User-Driven Innovation - Context and Cases in the Nordic Region

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User-Driven Innovation

Context and Cases in the Nordic Region

- User-driven innovation encompasses both meeting user needs and involving users in the process
- Companies are adopting new approaches to innovation, requiring a different logic and combination of competencies
- The public sector can support these activities through awareness raising, knowledge institutions and platforms for user involvement

Editors: Emily Wise, Casper Høgenhaven

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Fact Sheet

Title: User-Driven Innovation – Context and Cases in the Nordic Region

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Abstract:
The nature of innovation is changing. An increasingly globalized society, enabled by information and communication technologies (ICT), has changed the process of value creation and shifted the balance of power between firms and individual consumers – or users. Companies can no longer rely solely on operational efficiency or technological superiority in order to create a competitive advantage.

Today, companies must also find ways to define and deliver unique experiences, together with users, in order to survive. However, this requires a paradigm shift – both a change in mindset and adjustments to current working practices.

In this report, the process of defining unique experiences together with users is referred to as user-driven innovation. User-driven innovation encompasses both an understanding of true user needs and a systematic involvement of users in the innovation process.

The report explains a number of market forces and academic underpinnings, and presents an overview of the context regarding user-driven innovation in each of the five Nordic countries. The report also presents concrete examples of how companies employ user-driven innovation processes. Finally, the report suggests a number of policy-level activities which could be undertaken to strengthen both the understanding and practical competencies related to user-driven innovation.

Topic/NICe Focus Area: Innovation Policy

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Executive Summary

In November 2006, the Nordic Innovation Centre (NICe) launched a call for proposals under the theme of 'user-driven innovation' (UDI). Six projects were selected and approved for financing. These projects were kicked-off in June 2007.

Main Objectives

This project – *User Driven Innovation: Context and Cases in the Nordic Region* – was one of the six, and is the first in the portfolio of NICe user-driven innovation projects to deliver its findings. The project has had three overall objectives:

1. To present an explanation of user-driven innovation in a Nordic context
2. To develop in-depth written and presentation materials which explain specific examples of companies who employ user-driven innovation methods (why and how they do it…and with what results)
3. To present summary observations and policy recommendations

This study has achieved these aims by explaining some of the drivers of user-driven innovation, proposing a number of frameworks and a definition in order to structure the ongoing discussion about user-driven innovation, and by describing the general context and a specific company example in each of the five Nordic countries. The project also suggests a number of Nordic policy-level activities which can be considered going forward.

Method/Implementation

The project has been implemented over the course of one year. Following a kick-off meeting, the first stage of the project focused on the development of a common interview guide and frameworks (which were piloted with Danish companies before 'rolling out' to others). Next, each country created a short-list of companies that employ user-driven innovation processes, from which (at least) one company was selected for detailed interviews.

A video conference was held to communicate adjustments to the project's framework and suggest a number of key elements to address in the company cases. Draft versions of country context descriptions and cases were sent to team members to serve as guides. In late January, the project held a status meeting, where the general frameworks and a number of company cases were presented and discussed. Participants included team members, representatives from other NICe UDI projects, members of the NICe reference group for UDI, and a number of other interested parties.

Throughout the project, the various frameworks, methods and project process have been regularly anchored with an inspiration group – comprised of academics and various professionals who have experience with user-driven innovation processes.[3] In addition, national NICe reference group members (and others) have been involved in consultations and discussions.

This final report has been a team effort. The various sections of the report have been authored by different team members. Each section has a footnote reference of the author(s). The report has been compiled and edited by the project's managers and team members at FORA.

Concrete Results and Conclusions

The nature of innovation is changing. An increasingly globalized society, enabled by information and communication technologies (ICT), has changed the process of value creation and shifted the balance of power between firms and individual consumers.

[3] Inspiration group members have included: Assistant Professor Lars Bo Jeppesen (Copenhagen Business School – CBS), Associate Professor Robert D. Austin (Harvard Business School/CBS), Christian Madsbjerg (Partner, ReD Associates), and Jacob Schjørring (Head of Section, Mindlab)

Companies can no longer rely solely on operational efficiency or technological superiority in order to create a competitive advantage. Today, companies must also find ways to define and deliver unique experiences, together with users, in order to survive. However, this requires a paradigm shift – both a change in mindset and adjustments to current working practices.

In this report, user-driven innovation is defined as ***the process of tapping users' knowledge in order to develop new products, services and concepts. A user-driven innovation process is based on an understanding of true user needs and a more systematic involvement of users.*** This definition encompasses two key elements: an understanding of true user needs (in order to be able to define unique experiences), and systematic user involvement in the innovation process. Two frameworks – the innovation wheel and the framework for mapping UDI processes – are used to describe user-driven innovation processes in more detail. Eight case examples are presented, describing the process (step by step), specific methods employed, results and key lessons. The general context regarding user-driven innovation (research, education, public and private sector activities) in each of the Nordic countries is also presented.

The context descriptions provide general background information to explain the different points of departure in each country. The company case examples help the reader to begin to understand the changing nature of innovation – and how innovation processes in those companies who employ user-driven approaches differ from the current paradigm.

This report is the primary result of the project work. The report presents no specific conclusions, but should rather be seen as a tool for increasing awareness and understanding of user-driven innovation. Different stakeholder groups can benefit from different pieces of the report. Companies can gain a better understanding and inspiration from the cases. Universities can gain insight on the increased need for inter-disciplinary approaches to education, as well as the need for further research in a number of areas. Public sector organizations can better understand what user-driven innovation is, and what different activities may be needed in order to support making the paradigm shift.

Recommendations

The following areas are recommended for further research or policy action on a Nordic level:

- Building knowledge institutions with specialised skills in the area of user involvement
- Establishing platforms for user involvement
- Applying user-driven innovation in welfare benefits and public services

In addition, further efforts to raise awareness and develop a better understanding of user-driven innovation processes and methods are still in demand. Some specific research topics or projects which have been requested include:

- Collection and description of additional company cases in order to better understand what methods can be used in which business contexts (and with what success)
- Quality checks (or standards) for living labs (and other co-creation environments)
- More detailed understanding on what approaches and business models can be appropriate to involve different types of users (including individual users, groups of consumers, customers, etc.)

And to complement research activities and disseminate new information, educational programmes should incorporate different aspects of the 'new nature of innovation' (including inter-disciplinary education and closer links with companies).

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Preface

This project – *User Driven Innovation: Context and Cases in the Nordic Region* – has the general aim of providing increased clarity and a common baseline understanding of the topic. By proposing an initial definition and a set of frameworks which can be used to describe and learn from various types of user-driven innovation approaches, the project team hopes that we can move things forward in this region.

The project team has received helpful inspiration and guidance from Jørgen Rosted (Director, FORA), as well as from a number of external sources. The co-editors have done their best to synthesize and communicate a broad range of information.

Although all team members have followed common guides, the story for each country and company case is unique. This report should be viewed as a document which provides the 'broad strokes' regarding the topic, an overview of the current context in each of the five Nordic countries, and some initial examples of how different companies employ user-driven innovation approaches.

The project team would like to thank all national contacts who generously provided their time and input on the country context descriptions and company cases, as well as the fellow NICe project and reference group members who participated at our project's status meeting. A special thanks goes out to those who have participated in our expert group meetings over the year: Assistant Professor Lars Bo Jeppesen (Copenhagen Business School – CBS), Associate Professor Robert D. Austin (Harvard Business School/CBS), Christian Madsbjerg (Partner, ReD Associates), and Jacob Schjørring (Head of Section, Mindlab).

The team hopes that this report can help answer some of the many questions that have been posed about user-driven innovation, help frame the ongoing discussion about user-driven innovation processes, and help catalyze future action in the field of user-driven innovation.

Introduction[4]

Since the introduction of 'economic innovation' (Schumpeter, 1934) and subsequent 'new growth theories' (Dosi, 1982; Freeman, 1982; Nelson and Romer, 1996) explaining the positive impact of innovation and technological change on the economy, many individuals have spent countless hours on the topic of innovation.

In the 80's and 90's, focus was primarily on the supply of new research and technology as the key driver of innovation. National innovation strategies aimed at increasing R&D investments – particularly in 'high-tech' industries. Companies aimed at developing the most technologically-advanced products and processes.

In recent years, however, more focus has been given to demand-led innovation – innovation driven by user's needs and requirements. With increased global competition and cheaper sources of high-quality technological solutions, companies can no longer rely on maintaining a competitive advantage based on 'traditional' drivers of price and quality. Companies must strive to seek alternative sources of competitive advantage, and are therefore undertaking major transformations in their innovation processes and business models in order to deliver more valuable products and services to the market. These new innovation strategies often involve increasingly open business models, a greater focus on understanding latent consumer needs, and more direct involvement of users in various stages of the innovation process.[5]

Policymakers, too, are re-thinking their innovation strategies. In a note to the competitiveness ministers in 2006, the Finnish EU Presidency highlighted that

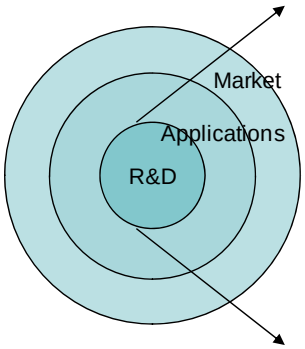
"Success in the global economy is increasingly determined by firms' ability to respond innovatively to the changing views and needs of customers and users – the demand side of the market. So far, the way in which market demand facilitates innovation has received less attention in European policy formulation than the private and public funding of R&D and expenditure on education, which typically represent supply-side policies."

This has catalyzed a number of countries to consider how they can achieve a better balance between 'supply-side' and 'demand-side' innovation policies. This call for more balanced innovation policies was also mentioned in a recent presentation made by Esko Aho, Former Prime Minister of Finland and President of the Finnish Innovation Fund (see Figure 1.1 below).

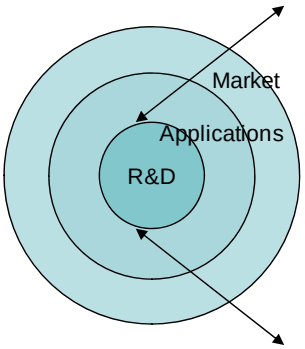
[4] The Introduction has been written by Emily Wise (Consultant at IEC and Research Fellow at Research Policy Institute, Lund University)

[5] see McGregor, Jena (2008), "Most Innovative Companies: Smart Ideas for Tough Times " in *Business Week*, April 28, 2008.

Figure 1.1: Supply-driven and Demand-driven Innovation Approaches



Supply-driven approach
- Research/technology-driven (technology push=supply driven)
- Linear (first R&D, leads to applications, then commericalized/brought to market)



Demand-driven approach
- Market-driven (market pull=demand driven)
- Iterative (market/consumer/user demand incorporated – ***together with technology*** – into a product/service/concept, then commericalized/brought to market)

Source: Author's interpretation of presentation by Esko Aho at *New Trends in Nordic Innovation* conference, Oulu, Finland, November 30, 2007

With calls for change come many questions:

- What is user-driven innovation?
- Is this really anything new?
- If so, how are countries' and companies' innovation strategies changing?
- What, concretely, are companies doing?
- Can user-driven innovation be pursued in a systematic way?
- Do user-driven innovation methods result in high economic impacts?

The objective of this report is to provide some responses to these questions. Part One will provide an overview of the changing market context and academic underpinnings that have shaped what we call 'user-driven innovation'. The report will suggest a definition of user-driven innovation and explain a number of factors that can be considered new. The final section of Part One will introduce a framework for understanding various approaches to user-driven innovation.

Part Two of the report will present a description of the national context regarding user-driven innovation in each of the five Nordic countries. In addition, several cases – detailing user-driven innovation processes in companies – will be described.

In Part Three, summary observations and implications on policy will be presented.

Part One: Overview of User-Driven Innovation[6]

Various changes in the market have created a need for companies to re-think their innovation processes. Companies are pressed to find new ways to create value for the user, and to access knowledge outside of their organizational boundaries. Some companies have been inspired by various theories and practices which originate from different academic disciplines. This section will present a number of market forces and academic underpinnings which, together, have shaped an increasingly-observed practice of user-driven innovation. This section will also introduce a two-part framework which has been used to map user-driven innovation processes in companies.

The Changing Marketplace[7]

A number of factors have impacted the development of thoughts and practices over the past several decades. These include the increased proliferation of information technology and globalization.

The increased speed and decreased cost of the internet (and information technology more generally) has led to very high proliferation rates – even in developing economies. The **increased proliferation of IT** has not only led to increased spread of knowledge, but it has also been an enabler to more open and distributed innovation processes (including open source software, mass customization toolkits, co-creation platforms, etc.).

The **'democratization' of knowledge** enabled by the internet has helped consumers to be more aware of 'what's out there' and, more importantly, to have the possibility to communicate their demands and actually take part in development processes. Through blogs, forums, search engines etc. consumers are now able to compare price, performance, discuss company ethics, and customize products and services. These **more sophisticated and demanding consumers** – with masses of information and the ability to buy from companies all over the globe – no longer consider the price/quality trade-off as the sole driver of choice. Instead, consumers increasingly consider how a company and its products match their own personal values, behaviours and needs. Consumers now have increased power over companies.[8] This has **catalyzed companies to include users in the innovation process** – gaining insight on what to produce, and developing new innovations together with users.

Globalization has had many impacts on companies and the way they approach innovation. The broadest impact is the **increased competition from emerging economies** – where low cost of high skills has put increasing pressure on companies in 'mature' industrialized economies. These companies **can no longer rely on the advantages of being the first to introduce new technologies** to the market, as new entrants from emerging economies are quick to follow with products of similar quality at a fraction of the price.

Globalization has also **changed the nature of organizational structures** within companies. Multi-national companies now often have globally-distributed research and product development organizations (through international subsidiaries, alliances, or even 'simple' internet channels). This has had an **impact on companies' innovation strategies**, as well as

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[6] Part One has been written by Emily Wise (Consultant at IEC and Research Fellow at Research Policy Institute, Lund University) and Casper Høgenhaven (Consultant, Høgenhaven Consulting), with inspiration from Jørgen Rosted, as presented in *How to make Concept Innovation together with Users* (FORA, forthcoming 2008).

[7] The authors have been very inspired by the thoughts of C.K. Prahalad and Eric von Hippel, presented in their books: *The Future of Competition* (Prahalad and Ramaswamy 2004), *Democratizing Innovation* (von Hippel, 2005) and *The New Age of Innovation* (Prahalad and Krishnan, 2008).

[8] See Economist special report: *Power at Last – how the internet means the consumer really is king (and queen)*, April 2005.

on the methods and business models that are used – pushing towards more open and collaborative processes, and increasing engagement of users.

In addition, globalization has broadened the possibilities for companies to **access skilled labour**. Firms' efforts to access and capitalize on knowledge are no longer restricted to their own employee base. Increasingly, companies are finding systematic ways to access specialized knowledge and experience (even in completely different industries than their own) through methods such as internet communities and lead-user panels.

In broad terms, there is nothing new about innovation being driven by market demand and entrepreneurial initiatives of users. However, the text above points to a number of new – or re-discovered and newly prioritized – factors that ARE new to 'user-driven innovation', such as:

- the increased ability for users to take part in innovation processes, thereby allowing users to get their demands heard and addressed (through IT-enablement and greater acceptance of 'open innovation' processes in a number of companies).
- companies' desire to more systematically capture knowledge and inspiration from outside of the company
- companies' understanding of more sophisticated consumer demand and increased focus on developing products/services that address unmet consumer needs or solve problems in new ways
- the increased frequency of companies' employment of consumer insights and user involvement in their innovation processes

These new factors highlight the need to consider innovation processes (and policies) with a different perspective – to consider different methods, business models and skill sets. Some companies have already adopted new perspectives. Other companies may look to the academic world for inspiration. An overview of those academic disciplines that are most often associated with innovation processes reveals that academic theories are also changing. An overview of some of these changes is presented in the next section.

