekistan. http://aict2010.qafqaz.edu.az/

[25] Uusitalo, I., Karppinen, K., Juhola, A. & Savola, R. Trust and Cloud Services – An Interview Study.The 2nd IEEE International Conference on Cloud Computing Technology and Science (CloudCom 2010). November 30– December 3, Indiana University, USA. http://cloudcom.org/

[26] Savola, R. 2010. On the feasibility of utilizing security metrics in software-intensive systems. International Journal of Computer Science and Network Security, Vol. 10, No. 1. Pp. 230–239.

[27] Savola, R.A security metrics taxonomization model for software-intensive systems. Journal of Information Processing Systems, Vol. 5, No. 4, Dec. 2009. Pp. 197–206.

[28] Womack, J.P. & Jones, D.T. 2003. Lean thinking: banish waste and create wealth in your corporation. Free Press Business, London.

[29] Poppendieck, M. & Poppendieck, T.D. 2003. Lean software development: an agile toolkit. Addison Wesley, Boston, MA.

[30] Poppendieck, M. & Poppendieck, T.D. 2007. Implementing lean software development: from concept to cash. Addison Wesley, Upper Saddle River, NJ.

[31] Rickards, R. C. & Ritsert, R. 2012. Rediscovering Rolling Planning: Controller's Roadmap for Implementing Rolling Instruments in SMEs, Procedia Economics and Finance, 2. Pp. 135–144.

[32] Liker, J.K. 2004. The Toyota way: 14 management principles from the world's greatest manufacturer. McGraw-Hill, New York.

[33] Rouse, W.B. 2005. A theory of enterprise transformation. Systems Engineering, Vol. 8, No. 4. Pp. 279–295.

[34] Klotz, L. & Horman M. et al. 2008. The impact of process mapping on transparency, International Journal of Productivity and Performance Management, Vol. 57, No. 8. Pp. 623–636.

[35] Drucker, P. F. & Maciarello, J. A. 2009. Management cases. New York, Collins Business.

[36] Stark, J. 2011. Product lifecycle management. Product Lifecycle Management. Pp. 1–16.

[37] Hope, J. & Fraser, R. 2003. Beyond budgeting: how managers can break free from the annual performance trap. Harvard Business School Press, Boston, Massachusetts.

[38] Svahnberg, M., Van Gurp, J. & Bosch, J. 2005. A taxonomy of variability realization techniques. Software, Practice & experience, Vol. 35, Issue 8. Pp. 705–754.

[39] Chen, L. & Ali Babar, M. 2010. Variability Management in Software Product Lines: An investigation of Contemporary Industrial Challenges. Proceeding SPLC'10 Proceedings of the 14th international conference on Software product lines.

[40] Ali Babar, M., Chen, L. & Shull, F. 2010. Managing Variability in Software Product Lines. IEEE Software, Vol. 27, No. 3. Pp. 89–94.

[41] Bosch, J., Florijn, G., Greefhorst, D., Kuusela, J., Obbink, H., & Pohl, K. 2001. Variability Issues in Software Product Lines. Variability Issues in Software Product lines. In: van der Linden, F. (Ed.) Fourth International Workshop on Product Family Engineering (PFE-4), Bilbao, Spain, 2001. Pp. 13–21.

[42] Abdulmalek, F.A. & Rajgopal, J. 2006. Analyzing the benefits of lean manufacturing and value stream mapping via simulation: A process sector case study. International Journal of Production Economics, Vol. 107, No. 1, Pp. 223–236.

[43] Yeo, R. 2002. From individual to team learning: practical perspectives on the learning organisation. Team Performance Management, Vol. 8, No.7/8. Pp. 157–170.

[44] Kuusela, R., Sirkka, A. & Kuusela-Korva, T. 2013. Organizational Learning in Cloud and Lean Transformation. In review process of Communications of Cloud Software -journal.

[45] Suomalainen, T. & Kuusela, R. Continuous Planning – A Critical Element of Agile and Lean Development. In review process of Journal of Systems and Software.

[46] Kuusela, R. & Koivuluoma, M. 2011. Lean Transformation Framework for Software Intensive Companies: Responding to Challenges Created by the Cloud. Software Engineering and Advanced Applications (SEAA), 2011 37th EUROMICRO Conference on 2011, IEEE. Pp. 378–382.

[47] Robins, F. 2010. Learning from corporate mistakes. Corporate Communications: An International Journal. Emerald Group Publishing Limited. Vol. 15, No. 2. Pp. 169–180.

[48] Schwaber. K. 2004. Agile Project Management with Scrum. Redmond, Washington, USA: Microsoft Press,. 192 p. ISBN 978-0735619937.

[49] Beck, K. 2000. Extreme Programming Explained: Embrace Change. Upper Saddle River, New Jersey, USA: Addison-Wesley. 190 p. ISBN 978-0201616415.

[50] Dennis, A.R., Fuller, R.M. & Valacich, J.S. 2008. Media, tasks, and communication processes: A theory of media synchronicity. MIS Quarterly. Vol. 32. Pp. 575–600.

[51] Ferreira, J., Noble, J. & Biddle, R. 2007. Up-Front Interaction Design in Agile Development. In: Agile Processes in Software Engineering and Extreme Programming. Lecture Notes in Computer Science.

[52] Dayton, D. & Barnum, C. 2009. The Impact of Agile on User-centered Design: Two Surveys Tell the Story. Technical Communication, Vol. 56, No 3.