Academic Underpinnings

Innovation processes can be seen from many academic viewpoints. Schools of engineering, economics and management teach various elements, while schools of design and social sciences focus on other, equally important, aspects of innovation processes. An overview of some of the related perspectives borne out of these different disciplines is presented in the following sections. This also highlights the inter-disciplinary aspects of user-driven innovation.

Architecture and Design

The fields of architecture and design are very much inter-twined – particularly in more recent years. In today's 'post-modernistic' era, architecture stresses the everyday needs of people and how technology can be used to provide a liveable environment. In his 1964 *Notes on the Synthesis of Form*, the architect Christopher Alexander inspired the focus on more people-oriented designs and the use of behavioural, environmental, and social science studies as a starting point for design processes. Since then, the architecture industry has increased its focus on users, and a range of firms that work with user needs in relation to architecture has emerged.

These ideas were part of the *design methodology movement* (catalyzed by the designer John Christopher Jones), which stressed a consideration of user-centred issues and behaviours – and the need for designers to work in cross-disciplinary teams to systematically define and

solve problems in different contexts. The systematic *design thinking* process – involving seven stages (define, research, ideate, prototype, choose, implement, learn)[9] – is now at the core of design education[10], design research, and design practice[11].

This process can involve the user in a number of different methods or approaches, depending on the philosophy in focus. The *user-centred design*[12] (UCD) philosophy stresses the needs, wants and limitations of the end-user, and can be implemented using cooperative or *participatory design* methods.

Service Design[13] is the conscious and deliberate use of design thinking to conceive services. In that sense, the object of service design is the process of co-creation of a service experience. Such a co-creation process is performed in the meeting between multiple organizations and people over time, as well as complex systems that coordinate, reframe and cooperate to create value. The most tangible aspects of a service design are the touch points, which may be made up of products, graphics, customer meetings, etc. Like user-centered design, service design also stresses that the consumer perspective needs to be integrated in very early stages of the design process, and that new multi-disciplinary and participatory methods may be used.

In general, there is an increasing focus on the use of design philosophies, processes and methods – which often tend to involve the users – in earlier (more strategic) phases of companies' development processes. Rather than employing 'design as styling' (where form and function are the focus) or 'design as a process' (where design thinking is integrated into the development process), some companies are striving to employ design as a strategic element of the company's business concept. This highest level can be referred to as strategic design, concept design or design as innovation (see Figure 1.2 below).

[9] There are different views on the steps of design thinking. Stanford's d.School (see You Tube video: http://www.youtube.com/watch?v=JZH70qhmEso) and IDEO (see: http://www.businessweek.com/pdf/240512BWePrint2.pdf) are two sources of more information on how the design thinking process is used to innovate.

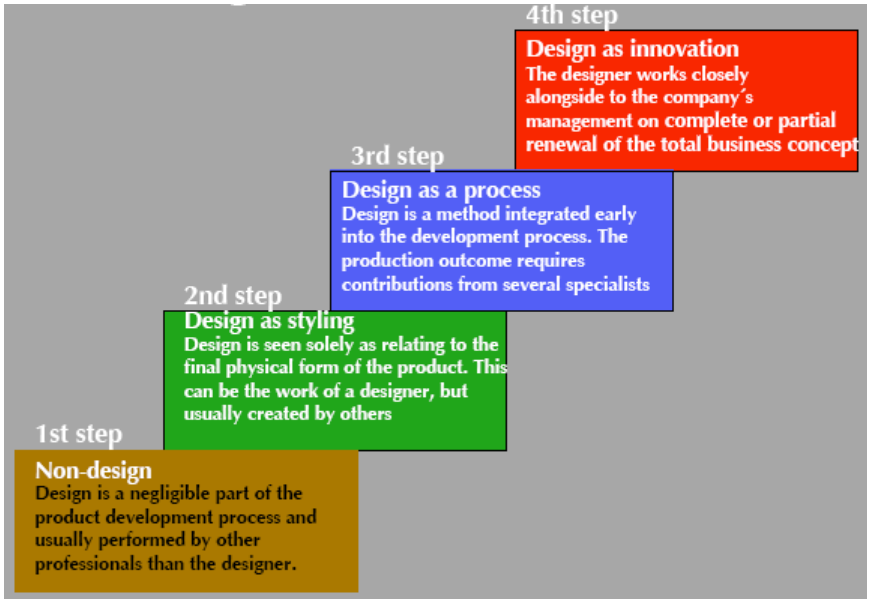
[10] Today, there is a notable increase in the number of programmes linking design with business and engineering. The Stanford Institute of Design (d.School) and the Innovation University in Helsinki are two examples.

[11] exemplified by consultancies like Ziba Design, IDEO, and the Doblin Group

[12] see Donald Norman's publications, including *The Design of Everyday Things* (1986) and *User-Centred Design* (2003) by Stine Hedegaard Jørgensen (available in Danish at: http://www.ebst.dk/file/1622/brugercentreret_design.pdf)

[13] see *Service Design and Why it Matters to Business* at the Danish Design Council's homepage: http://www.ddc.dk/DESIGNVIDEN/artikler, and *What is Service Design?* on the British Design Council's homepage: http://www.designcouncil.org.uk/

Figure 1.2: The Design Ladder



Source: DDC 2001, SVID 2004

Engineering and IT

User-centred design can, in some cases, also be referred to as *human-centred design* (HCD). HCD is the term that can be seen within engineering disciplines (referring to the design of technology systems, such as software and mobile devices). *Human Computer Interaction* (HCI, or CHI) is the study of the interaction between humans (users) and computers – and is at the intersection of a number of fields (e.g. computer science, behavioural sciences, design). Modern HCI methodologies tend to focus on constant feedback and dialogue between users, designers and engineers – and push for technical systems to be based on the types of experiences users want to have (rather than basing user experiences around a completed system).

Social Sciences

Social sciences are a group of academic disciplines that study human behaviour, and include: anthropology, psychology, sociology and ethnography[14]. The *social construction* of technology (SCOT) theory argues that technology does not determine human action, but rather that human action shapes technology – and that the ways in which a technology is used cannot be understood without understanding how that technology is embedded in its social context[15]. This follows the same line of thought in many social and *cultural anthropological* theories, which were developed around ethnographic research. Today, *ethnographic methods* are increasingly common in business settings, typically in early phases of strategic research. Large companies like Intel and Microsoft employ quite a number of ethnographers (and co-sponsor annual Ethnographic Praxis in Industry Conferences[16]). Consulting companies like Cheskin, Ziba Design and Gravity Tank also view ethnographic methods as a way to "inform design by revealing a deep understanding of people and how they make sense of their world". This helps to produce more compelling and innovative design that really connects with

[14] Ethnography is the genre of writing that presents varying degrees of qualitative and quantitative descriptions of human social phenomena, based on fieldwork.

[15] see Hughes, T. (1987), 'The Evolution of Large Technical Systems', in Bijker, W., Hughes T. & Pinch, T. (eds), *The Social Construction of Technological Systems. New Directions in the Sociology and History of Technology*, Cambridge, MA.: MIT Press (pp. 51-82)

[16] see http://www.epic2008.com/

users.[17] In general, social sciences have contributed with important theories and methods for companies' to gain knowledge about the users.

Business Management

Within business management, there is a wide range of literature on innovation – and how innovation processes can be made more successful by more effectively and systematically involving stakeholders outside the company (including the user). In the last several years, the principles of open innovation (sometimes called distributed innovation) have pervaded management literature.

In *Open Innovation* (2003), Henry Chesbrough presents the reasons behind the transition from closed innovation to open innovation models, and why companies need a different mindset and culture to respond to (and benefit from) open innovation. Table 1.1 below summarizes a number of aspects of this shift.

Table 1.1: Closed vs. Open Innovation Principles

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us.	Not all the smart people work for us. We need to work with smart people inside and outside our company.
To profit from R&D, we must discover it, develop it and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to market first will win.	Building a better business model is better than getting to market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our innovation process, so that our competitors don't profit from our ideas.	We should profit from others' use of our innovation project, and we should buy others' IP whenever it advances our own business model.

Source: Chesbrough (2003)

Procter & Gamble[18], IBM and Intel are all companies who have benefited from and promote open innovation.

Along the same lines, the 2004 book *The Future of Competition* by C.K. Prahalad and Venkatram Ramaswamy and the 2008 book *The New Age of Innovation* by C.K. Prahalad and M.S. Krishnan argue that, increasingly, value is co-created by the firm and the customer – rather than being entirely created within the firm. No longer can firms autonomously create value. Neither is value embedded in products and services *per se*. Products are an artefact around which individual experiences are created. Thus, the focus of innovation is shifting from products and services to experience environments that individuals can interact with to co-construct their own experiences. These personalized co-creation experiences are the source

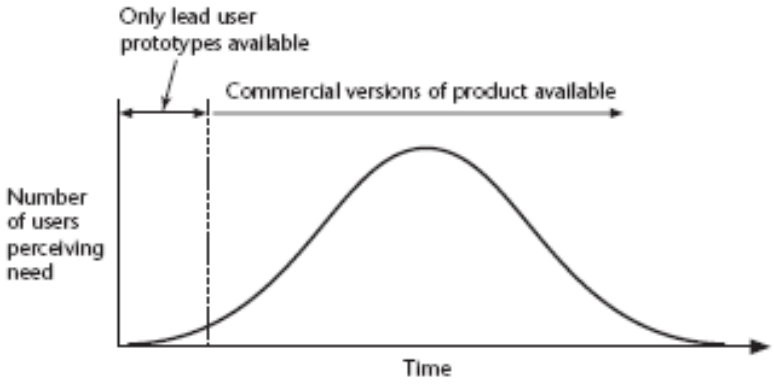
[17] http://www.cheskin.com/view_articles.php?id=28

[18] see Harvard Business Review (2006), "Connect and Develop – Inside Procter & Gamble's New Model for Innovation", Larry Huston and Nabil Sakkab, March 2006

of unique value for consumers and companies alike. Methods of co-creation vary, and can include living labs, virtual communities and lead-user panels.

In *Sources of Innovation* (1988) and *Democratizing Innovation* (2005), Eric von Hippel explains his research on the nature and economics of open and distributed innovation. Von Hippel focuses on the premise that lead users (rather than manufacturers) are responsible for a large amount of innovation (see Figure 1.3 below). The democratized innovation paradigm is based on the fact that lead users innovate to solve their own needs (at private expense) and then freely reveal their innovations. Companies have the opportunity to engage lead users and user communities in order to bring their innovations to the broader commercial market.

Figure 1.3: Early Innovation Activity of Lead Users



Source: von Hippel (2005)

Von Hippel's latest book provides company cases, practical tools and recommendations for involving lead users in innovation processes. Von Hippel leads a global network of researchers on lead-user innovation[19].

At the Intersection

From a broad perspective, one can notice a number of common threads among the different disciplines, including such things as:

- There is increasingly broader participation by users, customers, suppliers, etc. in both science/research and development/innovation processes – a move from closed to open innovation processes.
- The focus on addressing 'higher level'[20] user values seems to be increasing. Although academic views on innovation processes have always included the user perspective, this has typically focused on concrete factors such as price, quality and functionality. Now, it seems that more emphasis is placed on other types of factors, such as 'fit' with lifestyle, behaviours and emotional values.

Based on a number of company cases (presented in Part Two), we see that the skills being demanded by companies are no longer 'pure' business or engineering degrees, but rather 'T profiles'[21] – the combination of multiple skills and perspectives.

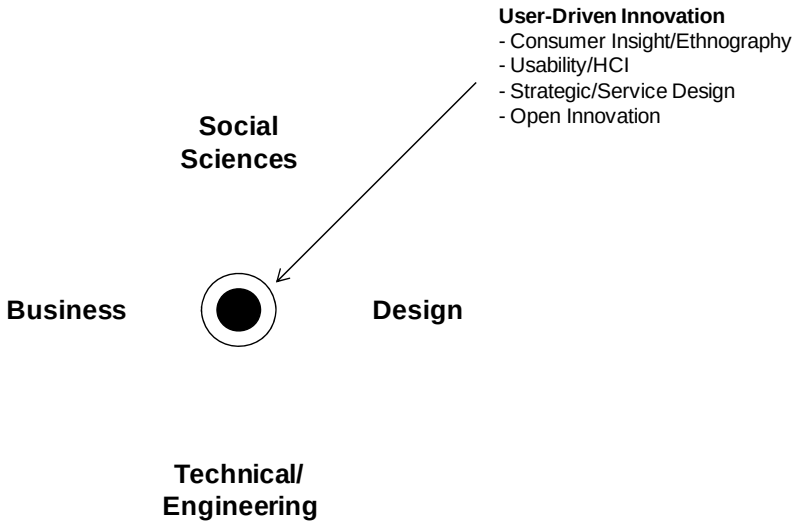
The figure below illustrates the intersection of academic thought that exists between the four areas discussed and what can be observed in firm behaviour today.

[19] see http://userinnovation.mit.edu/

[20] Refer to Maslow's heirarchy of needs

[21] Tim Brown, President and CEO of IDEO, is a proponent of the T-profile.

Figure 1.4: User-Driven Innovation at the Intersection

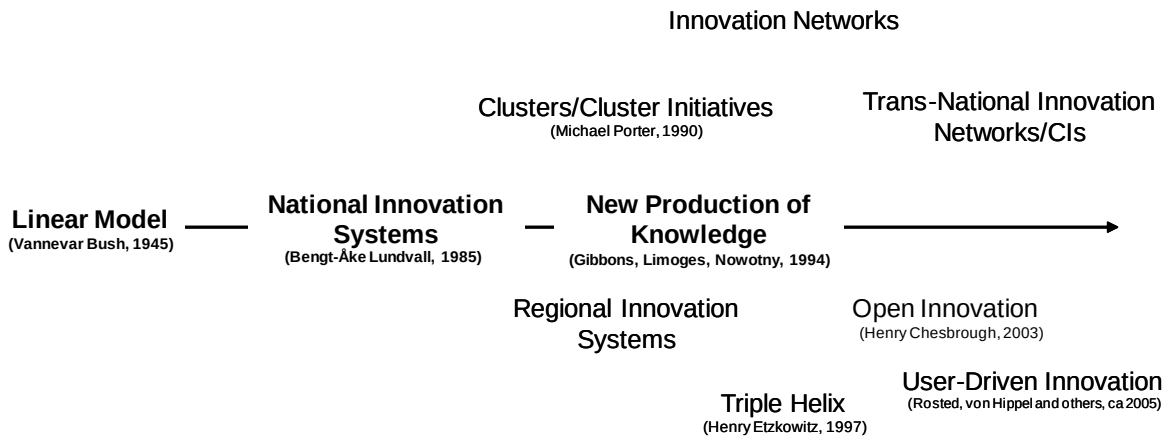


Source: Report authors, with inspiration from Intel and Stanford d.School

In the field of innovation studies – which itself is a combination of many academic perspectives – one can notice the same types of trends taking place: a broadening of participation; a blurring of disciplinary, geographical and organizational boundaries; and an increased focus on societal needs balanced with economic productivity. The figure below is an illustrative perspective of how 'innovation frameworks' have evolved over time – moving from linear to systemic models, and later to new modes of knowledge production. These later theories and approaches to innovation stress that knowledge is increasingly created in broader, trans-disciplinary social and economic contexts. Some examples of broader contexts include: cluster initiatives and innovation networks, trans-national innovation initiatives, open innovation and user-driven innovation.

In terms of national innovation strategies and policies, Denmark is perhaps the only country to prioritize activities to support user-driven innovation (see Financial Times article[22] and Danish national context in Part Two). Activities have been catalyzed by a series of reports, written by Jørgen Rosted and others at FORA.

Figure 1.5: Evolution of Innovation Frameworks (illustrative)



[22] Michael Fitzgerald (2007), "How to Improve It? Ask Those Who Use It" in *Financial Times*, March 25, 2007.

A Definition of User-Driven Innovation

Research is money turned into knowledge. Innovation is knowledge turned into money. (Quote attributed to Per Eriksson, Director General, VINNOVA).

Inspired by the quote above, and based on case studies of what is happening in companies today and the methods described by different academic schools, a definition for user-driven innovation is suggested.

User-Driven Innovation is the process of tapping users' knowledge in order to develop new products, services and concepts. A user-driven innovation process is based on an understanding of true user needs and a more systematic involvement of users.

If innovation is the process of turning knowledge into money, then user-driven innovation is the process of companies' tapping into and capitalizing on **users'** knowledge. This includes latent knowledge that cannot be easily articulated, and tacit knowledge that cannot be easily transferred.

There are two important elements of the above definition that need to be stressed:

1. ***The innovation process is based on an understanding of true user needs in order to determine new opportunities to create value.***

   Companies today are increasingly using alternative methods to identify new opportunities to create value – areas where users' needs are currently unmet, or where problems are currently unsolved. Because many of these opportunity areas are based on needs that users cannot articulate themselves, traditional market research methods are not adequate. Increasingly, companies initiate the innovation process by using ethnographic methods in order to identify these new opportunity areas.

2. ***The innovation process is undertaken with a systematic (or planned) involvement of the user.***

   Traditionally, strategic management at companies has focused on sales, costs and profits – leaving the decision on 'what to produce' to internal R&D departments or external entrepreneurs. Today, companies can no longer rely on the random success of these ideas on 'what to produce'. In order to survive, companies must systematically incorporate the vast range of knowledge and experience that exists outside of their organizational boundaries. As part of their innovation strategy, companies plan to involve users in their development processes, tapping into users' tacit knowledge and involving users more directly as part of the development team.

The two elements of user-driven innovation mentioned above have an impact on how companies understand and interpret user needs, and how they plan for user involvement in the process. Companies' innovation strategies, organizational forms, innovation processes and methodologies, demanded skills, and business models are all changing – and with an increasing frequency. Over the last decades, user-driven innovation has developed from being a method only embraced by very few cutting edge companies like Xerox (that tested the usability of Xerox copying machines by watching users trying to take copies in the late 1980s) to something that has become an important part of leading companies' innovation processes.

In the process of identifying and describing cases of companies who employ user-driven innovation, the project team noticed different types of outcomes to user-driven innovation processes. In some cases, innovation processes resulted in minor changes to existing solutions. In other cases, user-driven innovation resulted in completely new solutions (often

based on combinations of existing technologies or components). Therefore, this report makes a distinction between the types of outcomes of user-driven innovation processes: either incremental innovation or concept innovation.

Most companies today (using traditional methods of market surveys and focus groups) can serve as case examples of user involvement in incremental innovation. However, the project team identified systematic user involvement in concept innovation as a new trend which the project has chosen to focus on. These cases are described in Part Two.

The objective of focusing on user-involvement in concept innovation is to better understand the newer trends and less documented approaches to innovation. This project provides a first insight into these new innovation processes.

The User-Driven Innovation Framework

Companies have always developed products and services with the user in mind. However, the way that companies keep 'the user in mind' and make this an integrated part of their innovation processes has changed.

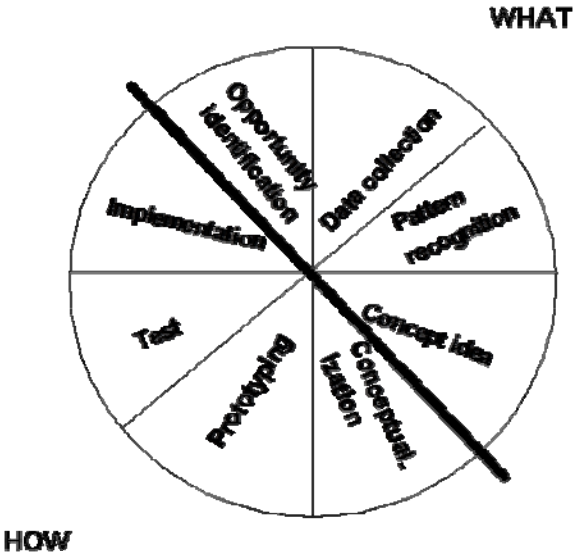
The Innovation Wheel and Methods for User Involvement

Companies are hard-pressed to ensure that innovation investments lead to successful results. With little willingness to take a chance on random success, companies are instead focusing on more systematic innovation processes and making strategic choices regarding when and how to involve users.

The *Innovation Wheel* is a model which can be used to describe a company's innovation process – and the involvement of users throughout the process – in a consistent way. Companies use different approaches when working with innovation and may use a range of different terms to describe the process. The Innovation Wheel has been developed based on interviews with forty design and business consultancies in USA and Europe and their experience with innovation processes with a large number of companies. Findings from these interviews are summarized in FORA's concept design report[23].

[23] FORA (2007), *Concept design – how to solve complex challenges of our time,* available as pdf at http://www.ebst.dk/file/7661/conceptdesign.pdf

Figure 1.6: The Innovation Wheel[24]



The Innovation Wheel divides the innovation process into two phases: the WHAT phase (which focuses on what to produce), and the HOW phase (which focuses on HOW to produce it). Each phase is comprised of four steps. It is important to stress that an innovation process does not always include all eight steps in the Innovation Wheel, nor does an innovation process go through the steps consecutively. Sometimes, companies iterate between the different steps of the wheel.

The first crucial question to answer when launching the innovation process is the WHAT question: Why are people acting in the way that they do? And WHAT problem should we then solve? The WHAT phase – which is often called the "fuzzy front end" – consists of four steps: Opportunity Identification, Data Collection, Pattern Recognition and Concept Ideas. Each of these four steps is described below:

1. *Opportunity Identification* – During the opportunity identification step, business opportunities are discovered either within the firm by employees (intrapreneurs) or from outside the firm (often involving users). Often this step ends with an agreement on looking into an interesting field/ area where the company might have an opportunity in the future.
2. *Data Collection* – In the data collection step, the identified opportunity is examined by collecting data about the users. Different types of data and other material are gathered using various methods in order to develop a better understanding of the users' articulated and unarticulated needs.
3. *Pattern Recognition* – Data is analysed in order to understand unsolved problems and user needs. The users are seldom involved in the pattern recognition process, but have (in some cases) been part of experiments related to the process.
4. *Concept ideas* – In the concept ideas step, the patterns identified in the previous step are transformed into new concepts. The concept ideas are the outcome of the WHAT phase and can be physical or non-physical, a new business model, an adjustment of an existing business model, or a new way of meeting users' needs.

The next crucial question to answer in order to implement any new business idea is HOW: HOW can this idea be used for business – does it create value? The HOW phase also consists

[24] FORA (forthcoming 2008) *How to make Concept Innovation together with Users?* (working title)

of four steps: Conceptualization, Prototype, Test and Implementation. Each of these is described below:

5. *Conceptualization* – In the conceptualization step, ideas are described in detail in order to evaluate the economic potential.
6. *Prototype* – In the prototype step, the first concrete example of a new product or service is created. Prototypes of physical products are often models or sketches. It can be harder to make a prototype of a service or a new business model. In the case of non-physical products and services, prototypes often have the form of descriptions or experiments. Users are sometimes involved in prototyping, particularly in the IT sector.
7. *Test* – In the test step, prototypes are tested by future users. The idea behind the prototype and test steps is to provide an opportunity for users to react and provide input, and for the companies to make adjustments to the product or service.
8. *Implementation* - In the implementation step, the innovation team might work together with other departments in the company (responsible for producing, marketing, and selling the product or service to market).

A Framework for Mapping User-Driven Innovation Processes

Companies employ user-driven innovation processes in order to deliver an end result which has greater value to the user. When companies involve the user more actively and seek to understand user needs and behaviours more deeply, the company has the opportunity to blend in its own knowledge and create a unique value proposition.[25]

When trying to describe, understand and work with user-driven innovation processes, it is important to be aware of several factors that impact the tools and methods used. In order to analyse important features of user-driven innovation processes, a framework has been constructed during this project which can be used to map different user-driven innovation processes.

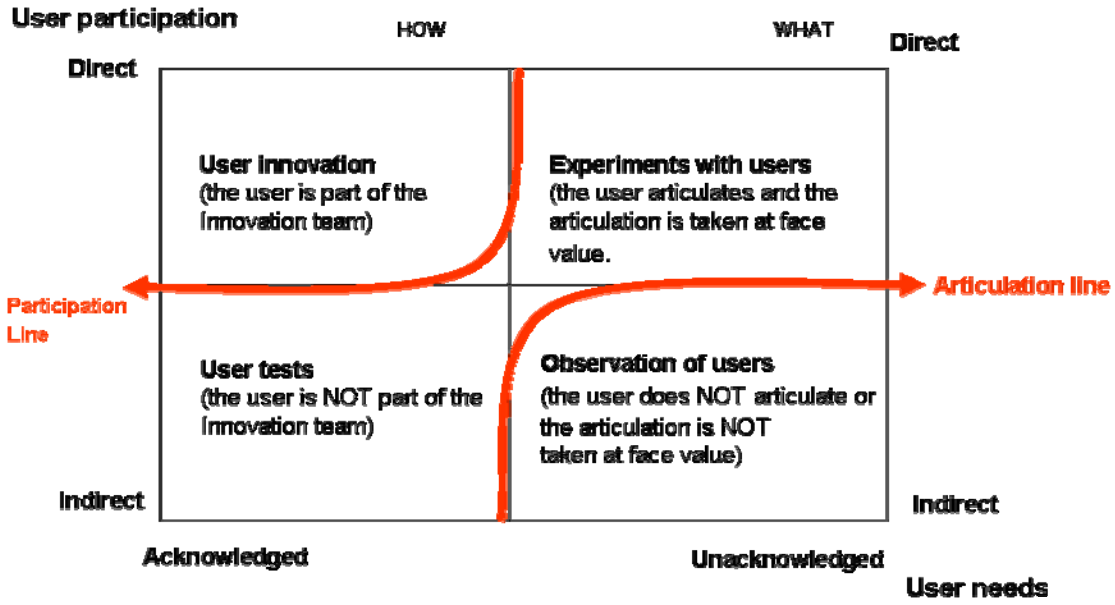
When involving users in the innovation process, it is important to distinguish between **acknowledged and unacknowledged needs**. There is often a gap between what people say they do and what they actually do in real life. Depending on the character of the needs that the companies want to identify, different methods and techniques are used in different parts of the process.

Furthermore, it is important to distinguish between whether the users are **directly or indirectly** involved in the innovation process. Are users part of the innovation team and active in creating the innovation? Or is the innovation team interviewing or observing the users?

Finally, it is of great importance to distinguish whether the company is in the **WHAT or HOW phase**. Companies in the WHAT phase often employ other methods and tools than they do in the HOW phase.

[25] Ziba Design refers to this intersection of company brand, its own resources, and user needs as ***authentic design***.

Figure 1.7: Framework for mapping user-driven innovation processes (from the company's perspective) [26]



The two right-hand quadrants represent the WHAT phase – meaning that activities focus on opportunity identification, data collection, pattern recognition and concept ideas.

Observation of users (lower-right quadrant) – In this quadrant, users are involved indirectly in the process, and the users' articulation is not taken at face value. Typical methods for involving users here are ethnographic methods such as shadowing, user self observations, guided tours in users' homes, etc.

Experiments with users (upper-right quadrant) – In this quadrant, the users are involved directly in the process, and their articulations are taken at face value; but they are not a part of the innovation team. Typical methods for involving users in this quadrant could be, for example, personal interviews, role-playing and living labs.

The two left-hand quadrants represent the HOW phase – meaning the activities of conceptualization, prototyping, testing and implementation.

User innovation (upper-left quadrant) – In this quadrant, users are company innovators or participate as members of the company's innovation team. Users' articulated needs are taken at face value. Typical methods for involving the users in this quadrant could be the lead user approach as promoted by Eric Von Hippel[27].

User test (lower-left quadrant) – In this quadrant, the users are not a part of the innovation team, but their articulation is taken at face value. Typical methods for involving users in this quadrant are focus groups and different kinds of user tests.

Inside the **participation line** – in the upper left-hand quadrant – users are directly involved as innovators for the company or as a part of the company's innovation team. Outside the participation line – in the remaining three quadrants – companies gain access to user knowledge by asking, observing or experimenting (with users). However, users do not innovate by themselves or take part in an innovation team.

Inside the **articulation line** – in the lower right-hand quadrant – companies gain access to user knowledge without any articulation from users or without taking articulation at face

[26] FORA (forthcoming 2008) *How to make Concept Innovation together with Users?* (working title)

[27] *Democratizing Innovation*, Eric Von Hippel 2005.

value. Outside the articulation line – in the other three quadrants – companies take articulation at face value.

By introducing the participation line and articulation line, it should be easier to understand and explain possible user activities within the four quadrants.

Summary

Companies today are faced with great challenges. They need to understand their customers and users better than their competitors do. Inspiration on how to do this might be found from approaches taught in several academic fields. In recent years, different methods have been developed. Based on new insights on what companies are doing today, it can be concluded that innovation processes are increasingly involving users and aim at addressing users' unacknowledged needs.

Part One has traced the general trends and academic underpinnings which, together, have shaped what this report refers to as user-driven innovation. A definition of user-driven innovation has been proposed, and two elements which are new have been highlighted: the understanding of true user needs in order to determine opportunities to create value, and the systematic involvement of the user.

A model for describing where in the innovation process user involvement takes place – the Innovation Wheel – has been presented. And a framework for mapping the steps and understanding the type of user involvement in the innovation process (from a company point of view) has been described.

In Part Two, a description of the national context regarding user-driven innovation in each of the five Nordic countries will be presented. In addition, eight company cases – detailing how user-driven innovation methods are applied – will be described, using the Innovation Wheel and the Framework for Mapping UDI Processes.

Part Two: National Context and Case Examples

This section will include an overview of the specific national capacities (including education, knowledge centres, network organizations, policy support and trends among companies) in the field of user-driven innovation for each of the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden). In addition, specific case examples will present how companies have implemented 'user-driven' innovation strategies and systematically incorporated 'user-driven methods' into their innovation processes. Eight case examples will be presented – six from the five Nordic countries, and two international cases. Of these cases, six exemplify relatively advanced user-driven innovation processes, and two exemplify companies who are in earlier stages of incorporating user-driven innovation methods more systematically.