[53] Blomkvist, S. 2005. Towards a Model for Bridging Agile Development and User-Cen-

tered Design. Human-Centered Software Engineering — Integrating Usability in the Software Development Lifecycle. Human-Computer Interaction Series, Vol. 8, IV. Pp. 219–244.

[54] Kane, D. 2003. Finding a Place for Discount Usability Engineering in Agile Development: Throwing Down the Gauntlet. Proceedings of the Agile Development Conference. ADC 2003.

[55] Beyer, H., Holtzblatt, K., & Baker, L. 2004. An Agile Customer-Centered Method: Rapid Contextual Design. Proceedings of CP/AU.

[56] Isomursu, M., Sirotkin, A., Voltti, P., & Halonen, M. 2012. User Experience Design Goes Agile in Lean Transformation – A Case Study. 2012 Agile Conference. IEEE. Pp. 1–10. doi:10.1109/Agile.2012.10

[57] Goods Spotter Press release, 16.11.2011, Tieto. http://www.tieto.com/tieto-develops-mobile-application-facilitate-consumers-purchase-decisions

[58] Välkkynen, P., Boyer, A., Urhemaa, T. & Nieminen, R. 2011. Mobile Augmented Reality for Retail Environments, presented at the Mobile HCI 2011 Workshop on Mobile Interaction in Retail Environments, Stockholm, Sweden, 2011. http://virtual.vtt.fi/virtual/proj2/multimedia/media/publications/mire2011.pdf

[59] Fogarty, J., Lai, J., & Christensen, J. 2004. Presence versus availability: The design and evaluation of a context-aware communication client. International Journal of Human-Computer Studies, Vol. 61, No. 3. Pp. 299–317.

[60] Oulasvirta, A., Raento, M., & Tiitta, S. 2005. ContextContacts: Re-designing SmartPhone's contact book to support mobile awareness and collaboration. Paper presented at the Proceedings of the 7th International Conference on Human Computer Interaction with Mobile Devices & Services. Pp. 167–174.

[61] Jung, Y., Persson, P., & Blom, J. 2005. DeDe: Design and evaluation of a context-enhanced mobile messaging system. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Pp. 351–360.

[62] Siltanen, S. 2012. Theory and applications of marker-based augmented reality. Espoo, VTT. VTT Science 3. 199 p. + app. 43 p., ISBN 978-951-38-7449-0 (soft back ed.) 978-951-38-7450-6. http://www.vtt.fi/inf/pdf/science/2012/S3.pdf

[63] Posselt, T. & Förstl, K. 2011. Success Factors in New Service Development: a Literature Review. In: Ganz, W., Kicherer, F. & Schletz, A. (eds.) Productivity of Services Next Gen – Beyond Output/Input. Fraunhofer Center for Applied Research and Supply Chain Service, Germany.

VTT's Cloud Software Program

contributors 2010—2013

Series title and number
VTT Research Highlights 9

Title	Value-driven business in the Cloud
Author(s)	Tua Huomo, Kaarina Karppinen, Pasi Pussinen
Abstract	Over the past few years we have witnessed how the Cloud technologies have rapidly evolved and many companies have transformed their business towards global, value-driven business in the Cloud. Many services have found a place in the Cloud and numerous new innovations currently exist and will continue to be based on the Cloud technologies. At the same time, the transformation from the traditional approaches towards Cloud-based business has resulted in major changes in ICT companies. DIGILE's Cloud Software Program (CSW) was initiated in 2010. CSW is the largest collaborative program in the field of ICT in Finland. The four-year program includes several partners from Finnish industry and research organisations. VTT Technical Research Centre of Finland has been one of the main research partners of the program. VTT's researchers have been working in a number of industry-driven business cases in collaboration with the companies and academic partners. The research cases have been challenging and have required a solid understanding of software business, processes, tools and methods from a variety of viewpoints. The Cloud Software consortia has achieved great results and generated real business value for many companies. Some of the examples and highlights are presented in this book.
ISBN, ISSN	ISBN 978-951-38-8127-6 (print) ISBN 978-951-38-8128-3 (online) ISSN-L 2242-1173 ISSN 2242-1173 (print) ISSN 2242-1181 (online)
Date	2013
Language	English
Pages	95 p.
Name of the project	Cloud Software Program
Commissioned by	
Keywords	Cloud Software, Business Transformation, User Experience, Lean Development
Publisher	VTT Technical Research Centre of Finland P.O. Box 1000 FI-02044 VTT, Finland Tel. +358 20 722 111

Value-driven business in the Cloud

Over the past few years we have witnessed how the Cloud technologies have rapidly evolved and many companies have transformed their business towards global, value-driven business in the Cloud. Many services have found a place in the Cloud and numerous new innovations currently exist and will continue to be based on the Cloud technologies. At the same time, the transformation from the traditional approaches towards Cloud-based business has resulted in major changes in ICT companies.

DIGILE's Cloud Software Program (CSW) was initiated in 2010. CSW is the largest collaborative program in the field of ICT in Finland. The four-year program includes several partners from Finnish industry and research organisations. VTT Technical Research Centre of Finland has been one of the main research partners of the program. VTT's researchers have been working in a number of industry-driven business cases in collaboration with the companies and academic partners. The research cases have been challenging and have required a solid understanding of software business, processes, tools and methods from a variety of viewpoints.

The Cloud Software consortia has achieved great results and generated real business value for many companies. Some of the examples and highlights are presented in this book.

ISBN 978-951-38-8127-6 (print)
ISBN 978-951-38-8128-3 (online)
ISSN-L 2242-1173
ISSN 2242-1173 (print)
ISSN 2242-1181 (online)