Denmark – National Context[28]

1. Introduction

It is a broadly accepted statement that the Danish companies' tradition for good salesmanship is a decisive reason for Danish wealth. Denmark does not have the size nor the amount of natural resources required to create large and "natural" important key industries such as iron (Volvo, Sandvik and Scania in Sweden) or companies related to the rich raw material resources (Statoil and Norwegian Hydro in Norway). Danish companies like Danfoss, Grundfos and Maersk are rarely competing on price or technology; instead the companies compete on trust, service and a deep understanding of the customers' needs. It can be argued that Danish companies have been forced by circumstances to focus on understanding the users' needs regardless of whether the user was the end user or a company.

Over the last 10 years the Danish public and private sector have increased their focus on users in innovation processes. Leading Danish companies and organizations are focused on working systematically together with users during their innovation processes and have included new methods and tools, such as ethnographic research, to uncover the users' unacknowledged needs. This knowledge is used to develop new products and concepts that will provide the companies with a competitive advantage in the rapidly growing global competition.

It can be argued that to a large extent the growing focus on the users in the innovation process is caused by globalization (cheaper transportation, communication, new technology etc.). Companies experience an intensified pressure to innovate and they are forced to look for new and hopefully more efficient ways to innovate. Most Danish companies do not compete on price or technology, but rather on good salesmanship. This demands that companies are skilled at identifying market opportunities and creating the most innovative and user friendly products, services and solutions. This chapter will describe user-driven innovation in Denmark and will introduce some of the Danish initiatives which have been carried out to improve the framework conditions for user-driven innovation in Denmark.

2. Historical Overview

User-driven innovation is rooted in IT and human-orientated design, which has existed for some time in Denmark in relation to design of computer programs and artefacts. Human-oriented design began as "Scandinavian Tradition", a political reaction to the technological development in the 1970s and was named human-orientated design. It drew attention to the users, not the technology, and accordingly this tradition concentrated on adjusting the computer programs and artefacts to the users' needs. In Denmark, Aarhus University and

[28] written by Casper Høgenhaven, Consultant, Høgenhaven Consulting

Aalborg University have offered interdisciplinary courses in Information Science and Humanistic Computer science since the mid 1980s.

In the early 1990s leading Danish companies including the **Danfoss Group** were inspired by the usability research conducted at the universities. The Danfoss Group were so inspired by the universities' work that the company established the in-house User-Centred Design department with the purpose of investigating and innovating on the interaction between man and machine in business areas of interest to the Danfoss Group.

Since the Danfoss Groups pioneer work with user innovation in the early 1990s the awareness of user-driven innovation among companies has grown considerably. Today it is estimated that at least a dozen Danish companies are working systematically with user-driven innovation in-house and that many more companies and organizations have worked with user-driven innovation in collaboration with external consultancies.

The Danish government has played an important part in the introduction of user-driven innovation and has launched a wide range of initiatives in order to improve the framework conditions for user-driven innovation in Denmark.

In 2000 a delegation from the **Danish Ministry of Economic and Business Affairs** visited Silicon Valley in California to study the local business environment. Among the companies visited were IDEO, one of the world's largest design companies. The Danish delegation was inspired by the way that IDEO worked to identify the users' needs through ethnographic research and how this knowledge had been integrated in the design process to create experiences to the users.

Inspired by what the delegation had seen in Silicon Valley the Danish Ministry of Economics and Business Affairs gathered a consortium of leading Danish design companies (Kontrapunkt, CPH Industrial Design, CBD and Bysted) that financed and published the book "User-Centred Design" (2003)[29], which described how leading design companies were increasing their focus on User-Centered Design and defined User-Centred Design as:

"Design that particularly was taking the user's needs, wishes and values into consideration and where design is considered from different angels among others Business economy, sociology, anthropology, psychology, esthetic etc. (Hedegaard Jørgensen 2003, p.4)".

The book presented the first indications of the importance of combining design, business and social science in order to innovate in a Danish context. The book managed to raise a general awareness in the design industry about the importance of the users in regard to innovation.

Another important publication that helped shape user-driven innovation in Denmark was the report "A Benchmark Study of Innovation and Innovation Policy - What Can Denmark Learn?" (2003)[30] by **FORA and Inside Consulting**. In the report innovation was recognized as an important driver of growth. Furthermore, the report argued that innovation could be divided into 3 kinds of innovation: price-driven innovation, technology-driven innovation, and user-driven innovation. The report concluded that both price-driven and technology-driven innovation were well understood while there was only very little knowledge about which framework conditions are importance to user-driven innovation. The report recommended that new studies were launched to shed light on user-driven innovation.

In "A Benchmark Study of Innovation and Innovation Policy - What Can Denmark Learn?" user-driven innovation was defined as:

[29] In Danish at: http://www.ebst.dk/file/1622/brugercentreret_design.pdf)

[30] In Danish at: http://www.foranet.dk/upload/innovation.pdf

"*Innovation where the primary sources to innovation are the ideas that emerge in interaction with customers, suppliers and other companies".* (Nyholm, Langkilde, Rosted, 2003).

In 2004, **FORA** and **The Danish Council for Trade and Industry** conducted an analysis of user driven innovation in 3 different Danish industries: the fashion industry[31], the medico industry[32] and the electronics industry[33]. The results and recommendations from the 3 industry reports were summarized by FORA in the report "User-Driven Innovation - Results and Recommendations" from 2005[34]. The report recommended a range of concrete steps to strengthen user driven innovation in Denmark by establishing:

- An interdisciplinary education for user driven innovation
- A research institute on user-driven innovation placed at a university with a strong record in human factors
- Educational programs in existing education
- Life-long learning programs in the area of human factors
- Knowledge- and innovation centers in collaboration between companies and universities and other knowledge institutions
- Autonomous network organizations to promote a networking culture in Danish business clusters
- Courses in regional development and cluster creation

In continuation of the FORA reports, **the Danish Enterprise and Construction Authority** and **ReD Associates** produced the report "Applied Business Anthropology – From Human Factors to Human Actors" in 2005. The report presented the theories and methods behind user-driven innovation and estimated the demand for an education and research centre for user-driven innovation or applied business anthropology in Denmark. The report pointed to a need for an education and research centre for user-driven innovation in Denmark and brought light to methods and theories essential to user-driven innovation.

Furthermore, the **Agency for Science, Technology and Innovation** published the report "User-Driven Innovation – Background for a strategic research program" in 2006. In the report a working committee consisting of leading user-driven innovation researchers from a range of educational institutions published their recommendations on how a strategic research program for user-driven innovation should be designed.

In connection with the research efforts an advisory committee was established with representatives from internationally leading companies within user-driven innovation such as **Intel** and **Microsoft**.

Based on the research efforts and the recommendations from the advisory committee on user-driven innovation the **Danish government** launched its strategy to gear Denmark for the future called "Progress, Innovation and Cohesion Strategy for Denmark in the Global Economy" in 2006.[35]

"*Innovation should be strengthened through the more systematic production of knowledge about the needs of customers and users. An integrated research environment should be created within the field of user-driven innovation".* Progress, Innovation and Cohesion Strategy for Denmark in the Global Economy" 2006, p. 30.

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[31] In Danish at: http://www.foranet.dk/upload/bi_mode_001.pdf

[32] In Danish at: http://www.foranet.dk/upload/medicorapport_001.pdf

[33] In Danish at: http://www.foranet.dk/upload/elektronik.pdf

[34] In Danish at: http://www.foranet.dk/upload/bi_hovedrapport.pdf

[35] In Danish at: http://www.foranet.dk/upload/bi_hovedrapport.pdf

The increased focus on user-driven innovation has lead to a number of initiatives with the purpose of improving the framework conditions for user-driven innovation. Below a number of initiatives designed to improve user-driven innovation will be presented.

3. Research

The comprehensive work with user-driven innovation in both the public and private sector has led to a number of research activities on the area. In the following the majority of the Danish research initiatives will be presented.

3.1 Danish research programme for user-driven innovation

To stimulate research in the area of user-driven innovation the ***Danish Council for Strategic Research (DSCR)*** has allocated 90 million DKK (12 million EURO) annually to research in user-driven innovation for three years starting in 2007. The *User-driven innovation programme* is seeking to support research projects which are theoretically and methodologically reflective, and which serve to create and practice qualitative and quantitative methods. Furthermore, the programme supports projects on user-driven innovation that shed light on both barriers and potentials arising when including users in the many ways in which this can be achieved. See a list of endorsed projects in 2007. [36]

3.2 Research in user-driven innovation

A significant amount of research is currently being conducted in Denmark on user-driven innovation. One interesting point is that the research is being conducted not only in one discipline but across various disciplines. This multi-disciplinary interest in user-driven innovation is explained by the fact that user-driven innovation relies on methods and techniques from disciplines in engineering, business, design and social sciences. In the following some of the most interesting research conducted on user-driven innovation will be presented organized according to which discipline conducted the research:

3.2.1 Research at design- and architecture schools

The Danish Centre for Design Research is collaboration between ***The Royal Academy of Fine Arts School of Architecture; Aarhus School of Architecture; Denmark's Design School and The Design School Kolding*** the center is located in Denmark's Design School. The centre supports the need for research based education within design and focuses on developing a strong research environment around design at Danish design schools and architect schools. One of the areas of special interest is research in user-driven innovation:[37]

3.2.2 Research at Business Schools

At ***Copenhagen Business School (CBS)*** several departments are researching in user-driven innovation. At the *Department of Innovation and Organizational Economics* the Associate professor, PhD. Lars Bo Jeppesen is researching in user-driven innovation with special focus on the lead user approach. Over the years Lars Bo Jeppesen has worked closely together with Professor Eric Von Hippel, Massachusetts Institute of Technology, on lead user innovation. Furthermore, the departments *Center for Business Development and Management*, *Department of Innovation and Organizational Economics* and *Department of Marketing* are researching in user-driven innovation at Copenhagen Business School in close co-operation with Danish Companies.[38]

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[36] http://fi.dk/site/forside/soeg-stoette/bevillingsoversigter/bevillingsoversigter-2007/programkomiteen-for-kreativitet-innovation-nye-produktionsfo

[37] http://www.designresearch.dk/visForside.uk.asp?artikelID=2104

[38] http://www.cbs.dk/staff/lbj

http://uk.cbs.dk/forskning_viden/institutter_centre/institutter/cvl

The Danish User-Centered Innovation Lab (DUCI) located at the ***Copenhagen Business School*** is a collaboration between ***Copenhagen Business School; Aarhus School of Business*** and ***Massachusetts Institute of Technology***. DUCI consists of a number of researcher, six large Danish companies as well as representatives from the Danish Government. The most important activities for DUCI is to bring user-driven innovation researchers together with companies, organize meetings between leading researchers within user-driven innovation and develop various documentation of "Best Practice" methods in user-driven innovation. Furthermore, DUCI works on communicating the gathered insights to the Danish trades and industries as well as the educational environment.[39]

Strategy-lab at ***Aarhus School of Business*** is a strategy and business development research initiative focusing on management development and education. The lab, which was founded in 2003, is financed in part by *Aarhus Business School*, in part by private companies that are members of the Strategy-lab and in part from consultancy work conducted for private companies. User-driven innovation is an important part of Strategy-lab's work and the lab conducts user-driven innovation work for a range of private companies. Furthermore, Strategy-lab has several PhD's that work with management related user-driven innovation.[40]

Furthermore, ***Aarhus Business School*** has established the *Innovation Management Research Group* to disclose and understand the factors required to enhance companies' innovation capacity. The Innovation Management Research Group has specific focus on user-driven innovation. [41]

Also at the ***Aarhus Business School*** the *Centre for Research on Consumer Relations in the Food Sector (MAPP)* was established in 1991 and has in recent years carried out research in user-driven innovation. MAPP has developed a range of tools on how to conduct user-driven innovation in the food industry; tools that are not only being used in Denmark but across several food producing countries. [42]

3.2.3 Research at the Universities

The Department of Anthropology at the ***University of Copenhagen*** has established the research program *Anthropological Analysis* which aims to build a bridge between anthropological research and the increasing demand for anthropological skills in the private and public sectors. Anthropological Analysis offers different user-driven innovation services i.e. concept development, courses in user-driven innovation and also carries out assignments for companies and organizations on market terms. Furthermore, Anthropological Analysis matches candidates from anthropology with organizations and companies.[43]

Also the *Danish Research School of Anthropology and Ethnography* at the ***University Of Aarhus*** has user-driven innovation listed as one of its important research areas.[44]

E-learning Center for User Driven Innovation, Learning and Design is a research and consultant unit at ***Aalborg University*** with the objective of supporting the development of e-learning by means of user-driven innovation regionally and internationally. Besides

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http://uk.cbs.dk/forskning_viden/institutter_centre/institutter/ino

http://uk.cbs.dk/forskning_viden/institutter_centre/institutter/marketing

[39] http://www.duci.dk/

[40] http://www.strategylab.dk/

[41] http://www.asb.dk/about/departments/ms/research/innovation.aspx

[42] http://www.asb.dk/research/centresteams/centres/mapp/about.aspx

[43] http://antropologi.ku.dk/english/

[44] http://www.aal.au.dk/en/antro/unit/contact

researching in e-learning the unit carries out user-driven innovation consulting for organizations and private companies. The unit employs more than a dozen researchers.[45]

CIPU (Centre for Innovation Product Development) is a network co-operation for researchers representing a range of Danish research institutions; ***the Technical University of Denmark***; ***Copenhagen Business School; Aalborg University; University of Southern Denmark*** *and* ***the University of Copenhagen*** with the purpose of developing a framework system for integrated innovation in system and service development. User-driven innovation is a very important part of CIPU's work and the co-operation has a research school in design and innovation that focuses on research in user oriented and value added design.[46]

At the ***University of Southern Denmark (SDI)*** the *Mads Clausen Institute for Product Innovation* was established in 1999 and today employs 65 people. The Institute has formed 6 research groups and User Centred Design is one of these. [47]

4. Education

Several educational programs in new institutions for user-driven innovation have been launched in Denmark. Furthermore, the range of educational programs in already existing educational institutions and new educational programs will be introduced:

180◦academy is a new institution educating concept makers and concept talents in both small and large companies to be able to follow the entire innovation process. 180◦academy offers educational programs lasting between 4 and 15 months.180◦academy teaches on how to create successful concepts and combines theory and practice. The methods used at 180◦academy include methods from design, human sciences, marketing and business strategy.[48]

Copenhagen Institute of Interaction Design **(CIID)** opened in the beginning of 2007 with the purpose of creating a multidisciplinary environment for user orientated solutions in design and technology. CIID's structure incorporates an integrated plan of teaching, research and consulting. The institute will teach and research on how to interact with technology through user-driven innovation. The first classes at CIID will commence in September 2008.[49]

At the ***University of Southern Denmark (SDI)*** the *Mads Clausen Institute for Product Innovation* (see more about the institute above) has been established in collaboration with the Danish company Danfoss. The institute offers two graduate programmes; engineering and IT Product Design. The IT Product Design track covers three educational areas; user-centred design, interaction design and design research. To secure a solid foundation with the trades and industries all dissertations at the Mads Clausen Institute for Product Design must be conducted in collaboration with private companies. [50]

The Danish design schools have increased their focus on user-driven innovation in education. Within the last years three out of the four Danish design schools have adapted a more user oriented approach to design and are trying to establish a closer connection to Danish trades and industries. It will be interesting to follow the effect that the design schools' user friendly approach in the design educations will have on future Danish design graduates.[51]

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[45] http://www.ell.aau.dk/

[46] http://www.cipu.dk/

[47] http://www.mci.sdu.dk/m/Research/Research.htm

[48] http://www.180academy.com/

[49] http://ciid.dk/

[50] http://www.itproducts.sdu.dk/downloads/ITPDFolderview.pdf

[51] http://www.dkds.dk/index
http://english.designskolenkolding.dk/01_NYHEDER/?LANG=EN

At the ***Technical University of Denmark (DTU)*** the *Department of Mechanical Engineering* offers a master degree programme *Design and Innovation*. The programme is located in the cross-section between interaction between engineering, design and innovation.[52]

5. Other Public Sector Initiatives

In 2007 ***The Danish Enterprise and Construction Authority*** launched the *Danish Programme for User-Driven Innovation*. The purpose of the Programme is to strengthen the diffusion of user-driven innovation in the Danish business community and in the public sector thereby supporting growth in the participating companies and increased user satisfaction and/or increased efficiency among the participating public institutions. The programme runs from 2007-2010 and has a total budget of 400 million DKK (52 million EURO). Funding is allocated to projects that support user-driven innovation in Denmark, examine the users' needs in new ways, creates learning beyond the project participants, and has a measurable effect. [53]

Mind lab is a cross ministerial unit which carries out user-driven innovation processes in development initiatives in three ministries: ***The Ministry of Taxation, The Ministry of Employment*** and ***The Ministry of Economic and Business Affairs***. As project partner, Mind lab assists the ministries in creating new solutions through analyses of users and user involvement, solutions that will lead to better and more efficient public services. A dozen employees work at Mind lab.[54]

The Network for Research-based User-driven Innovation (NFBI) is subsidized by ***The Ministry of Science, Technology and Innovation***. It brings private companies and research institutions together to share knowledge on user-driven innovation. The purpose of NFBI is to inspire product development and innovation processes to become more user-driven in Danish companies. NFBI arranges work shops and conferences, which present new methods and tools within user involvement in product development.[55]

The Alexandra Institute in Aarhus is a research-based limited company affiliated to ***Aarhus University***. The Institute acts as matchmaker between researchers and companies and establishes collaboration between public researchers, private companies and other organisations. The institute's main focus is on pervasive computing (when IT becomes pervasive). The Alexandra Institute works with a number of conditions and models for how to organise a project to secure that companies as well as researchers benefit from a project. One of these models is "research-based user-driven innovation", which is being used to secure commercial and applicable relevance with the end users [56]

Aalborg University has launched the *International Center for Innovation* (ICI). The purpose of the centre is to work as a platform and framework for innovation of global business models. The centre is rooted in the northern part of Denmark and has is part of an international research environment with researchers in Europe, USA and Asia.[57]

Also ***The Danish Ministry of Culture*** has increased its focus on user-driven innovation. The Ministry has launched a newsletter on user-driven innovation in culture and held its first seminar on user-driven innovation in the world of culture.[58]

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[52] http://www.man.dtu.dk/English/Education/Master.aspx

[53] See the list of endorsed projects on; http://www.ebst.dk/brugerdreveninnovation.dk/foersteprojekter

[54] http://www.mind-lab.dk/inenglish/

[55] http://www.nfbi.dk/index.php?id=131

[56] http://www.alexandra.dk/uk/research/innovation.htm

[57] http://www.iciaau.dk/english/Pages/default.aspx

[58] Only available in Danish; http://www.kum.dk/sw62911.asp

The Index Design Award is the world's biggest biannual design award. Index gives out 5 prices of 100.000 Euros. Every second year the Index Award carries a special theme. In 2007 the special theme was user-driven innovation which the Index Award considers to be a crucial element in meeting The Index Design Award's key focus – "Design to improve life". Index has created several initiatives to raise awareness of user-driven innovation. Among other things the Index Design Award dedicated a full number of its magazine to user-driven innovation.[59]

6. Private Sector

As described in the *History Overview* section of the Danish National Context, the private sector has played an important role in diffusing user-driven innovation across Denmark. From a very early stage, companies such as the Danfoss Group have experimented with user-driven innovation. Today, it is estimated that more than a dozen Danish companies are working systematically with user-driven innovation and several of these companies, e.g. Lego, Danisco and Grundfos, work with the approach on a very sophisticated level.

In the slipstream of the user-driven innovation initiatives initiated by the Danish public enterprises listed above, user-driven innovation seems to have spread further from a few vanguard companies to a broader group of leading companies.

7. Summary

It is hard to say whether the comprehensive awareness on user-driven innovation in Denmark is driven by the traditional Danish companies' focus on good salesmanship alone, or that the public sector in Denmark has been very quick at understanding the possibilities found in user-driven innovation and the concepts that are particularly relevant to the Danish business community. In Denmark there has been early and comprehensive examples of user-driven innovation (for example the following case regarding the Danfoss Group) but over the last ten years the public sector in Denmark has recognized the importance of user-driven innovation and has supported and promoted the area extensively.

But whatever reason or reasons for the focus on user-driven innovation in Denmark it remains a fact that Denmark today has an impressive amount of initiatives to support user-driven innovation. The initiatives have helped the Danish companies realize the potential of user-driven innovation and thereby strengthened the position of Danish companies in the global competition.

[59] See the Index Award's special theme magazin on user-driven innovation; http://www.indexaward.dk/2007/default.asp?id=1876&Article=1932&Folder=1932

Danish Case A: the Danfoss Group Water Vision Project[60]

Industry: The Danfoss Group is a leading global manufacturer of components and solutions for Refrigeration & Air Conditioning, Heating & Water and Motion Control.

Headquarters: Nordborg, Denmark

Net sales: DKK 19,4 billion (2006)

Operating profit (EBITDA): DKK 1,6 billion (2006)

Employees: 20.600

Strategy:

- Danfoss will be a global leader within our core businesses, as a highly respected company, which improves quality of life by mastering advanced technologies in customer applications while creating value for all stakeholders (from "Danfoss Vision").
- Danfoss is in the middle of a developing process where mass production is moving towards "customer oriented mass production". By combining advantages from mass production, for instance reliable products and low unit costs, with the ability to produce a large number of products that are adjusted to the wishes of the customers (from "Danfoss Fact Statement").

The Danfoss Group is a pioneer within user-driven innovation in Denmark. For more than a decade, the company has been working with user-driven innovation tools and methods in order to increase their products' user-friendliness and to uncover knowledge about users as an input to the Danfoss Group's innovation process.

Until now, the Danfoss Group has been using user-driven innovation methods primarily to uncover user involvement in ongoing improvements of products and services. But over the last year the Danfoss Group has also revised its focus on user-driven innovation as a tool for developing new concepts.

Even though the Danfoss Group has recently increased its focus on user-driven innovation as a tool to develop new concepts, the company's initial experience of user-driven innovation as a tool to develop new concepts dates back to 1999 when the *Water Vision Project* was launched.

Below, we will introduce this very early example of developing concepts based on user-driven innovation methods.

1. Company background and user-driven innovation in Danfoss

In 1933, the engineer Mads Clausen established the company "Dansk Køleautomatik- og Apparat-Fabrik" which manufactured valves. Over the next 10 to 15 years, the company broadened the product portfolio with a range of new products such as automatic valves, snap-valves and thermostat products that still - in improved form – constitute an important part of the company's product line.

In 1946, the company changed its name to Danfoss. Today, the Danfoss Group is one of Denmark's largest industrial companies. The Danfoss Group is a global leading manufacturer of components and solutions for Refrigeration & Air Conditioning, Heating & Water, and

[60] written by Casper Høgenhaven, Consultant, Høgenhaven Consulting

Motion Control. The company plays a leading role in research, development, production, sales and service of mechanical and electronic components and solutions for a wide range of sectors.

Since the mid 1990's the Danfoss Group has been working with user-driven innovation methods first as a way to improve the usability of the company's products. Most recently, the Danfoss Group has begun using user-driven innovation as a tool for identifying new concept platforms with strategic significance.

The Water Vision Project is the first very early example of the Danfoss Groups shift towards using user-driven innovation as a tool for creating new concepts.

2. Concept Innovation

The Danfoss Group defines the results of the Water Vision Project as concept innovation. This is due to the open structure design of the project and because the concept suggestions that came out of the process were new concepts combining existing technology and products:

"The result of the project was new concepts that combined existing technology and components in new types of products such as the Bio-scope and the Water Quality Meter." Jacob Buur, Professor the Mads Clausen Institute and head of the User-Centred Design unit during the project.

The Water Vision Project showed a new way to examine business opportunities for the Danfoss Group. The project design followed a new path by taking the users' needs - rather then technology - as the point of departure. The project outcome were suggestions for new products addressing users' unmet needs.

The project presented a new concept for an outdoor control screen that compiled the different products from the Danfoss Groups into one screen. Another concept from the project was a pollution cost meter providing information on the amount of emissions from the plant. These new concepts would make it easier for the operators to run the plant more efficiently.

The project was commenced in September 1999 and was finalised in June 2000.

3. Business Outcome

The Water Vision Project pointed to considerable and new business opportunities for The Danfoss Group. However, shortly after the project was finished, the Danfoss Group decided to sell the Flow Division to Siemens AG. The project was not a part of Siemens' future plans for the division. Accordingly, the concepts that came out of this project were never implemented.

Even though the suggested concepts were never realized, the project has had an impact on the way The Danfoss Group understands user-driven innovation today.

4. The Innovation Process

In the section, the Water Vision Project will be described in line with an innovation process model that is appropriate for visualizing the extent of user involvement in an innovation process. By identifying in what, where, and how the users were involved in the Water Vision Project, valuable insights on how to apply user-driven innovation for systematic concept development is obtained.

The process is split up into two stages: the WHAT stage and the HOW stage. The WHAT stage identifies problems to be solved as well as opportunities and concept ideas (4.1 – 4.4). The HOW stage transforms identified concepts into specific products or services (4.5 – 4.8).

It is important to stress that the process is not necessarily linear, but may jump back and forth in loops between the different steps of the innovation process model.

At the end of each paragraph, you will find a box concluding to what extent and how user involvement was present and which tools were used to collect and interpret the users' needs in the Water Vision Project.

WHAT

4.1 Opportunity Identification

The opportunity identification was collected during the Danfoss Flow division's regular visits to wastewater plants in order to test the plants' flow meters. Several plant operators had complained about the equipment delivered by the Danfoss Group. The plant operators were not satisfied with the user-friendliness of the company's products.

The scope of the project was set to study the problems from the users' perspective in order to suggest future directions and user-friendly solutions for the Danfoss Group's Flow Division.

User Involvement in Opportunity Identification?	Yes
UDI methods/ tools used in the process	Personal interviews

4.2 Data Collection

The project was organized as a joint venture involving several business units within the Danfoss Group. The field research was completed in collaboration with research groups at Malmö University College and Aarhus University.

The project group consisted of four members of the *User-Centered Design Unit* at the Danfoss Group, two representatives from the business units in the Danfoss Group, and four people from the universities in Aarhus and Malmö.

The study included visits to six wastewater plants in Denmark and Sweden over a ten-month period, and was divided into 3 phases; a) a two-month data collection period; b) three months were spent on pattern recognition and involvement from the business units and c) a five-month desig period.

An ethnographic approach was chosen for the data collection in the project. The project team was divided into 3 video camera teams working in parallel. The teams followed different operators at wastewater plants (the plant manager, the process operator, technicians) on an ordinary working day.

After observing and video filming the six plants, the data material was edited and shown to the participating users for comments and verification of the research teams' initial findings.

Later in the process, areas of special interest at the wastewater plants were identified based on the early data collection, and the group made repeated visits and interviews and widened the field to include several other plants.

User Involvement in Data Collection?	Yes
UDI methods/ tools used in the process	- Video observations - Personal interviews

4.3 Pattern Recognition

After collecting the data, material and comments received from the users were presented at two internal seminars. The purpose of the seminars was to refine data. The business units at

the Danfoss Group were involved in the pattern recognition process and were asked to focus on the project's business opportunities.

An important part of the pattern recognition process the "video card game" - was started. In the "video card game", the user-driven innovation team members were asked to print out 30 snapshot photos from each of the 3 plant video recordings and arrange the photos in themes to illustrate what they (the team members) considered to be key findings from the observations.

After the user-driven innovation team had located some patterns in the data material by using the video Card Game the findings were presented to the operators at a workshop and the findings were discussed with the operators.

The pattern recognition phase lead to a number of interesting insights about what direction the future development process should take within the water division. The findings were summarized in three key insights:

- *Feeling the process:* Figures and curves on computer screens in the control room isn't enough to understand the processes of a wastewater plant. The operators' senses and experiences is an important part of running a plant.
- *Watching components:* Technology is not infallible. Operators know that components break down from time to time and the operators constantly have to keep an eye on the components.
- *Controlling the control system:* It is not the system that runs the process. It is the operators. The operators know when the system is about to reach a level which it cannot handle. When the system reaches such levels then the operators have to take over and drive the plant by manual operation.

User Involvement in the Pattern recognition?	Yes
UDI methods/ tools used in the process	Presenting video collages to operators for discussion

4.4 Concept Ideas

After the conclusion of the pattern recognition the concept idea phase was commenced. The concept idea phase was conducted internally and was carried out in the individual business divisions under the supervision of the user-driven innovation team and at two stakeholder seminars and at two workshops, one with internal employees from the business units, the other with operators from a number of wastewater plants.

At the second concept idea workshops the users from the wastewater plants were tested using a range of user-driven innovation methods (i.e. acting sequences in a full scale model of a pump station, playing board games etc.).

During the concept idea phase, a line of concepts was developed, among others:

- *The concept of the outdoor control screen and the gathering of a range of control functions from the Danfoss Group on one screen*: The early data collection process had shown that it was important for the operators at the plant to be able to walk around the wastewater plant and use their senses rather than just sitting in a control room. The control screen should be moved out into the open.

  Furthermore, the pattern recognition disclosed a need to have an overview of several functions at the same time. At wastewater plants, the control screens are usually located in separate positions in the control room. A new control screen should therefore incorporate the different screens into one screen.

- *The concept of a pollution calculator*: When an emission happens at a wastewater plant, the operator needs an indicator to inform them about the extent of the emission. The data collection had shown a need for a new product that describes the extent of pollution emission from the plant.

User Involvement in Concept Idea?	Yes
UDI methods/ tools used in the process	- Participatory Design workshops - Design games - Video scenarios recorded with plant operators

HOW

4.5 Conceptualization

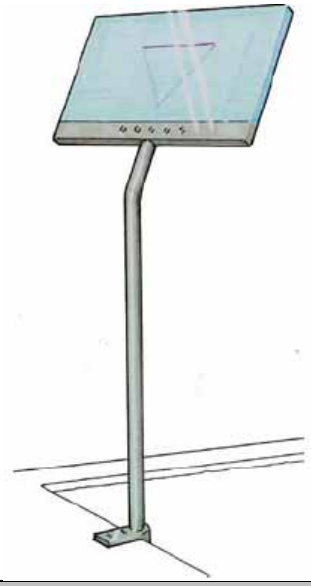
Even though the main part of the conceptualization process was conducted internally in the Danfoss Group by the user-driven innovation team and the involved business units, the users still had a prominent role to play in the process.

As an important part of the conceptualization process, a workshop was held where the plant operators were shown different scenarios developed by the project team and based on the data collection process. The operators were asked to comment on the scenarios. After the workshop, the user-driven innovation team members and the involved business units implemented the feedback from the users for the conceptualization process.

The conceptualization process produced a line of new product concepts which presented the Danfoss Group with new business opportunities, among others:

The Bioscope – First of all, the control functions carried out indoors in the control room are moved out into the open. Secondly, the separated control functions provided by the Danfoss Group are compiled into one screen. By moving the control room screen out into the open, the operators will have better conditions to use their experience and senses (touch, sight, hearing) controlling the plant on location, elements that the user-driven innovation study proved essential for running a wastewater plant.

Furthermore, the Bioscope offers a solution to the problems of creating an overview of the technical equipment and control system on a wastewater plant. The Bioscope screen collects most of the Danfoss Group components at a wastewater plant, thereby creating clarity to the operators in an otherwise confusing complexity of different components.



The Water Quality Meter – The meter makes it possible for the wastewater plant operators to measure the pollution cost in case of a wastewater emission from the plant. The pollution cost is the expense that the wastewater plant will have to pay to the authorities caused by the emission. The Water Quality Meter will be a quick and exact way of measuring the size and cost of an emission.

User Involvement in Conceptualization?	Yes
UDI methods/ tools used in the process	Testing scenarios with users

4.6 Prototype

The prototyping of the concepts were done internally by the user-driven innovation team. The prototypes were completed as quick mock-up's to give an impression of what the concepts would look like internally in the innovation team.

User Involvement in Prototype?	No
UDI methods/ tools used in the process	None

4.7 Test

The prototypes were mock-up's and not functional models. No functional models were never tested in real life in the Water Vision Project.

After constructing the mock-up's the prototypes were shown to the users in their natural environments at the wastewater plants. After the on-site presentation of the prototypes, the users were interviewed again by the user-driven innovation team - this time about their response to the prototypes.

User Involvement in Test?	Yes
UDI methods/ tools used in the process	- Personal interviews on-site

4.8 Implementation

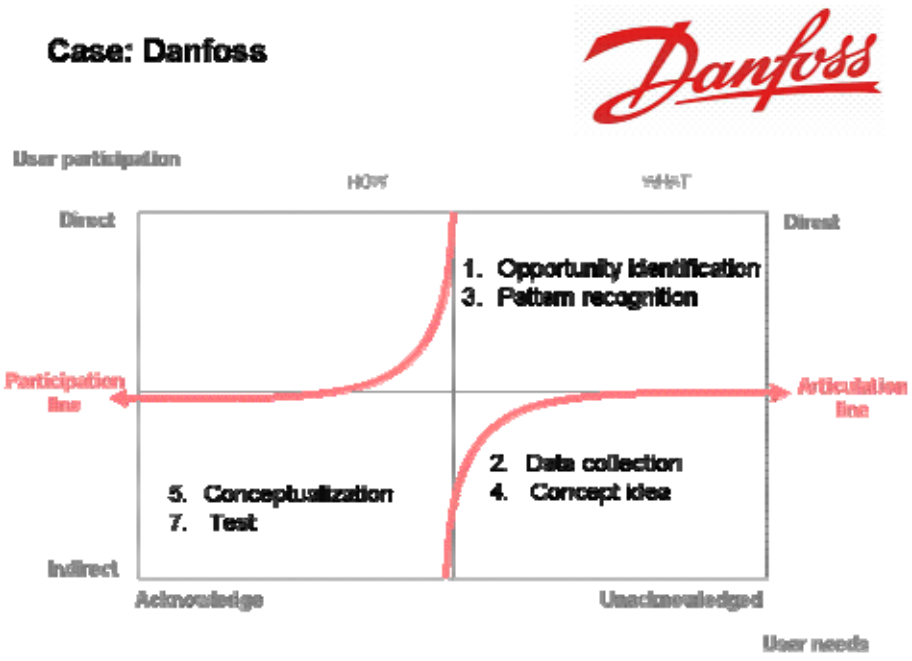
The project provided valuable input for the Danfoss Group for future innovation. However, none of the new product concepts have been put to the market yet. Shortly after the project was finished, the Danfoss Group sold its Flow Division to Siemens AG, Europe's largest electric and electric engineering company. Since the takeover of the Flow Division, Siemens AG has not yet implemented any of the concepts developed in the Water Vision project in its strategy for the water industry.

Since the Water Vision project, the Danfoss Group has continued its focus on being a creative and innovative organization through user-driven innovation methods.

Today, around ten people in the Danfoss Group have user-driven innovation as their main task, and user-driven innovation is considered an important tool for the company - not only to conduct incremental product and service innovations, but also in the process of developing new concepts and strategy.

User Involvement in Implementation?	No
UDI methods/ tools used in the process	None

Figure 2.1: Mapping of UDI processes at Danfoss



5. Key Lessons

Companies may gain a lot of important insights by applying user-driven innovation in the right way.

In the case of the Water Vision Project the Danfoss Group applied user-driven innovation to identify wastewater plant inspectors' needs' for "feeling" the process and watching the components at the same time, which delivered a new concept for a new type of products like the Bioscope and the Water Quality Meter. User-driven innovation was not new to the Danfoss Group, which has been working with user-driven innovation since the mid 1990s where the approach was used to uncover user involvement in ongoing improvements of products and services - but the Waste Water project made the Danfoss Group realize the potential for user-driven innovation as a tool to develop new concepts.

Based on the insights from the Water Vision project the Danfoss group is now working more focused with user-driven innovation as a way of developing new concepts.

The Danfoss case is one of the most advanced and comprehensive examples in the Nordic region of user-driven innovation as a way of identifying new concepts. Even though the concepts that came out of the Water Vision project have not yet been carried out due to structural reasons the case is interesting because of the advanced user methodology and systematic regarding users needs that was applied in the project.

Danish Case B: DSB - Creating increased value for DSB 1' customers[61]

Industry: Transport service

Headquarters: Copenhagen, Denmark

Total income: DKK 10,7 billion (2007)

Operating profit (EBITDA): DKK 2,7 billion

Employees: 8.500 (2007)

In 2006 the Danish State Railways (DSB) was facing, that the number of passengers travelling on premium class DSB 1' on their most important route between Copenhagen and Aarhus had decreased compared to the growing general travelling market.

The observation led to a project where the goal was to achieve an increased value for customers on DSB 1'. This case provides an example of how DSB successfully incorporated user-driven innovation tools and methods in their business development process. DSB identified what could be done to add value to DSB 1' for the customers and increase the incentive for the users to pay a premium for travelling on 1'.

The outcome of the project was a list of initiatives of which some have already been integrated on DSB 1'. However, the results of the first initiatives have been so convincing that more are expected to be integrated in the time to come.

1. Company Background and User-Driven Innovation at DSB

DSB was founded in 1885 when the state took over the operation of the privately owned "Zealand Railway Company". Up through the 19th and 20th century DSB continued to grow as a railway company and eventually the company included ferry and bus operations.

During the 1990s, the business of DSB was focused on passenger railway services, and business areas such as bus, ferry and cargo operations were removed from the business portfolio. In 1997 the national railway infrastructure was transferred to Rail Net Denmark.

DSB provides regional, national and international passenger railway services and DSB is a market leader in Denmark with a market share of approximately 80 %[62].

In 1999 DSB became an independent public corporation but the company is still fully owned by the Danish Ministry of Transport. The new situation has made DSB focus more on being competitive through enhancing its profile and adopting a more commercial approach to train operations[63].

One of the focus areas is to have spotlight on the customer:

"All employees in DSB must have a commercial attitude. Fundamentally, it's all about understanding what customers demand and to supply the preferred service in a way that is economically viable……The core product (trains that run on time ed.) must be in place.

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[61] written by Casper Høgenhaven, Consultant, Høgenhaven Consulting

[62] http://www.dsb.dk/cs/Satellite?pagename=DSBUK/Forside

[63] DSB Annual report 2007
http://www.dsb.dk/cs/BlobServer?blobtable=Download&blobcol=urldownload&blobheader=application/pdf&blobkey=id&blobwhere=1148306855813&ssbinary=true&filename=file.pdf

But over and above this, it is crucial to understand that customers are not all the same. We have different requirements when we travel. The art is to understand customers' requirements and meet them. What are the different types of requirements?"[64]. Mogens Jønck, Commercial Director and member of the Corporate Management, DSB.

In DSB's management the increased commercial focus is seen as a change in the organization's DNA.

"As I see it, DSB is on a journey. We have moved away from being a highly production-oriented organisation, our DNA if you like, to a situation where focus is increasingly on our customers"[65]. Mogens Jønck, Commercial Director and member of the Corporate Management, DSB.

This case will illustrate how DSB due to the increased focus on the customers now is working with user-driven innovation as a way of identifying and understanding the customers' unmet requirements and the specific competitive situation faced by the passenger railway industry.

The project was lead by DSB's department for Commercial Business Development and involved several other departments in DSB such as *Business Intelligence* and *Design Department*. In the early stages, the project was conducted in collaboration with two external consultancies; *3Part* and *Danish Technological Institute*.

The Project was carried out in 2007.

2. Concept Innovation

The project led to a set of new ideas that were transformed into a strategy of how to increase value for train travel on DSB 1' for customers and to continue the development of DSB 1´as a premium concept.

This case study focuses on one of the ideas from the project; the new concept for transforming a part of DSB 1' into two zones which accommodate the fact that the customer's use of the train will depend on the individual passenger's situation. With the introduction of the new Silence-zone the DSB 1' was physically split up into two. The customer on DSB 1' can now choose between the original DSB 1' where it is possible to use the telephone, have meetings etc and a "Keep Quiet zone" with the possibility for absorption, reading, sleeping etc.

Furthermore, the concept of the zone division included flexibility in the use of pictograms, which demarcate the individual train products, where the number of seats in the individual zones could change according to the demand by means of a dynamic signposting in the carriage.

3. Business Outcome

The strategy for adding value for travelling by train on DSB 1' started with the implementation of the "Keep Quiet zone" and thus the possibility of choosing the zone which best fits the individual journey. The results from the zone division on DSB 1' have been very satisfying. The introduction of the zones led to an increase in revenue of 10 % on the Copenhagen-Aarhus route Mondays to Fridays.

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[64] DSB Annual report 2007
http://www.dsb.dk/cs/BlobServer?blobtable=Download&blobcol=urldownload&blobheader=application/pdf&blobkey=id&blobwhere=1148306855813&ssbinary=true&filename=file.pdf

[65] DSB Annual report 2007
http://www.dsb.dk/cs/BlobServer?blobtable=Download&blobcol=urldownload&blobheader=application/pdf&blobkey=id&blobwhere=1148306855813&ssbinary=true&filename=file.pdf

4. The Innovation Process

This case will be outlined in line with the innovation process model presented in part 1.

As in the other cases in this report the case will be divided into two stages: the WHAT stage and the HOW stage. Where the WHAT stage identifies problems to be solved as well as opportunities and concept ideas (4.1 – 4.4) the HOW stage transforms identified concepts into specific products or services (4.5-4.8).

WHAT

4.1 Opportunity Identification

The project was initiated because of declining market share in DSB 1´. The route Copenhagen - Aarhus had experienced high growth rates for ordinary tickets for some time but DSB 1' had not experienced the same growth rate on the same route. Since the route Copenhagen-Aarhus is the most important route representing 90 % of revenues for DSB 1´ the problem was taken very seriously.

Due to stagnated growth on DSB 1' the management at DSB asked Commercial Business Development Department at DSB to come up with new initiatives for DSB 1` to turn around the sales at DSB 1'. Based on the request from management the following question was defined: how should the future of DSB 1' be as a product and as a business concept ?

The Commercial Business Development department started the process by desk research on the existing market for first class transportation services identifying the critical mega trends, the size of the market, the landscape of the market etc. A lot of the basic data material was obtained from DSB's extensive in-house market research data.

After the first desk research was conducted it was decided that user-driven innovation methods should be an important part of the project. The reason for the choice of user-driven innovation as a key component in the process was that it was estimated that user-driven innovation would give the best hit-rate.

"User-driven innovation was chosen since it was estimated to be the methology that gave the best conditions for achieving the target in a quick and precise manner" Erica Skafdrup Hornemann, Commercial Business Development, DSB.

In order to come up with ideas of how the future DSB 1' should be a workshop was arranged in cooperation with Danish Technological Institute and the design agency 3Part.

The workshop had participation of people from companies from related business sectors and from customers. Beside the team from the Commercial Business Development and representatives from some of the different groups of employees that work with customers on DSB 1' there were representatives from Scandinavian Airlines, The Danish Broadcasting Corporation and Arla, which contributed with knowledge from related areas as input to the idea generation phase.

The kick-off workshop was held in continuation of the preliminary desk research. The participants were presented for the results of the desk research that the Business Development Department had gathered. Afterwards the participants were asked to brainstorm and take part in conversations regarding their expectations and attitude towards travelling by train. Secondly, the participants were asked about their feelings towards DSB 1' as well as ideas of how to increase the value for the users on DSB 1'.

User Involvement in Opportunity Identification?	Yes

UDI methods/ tools used in the process	Workshop

4.2 Data Collection

The data collection was conducted by the Danish design agency 3Part.

In the data collection process, the research team followed four carefully-selected respondents on the route Copenhagen-Aarhus for a day from early morning when the respondents were getting ready to leave their home to late evening when the respondents returned home.

The respondents were chosen based on their profile in terms of their use of DSB 1' and not by demographic characteristics; 1) a vice president in a Swiss company with Danish origins 2) a consultant who was commuting regularly 3) a research assistant and 4) an art director in an agency with private travel activity.

The data collection process was a mixture of observations, video observations and personal interviews. The respondents were observed most of the day by the research team but the observations were supplemented by open ended interviews conducted by the research team. During the supplementary interviews the respondent were asked about why they reacted as they did in certain situations that occurred or how the respondent felt about situations that had occurred.

User Involvement in Data Collection?	Yes
UDI methods/ tools used in the process	- Observations - video observation - personal interviews

4.3 Pattern Recognition

The pattern recognition process was done by 3part based on the observations and interviews conducted in the data collection process.

The results from the pattern recognition process were gathered in 5 key themes:

- *Content in time* – when the passengers travel by train they get a possibility for content and freedom in time.
- *High-quality working hours* – the passengers travelling on first class get the possibility to concentrate fully on work.
- *Privacy* – the ability to work undisturbed and with personal papers and privacy to rest.
- *Hygiene* – that the environment on DSB 1' is clean and hygienic.
- *Etiquette and tone* – a positive experience on DSB 1' is almost always connected to a positive experience with the staff.

Beside the 5 key themes a very common overlapping finding was that the same passengers use DSB 1' in different ways depending on their individual time. For example; while conducting the data collection process the researchers observed that several of the respondents where working on their way out in the morning while relaxing on the way back. This was an observation that the users did not articulate when being interviewed.

User Involvement in Pattern Recognition?	No
UDI methods/ tools used in the process	None

4.4 Concept Ideas

The concept idea process began by a second workshop with the same participants as in the first workshop – the DSB team plus representatives from Scandinavian Airlines, Danish Broadcasting Corporation and Arla. Again the workshop was arranged in cooperation with 3Part and the Danish Technological Institute.

At the workshop 3Part presented the findings from the pattern recognition process. Based on the findings a brainstorm process was initiated.

The participants of the workshop suggested several hundred ideas of how to turn DSB 1' into a premium product with material and immaterial qualities that would meet the demands of the customers. Demands and needs were all characterized by being situation-dependent.

Subsequently some of the ideas from the workshop were developed and further by the in-house innovation team. The number of ideas was cut down to 47.

User Involvement in Concept Idea?	Yes
UDI methods/ tools used in the process	Workshop

HOW

4.5 Conceptualization

The conceptualization phase was made internally in the team.

The 47 ideas that came out of the concept idea phase were gathered into an idea catalogue. The ideas were presented and the concepts, expected investment, expected return related to the ideas were presented to DSB's management group the management group. Seven ideas were selected by the Management Group to form the backbone of a business development plan. The insights were transformed into a five-year plan for the further development of DSB 1´as a product and as a business development area. One of the ideas was to split the DSB 1' into two different zones – the normal 1' and a new concept the "Keep Quiet zone". The new product would allow customers to choose how to spend their time while travelling by train. In the normal 1' passengers work, network, hold meetings etc. On the new zone 1' passengers would enjoy the possibility of sleeping, relaxing and reading or working in privacy and in absorption.

Because of the variation of users needs it was important to create flexibility in the amount of Silence zone seats depending on demand. The flexibility was solve by the electronic signs in the ceiling of the wagons.

User Involvement in Conceptualization?	No
UDI methods/ tools used in the process	None

4.6 Prototype

Since the electronic signs in the ceiling of the wagons could easily be moved if the concept was not a success the Quiet Zone was introduced in all IC3 trains without any prototyping.

User Involvement in Prototype?	No
UDI methods/ tools used in the process	None

4.7 Test

After the introduction of the new concept in all IC3-trains the new zone was tested through a survey handed out to passengers travelling on DSB 1'. The results of the survey showed a great degree of satisfaction amongst the passengers with the division of DSB 1'.

Customer surveys show that the possibilities for reading, relaxing and working in a noiseless environment have been well received by the customer. 66 percent of the respondents state that a noiseless environment is very important. Overall, the customers welcome an effective journey – that they may use the journey for something more than simply getting from A to B. 64 percent of the respondents state that an effective journey is very important.

The fact that the customer use the travelling time consciously is further underlined by the fact that 45 percent of the respondents welcome the notion that the journey is a "time pocket"; a few hours that one may use as one sees fit.

Erica Skafdrup Hornemann is pleased that the new DSB 1' concept has struck a cord with the passengers: "*67 percent of our DSB 1' customers are contemplating which zone to choose prior to purchasing the ticket. They are conscious consumers that put emphasis on how to spent time. This supports our belief that the option is critical.*" 74 percent of the respondents find that it is important to be able to choose between two alternatives.

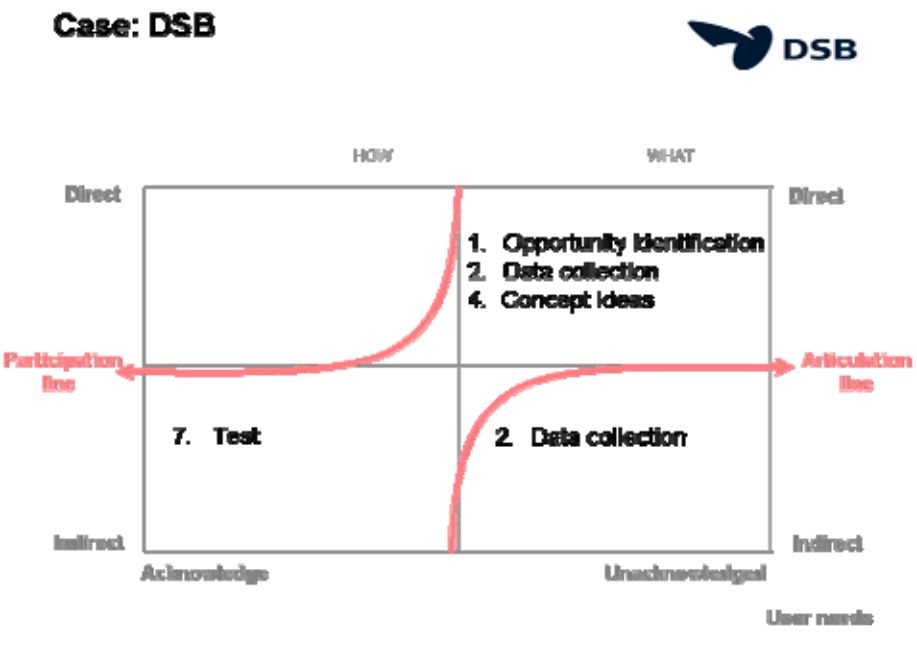
User Involvement in Test?	Yes
UDI methods/ tools used in the process	Survey

4.8 Implementation

Following the implementation of zone in DSB 1´, the Keep Quiet zone were introduced as a standard product and identical rules were introduced in the two zones, which are communicated in Danish and English via the PA system. Use of the zone in the suburban trains of Copenhagen ("S-trains") are currently under review and may become permanent.

User Involvement in Implementation?	No
UDI methods/ tools used in the process	None

Figure 2.2: Mapping of UDI processes at DSB



5. Key Lessons

The case is an example of the relevance of user-driven innovation in the service industries and how the approach can create great value as a creator of new service concepts.

By observations of the customers on DSB 1' the company gained valuable insights about the customers' behaviour in relation to the product DSB 1' and travelling by train in general that would not have been obtained simply by asking the consumers. For example, the finding that led to the launch of the Quite Zones; observations gave the researchers the insight that the customers often worked on the way to meetings and work relaxed on their way home, but when asked directly the customers responded that they also intended to work on their way home as well.

The first concept derived from DSB's user-driven innovation process, the Quite Zones, has been lucrative to the company. With several other concepts coming from the process on the way to be integrated on DSB 1', user-driven innovation has proven to be a successful innovation tool for DSB. Since the project DSB has taken initiative to launch new user-driven innovation projects.

Finland – National Context[66]

1. Introduction

While many globally active Finnish enterprises – including industrial enterprises – have already modified their strategy to allow for the user perspective, the Finnish innovation policy has not necessarily undergone a similar content reform.

In addition to business expertise, a demand-derived innovation policy places emphasis on such policy segments that help the customers and consumers' needs and preferences gain better recognition in the economy and throughout society. In this respect, it is important to consider the potential content of such demand or need-derived innovation policy. For example, competition policy, market regulation and standardisation may be seen as means for influencing demand, its orientation and formation and thus for influencing innovation activities.

Successful participation in an open, global economy and innovation activities are increasingly determined by how well enterprises and organisations can meet the needs of customers and users. This heralds the emergence of marked-derived, non-technological innovations in addition to innovations based on technological development. Customers and consumers stand at the heart of a user-derived approach, and their role as source of innovations and as R&D partners for businesses is gaining increasing importance. This highlights the importance of feedback obtained from the users of public sector services.

The key motivator behind corporate innovation activities is market pressure – competition between enterprises on the market. An open market and open competition offers an efficient growth platform for innovation activities, also increasing the consumers' options for making choices. Thus an efficient market promotes innovations and expertise, serving as the key interface to broad-based innovation policy.

In a service-driven welfare economy, the direction and content of production is increasingly shaped by consumer choices. This has a deep effect on the innovation activities of enterprises and organisations alike. The essential aspect of the consumer perspective is that consumers can genuinely have a say in the development of products and services. User-friendliness and the development of innovative services and products require a close dialogue between enterprises/producer organisations and consumers.

Standards are regarded as an important tool for supporting commercial operations. They can be used to set quality and safety regulations or ensure product conformity. Regulatory systems rely increasingly on technical specifications that are recommendatory in nature as support for both technical regulations and the set policy objectives. Within the European Union, standardisation has for the past two decades held a particular position as an integral part of legislation in certain fields (activities in accordance with the New Approach).

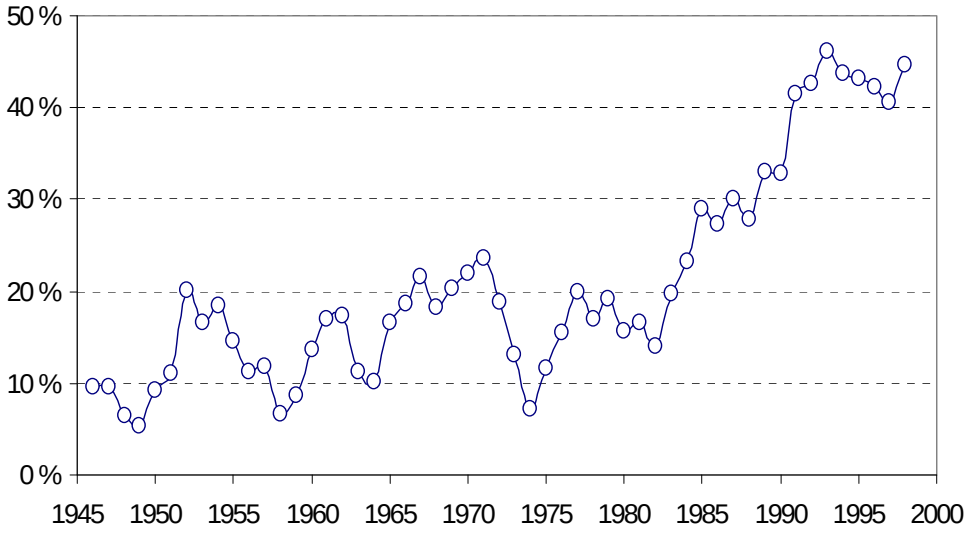
2. Historical Overview

In small countries such as Finland, innovation activities often take too narrow a view of the user perspective, regarding it as a national phenomenon. It would be important to identify global and international business-to-business value chains, which are sometimes quite long. This adds to the challenges posed by the user perspective in the different parts of the chain. In addition to long value chains, long product development times (up to 15 years) easily blur the end-user at the end of the value chain.

[66] The Finnish national context description was written by Jani Saarinen, Manager at PricewaterhouseCoopers (formerly from VTT Technical Research Center of Finland).

Customers' participation in innovation processes has been studied in the Finnish innovation projects (Sfinno) in VTT Technical Research Centre of Finland. In Sfinno data, the customers' involvement variable points out whether the role of customers has been *important* or *really important* during the development of innovations. In the following figure the long term change in this particular variable is illustrated.

Figure 2.3: Customers' involvement in innovation processes



Source: Saarinen (2007)

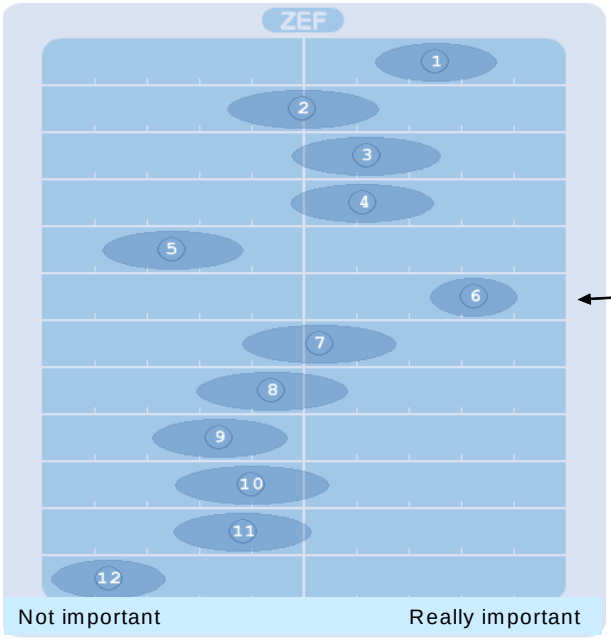
From 1945 to 1984 the frequency of customers' participation varied between 5 and 25 percent. In 1985, the customers' role became gradually more important and remained at levels above 40 percent. This indicates that Finnish companies have successfully been able to involve customers in their innovation development processes.

When talking about user-oriented innovation activities, the key question is: how do we define the user? Is the user the person using a service, or the party footing the bill? Defining who the users are stands at the core of the user-oriented approach as well as customer-oriented innovation activities: who has the authority and the power of decision? When authority and responsibility meet, the system is functional. With regard to user-orientation, user situations can be defined in various ways. Defining users is always context-dependent. The user is not always the customer.[67]

In the figure below, the importance of different knowledge sources in relation to the development of innovation has been illustrated. It is worth mentioning that the studied period covers years 1999-2004. In light of the results presented in figures 2.2 and 2.3, the question to be asked is: have innovations recently become more open in use of external ideas, or have customers been in an important role for the development of innovations during the last decades? According to the Finnish innovation data, the user-driven / customer-driven innovation in this respect is not a new thing.

[67] For more information about this issue, please see the forthcoming dissertation by Nordlund, H. 2008.

Figure 2.4: Importance of different sources of knowledge for innovation (or product development)



1. Research & Development (R&D)
2. Production
3. Marketing
4. Management
5. Other companies in same concern
6. **Customers & Users**
7. Competitors
8. Sub-contractors & suppliers
9. Consulting companies or commercial research centres
10. Universities & colleges
11. Public or non-commercial research institutes
12. Other actor

Source: Saarinen (2008)

3. Research

There are a number of organizations conducting research relevant to this area in Finland.

The *National Consumer Research Centre* investigates, anticipates and identifies change and risk factors within the consumer society, in consumer behaviour and in the market, and aims to be a communicator of consumer research knowledge. The Centre has a research programme on innovation and user needs. The aim of this research programme is to enhance knowledge about the dialogue between consumers and producers in the new environment of the information society and sustainable development. The study projects will evaluate user-driven technology and examine consumers' interpretations of novel technology in their everyday activities. Consumption can thus be seen and understood from a wider perspective: alongside utility, consumers seek pleasure, well-being and experiences. Research in this area also aims at developing technology and services within the frame of the Finnish innovation system.

The research findings can be used by decision makers to advance sustainable development and an information society that better serves the consumer. NCRC's partners will directly benefit from the accumulated data on users and consumers. Moreover, the studies provide a basis on which to develop new theoretical concepts for understanding the interface between the production and consumption of new technology, and on which to build practical tools to improve the dialogue between producers and consumers.

The *Innovation Management Institute (IMI)* at the Helsinki University of Technology is the leading innovation management research organisation in Finland. IMI has 15 years of research experience in the field of innovation management in industrial companies, service companies and public organisations. IMI's research focus includes the innovation management practices and processes of organisations at both strategic and operative levels. IMI aims to form deep, collaborative relationships with participating organisations, and aims to help them to develop their innovation capability and competitiveness.

IMI has networked with the world's leading research institutes in the field of innovation management to provide a window to global, state-of-the-art research activities. IMI is a part of the BIT Research Centre (Business Innovation Technology), which belongs to Helsinki University of Technology (TKK) and is at the forefront of academic business research.

4. Education

There are many educational programmes dealing with specific topics that are relevant to user-driven innovation. The focus of this section, however, is to highlight a number of inter-disciplinary educational programmes in Finland.

The *International Design Business Management* (IDBM) programme is a joint teaching and research programme of three leading Finnish universities: the Helsinki School of Economics, the University of Art and Design in Helsinki and the Helsinki University of Technology. The purpose of the programme is to bring together experts in different fields within the concept of design business management. The objective of the IDBM programme is to train skilled professionals for key roles in international design business. The programme emphasizes the importance of design as a competitive factor among others, such as technology. Arising from the needs of industry, this programme gives future marketers, engineering experts and designers an opportunity to practice important interpersonal skills through projects and courses. The programme teaches students to make full use of their own potential as members of interdisciplinary teams.

The *International Design Business Management for Professionals* (IDBMpro) is an interdisciplinary educational program organized through the cooperation of three leading Finnish institutions of higher education: the Helsinki School of Economics and Business Administration, the University of Art and Design, Helsinki, and the Helsinki University of Technology. Since 1999, 100 key persons from nearly 80 companies have completed studies over two years to achieve a Diploma in the IDBMpro program.

The IDBMpro program combines the marketing, design and technology resources of an enterprise. The program emphasizes the seamless integration of these elements to form a competitive strategy for the company and to fulfill its business objectives. IDBMpro enhances the capacities of the participating businesses for success in the international competition. The aim of the program is to create new competitive advantages in the international market, especially in the areas of design and product development, for businesses that represent various fields of operation. The concept of design covers products, services, the company image and public relations, and is hence involved in the operation of each enterprise. Design plays an important role in all kinds of products, from jewellery to machinery.

The target groups of the IDBMpro program include the personnel in charge of strategic planning and product development, design, production, marketing or public relations in a company. The program offers a brilliant opportunity for design houses to improve their own know-how and networks. IDBMpro is also excellent from the point of the view of internal development goals.

The *Creative Leadership Programme* is a joint project of Turku School of Economics, Pori Unit and University of Art and Design, Pori School of Art and Media. The project is funded by local EU-authorities and the city of Pori. The research group recruited this programme is multi-disciplinary – three employees present design research and art and media management studies, and four have a background in business studies. The aim of the project is to create a permanent Master's program that combines art and design with business studies and trains experts for managing innovative and creative processes. The project also does research in the field of the creative economy, which supports educational planning and creates theoretical background for the Master's studies. One emphasis of current research is to create close

contacts to local creative industry. This is for both supporting the employment of program graduates and to find out the educational needs of the local economy.

The *Innovation University* is a planned new university which will be created through a full merger of three existing universities: Helsinki School of Economics (HSE), University of Art and Design Helsinki (TAIK) and Helsinki University of Technology (TKK). Its special national mission will be to employ research and education professionals to support the success of Finland in the international economy. At the same time, the university will make a positive contribution to Finnish society, its technology, economy, culture and international appeal.

The goal for the new university is to be one of the leading institutions in the world in terms of research and education in its own specialised disciplines by 2020. The Innovation University is planned to start operating in August 2009.

5. Other Public Sector Initiatives

This section reviews the public sector measures aimed at promoting innovation activities primarily from the perspective of a user-driven approach. This perspective is very broad and covers issues that are fundamental to commercial enterprises, such as how enterprises can better align their innovation activities with the needs and preferences of their customers (including consumers). This could lead to the emphasis shifting from traditional product innovation-oriented development to business innovations.

The ***Innovation Department within the Ministry of Employment and the Economy*** is responsible for the development, implementation and performance of innovation policies in Finland. The Department's remit is to promote the growth, internationalisation and modernisation of enterprises and sectors of the economy, and to broaden the scope of innovation activities in both the private and the public sector. The Department is also responsible for drafting policy and acting as the authority in matters concerning minerals. The Department consists of six groups:

- Knowledge-based innovations
- Demand-based innovations
- Innovation environments
- Growth of enterprises
- Internationalisation and exports; and
- Minerals policy

The Demand-based innovations group has a very broad-based perspective covering fundamental questions from the industrial perspective, such as that of how companies might direct their innovation activities more effectively at customer (including consumer) needs and preferences.

The innovation university is one of the flagship projects in the extensive higher education reform currently being implemented by the ***Ministry of Education*** – aiming to create a science community spanning technology, trade and art. According to its programme, the Government will increase the financial and administrative autonomy of universities. In this connection, university governance and decision-making will also be reformed. The Ministry of Education will prepare a Bill overhauling the Universities Act and a proposal for the reform of the university steering and funding system.

The industries operating in the fields represented in the innovation university are of primary importance to Finland's competitiveness. The new world-class university will benefit the Finnish society as a whole. Ever stiffer international competition in the knowledge market

requires a capacity for renewal and a certain size of universities. A small economy and culture must find its own fields of specialisation in which it can reach the world top.

The innovation university is a new, bold and attractive solution, geared to contribute to the Finnish success and to respond to both national and global challenges. The university has world-class expertise at the intersection of global issues and the strengths and core competencies of Finnish society. An academic community across disciplinary boundaries will provide a solid basis for new world-class industry and employment.

Finland is in the process of finalizing their new ***National Innovation Strategy***. In this strategy, expertise and innovations are playing an increasingly important role. A key objective of the national innovation strategy in Finland is to create preconditions for a broad-based innovation policy within the Finnish society, to ensure the international competitiveness of the innovation environment, and to promote the creation and introduction of innovations. In practice, a broad-based approach means considering the innovation perspective also in other sectors of policy, such as the science, technology and industrial policies. The purpose of a broad-based innovation policy is to ensure that the government's innovation-promoting measures are mutually supportive and that their efficiency is not undermined due to conflicting sector policies or weak cooperation between state institutes.

The strategy will define the package of policies and choices that will make the Finnish innovation environment one of the best in the world by 2015. Moreover, the strategy in hand will define the procedures whose implementation will prove necessary by 2011. In the innovation strategy, it has been noticed that it is possible to influence the preconditions of user-driven innovation activities through various policies: by directing public R&D resources, influencing the conditions for competition or through consumer policy, market regulation, standardisation efforts and public procurement. A number of other identifiable political segments and measures may also have an effect on the demand for innovations.

The current innovation support system focuses on commercial enterprises. It can be asked whether the system should be extended to also share the risk associated with public sector innovation activities, thus reinforcing the risk tolerance of this sector. Traditionally, promotion of public sector innovation activities entails the idea that it should sponsor innovation activities. At present, this idea seems to be contradictory to public procurement legislation. Competitive dialogue under the new procurement legislation should be modelled, establishing a uniform interpretation and procedure which could be applied from the perspective of promoting innovation activities. To date, there is not sufficient expertise available in this respect. Launching joint pilot projects would promote the establishment of a joint interpretation and operating model.

Another problem that has emerged since the new procurement legislation entered into force is that rapid testing of ideas and creation of prototypes has decreased markedly, which has also decreased product development between enterprises and the public sector. As a whole, the public sector is a major buyer. It could have a significant impact on the demand for new solutions, services and products and the discovery of new innovations, if only the will to do so is there. The current procurement legislation, or at least the interpretations related thereto, can in their present form be regarded to constitute an effective barrier to innovation activities. It would be important for the new risk sharing models to promote innovation activities even in the public sector.

6. Private Sector

A number of companies employ different types of user-driven innovation methods. Of the broad range of examples, two are highlighted below.

Nokia Beta Labs is a company web site that is open to the public. Nokia built the website in order to share some of the exciting new ideas that Nokia is working on. Through Beta Labs,

Nokia gathers customer ideas from around the world - virtually free. Active users of Beta Lab can see their suggestions come to life. As these are experimental projects, Nokia can't make any guarantees or provide additional help. Users can, however, seek guidance from the beta community growing around this site.

In March, 2007, Nokia posted a mobile phone application called Sports Tracker on a company web site that is open to the public. The program, still a work in progress, was designed to let runners and cyclists take advantage of the global positioning capability included in some Nokia models. Users can record workout data such as speed and distance, and can plot routes. The response to Sports Tracker was overwhelming. Eventually more than 1 million people downloaded the program and used it for sports the developers never dreamed of, such as paragliding, hot-air ballooning, and motorcycle riding. More importantly, the users avidly provided criticism that Nokia then used to make improvements. Based on reader feedback, for example, developers added the capability to create online groups where users can share favourite routes and even photos that they took along the way. People were misusing the application in creative ways.

Beta Labs is part of a broader push by Nokia to harness customers and partners in the service of innovation. At Nokia.com the company allows users to share and rate applications they have created such as screen-savers or games. And over the past year, Nokia designers have travelled to the developing world to ask users to sketch their own dream cell phones. By year-end, more than half the world's population is expected to live in urban areas, so to exploit this mega-trend Nokia's researchers visited shantytowns in Mumbai, Rio de Janeiro, and Accra in Ghana.

Efficient information management, the use of high technology and developing new service concepts have become key competitive factors. ***Metso Corporation*** aims to provide its customers with a high level of process competence and their supporting automation systems. In addition to machinery and equipment, Metso offers expert services for developing customers' production processes and making the investment process more efficient. The Future Care service concept promotes cooperation, interaction and partnership between Metso and its customers. As a result, the product life cycle is expanded and an efficient communications channel is created and maintained.

7. Summary

In the future, there is a need in Finland for an innovation policy that does not rely on technological development alone. The innovation policy must also help promote services and non-technological innovation activities. From the point of view of steering innovation activities, it is also important to consider how technology can serve as a platform for the creation of added value, services or other technology-based solutions. Factors critical to business development include identifying the end-user perspective and creating networks and value chains, which promote the emergence of new types of “group structures”. An understanding of user orientation and revenue logic is also important.

Finnish Case: Outotec – "More out of Ore"[68]

Industry: Leading global provider of process solutions, technologies and services for the mining and metallurgical industries

Headquarters: Espoo, Finland

Net Revenue: 1 000,1 M Euro (2007)

Employees: 2144 (2007)

Strategy (from 2007 annual report):
Outotec's goal is to continue to strengthen its position as a leading global provider of process solutions, technologies and services principally for the mining and metals industries. The cornerstones of our strategy are to:

1) Seek sustainable growth
by pursuing a number of measures including
- developing and introducing new technological solutions;
- applying the company's existing technologies to new customer industries;
- expanding the scope of operations in selected geographic markets;
- increasing services and after-sales business; and
- undertaking acquisitions.

2) Maintain and improve profitability
and decrease its susceptibility to business cycles by
- improving efficiency of operations;
- optimizing cost structure and the flexibility of fixed costs; and
- increasing the share of the value-added component in its offerings.

Outotec operates in the metal processing industry, where the innovation process is a long-term and resource-intensive activity, highlighting the need for close collaboration and multiple partners. The case described here illustrates a situation where a long-term, large technology development project – including many sub-technologies – is conducted in a B2B-context. This case provides an example of an innovation process which was conducted in close collaboration with the business customer, employing a number of 'user-driven' methods. This case may also be viewed as an example of partnership innovation. In addition, this case illustrates some of the differences between user-driven innovation approaches in business-to-business (B2B) versus business-to-consumer (B2C) environments.[69]

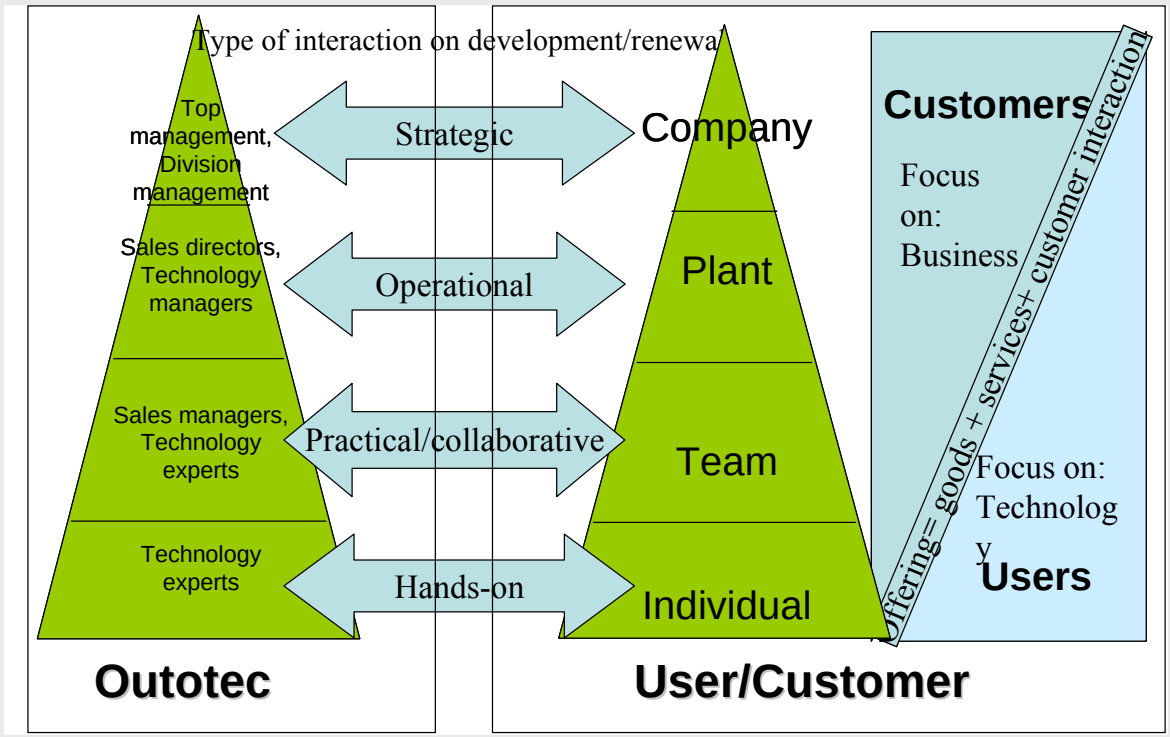
1. Company Background and "User-Driven" Innovation at Outotec

Outotec is a leading global provider of process solutions, technologies and services for the mining and metallurgical industries. Outotec employs 2144 people, and its sales amounted to 1000,1 million Euro in 2007. The company utilizes its extensive experience and advanced process know-how to provide plants, equipment and services based mainly on proprietary technologies. Outotec works in close partnership with its customers and provides

[68] The case was written by Dr. Pekka Berg and Researcher Tea Lempiälä, Innovation Management Institute, Helsinki University of Technology

[69] Given that much of the discussion about user-driven innovation is concentrated on B2C environments, this case – providing experiences and information from the B2B context – serves to extend the debate and bring a wider perspective to the discussion of user-driven innovation in the Nordic context.

environmentally-sound and energy-saving solutions. Today, this originally Finnish company is a publicly listed company with offices in several countries.



At Outotec, as in many B2B organisations, there are different people that are in contact with the different organisational levels of the customer. At the company level, the recipients are the top management and the divisional management. At this level, the focus is on maintaining good relationships with the customers and striving for being able to define – together with the customer – what kind of technology is needed and what kind of an assignment is put out to the marketplace. At the plant level of the customer, the recipients at Outotec are sales management and technology directors. At this level, the focus is on strategic planning (whether to build a new plant or reduce the amount of plants by increased efficiency). The actual product development cases begin at this level. At the team level, the counterparts at Outotec are the sales managers and technology experts. These discuss with the team foremen issues related to different sectors in the plant, e.g. planning their work and facilities. At the individual level, the contacts at Outotec are the technology experts. They discuss very practical and hands-on issues and try to solve problems that they have while operating the equipment. At this level, the focus of the development work is very incremental (from the point of view of Outotec) and when moving towards the plant- and company levels, innovation activities are more radical.

Outotec (formerly Outokumpu Technology) used to be a part of Outokumpu group, a consolidation which has a 100-year history in the metal industry. In 2006, Outokumpu Technology was separated from the Outokumpu group and became a public limited company of its own (and was listed in the Helsinki Stock Exchange on October 10th, 2006). The company changed its name to Outotec in April 2007. After the listing and separation from the Outokumpu group, the relationships with Outotec and its customers changed to some extent. Though, also before large part of the sales came from customers outside the Outokumpu group, the customer companies located within the same group were more natural partners for technology development. In this respect there were new challenges in finding similar development partners, because the setting for common development was not as natural as before. However, Outotec has been able to establish/maintain trusting and successful developing collaboration with its current customers, and finally the situation did not change very much in this respect. Of course, there is more that needs to be though about in relation to

non-disclosure agreements. Many of the customers have also remained the same, although the legal relationship has changed. Thus, Outotec has the advantage of having much historical knowledge of and long relationships with these companies.

The innovation methods utilized in this industry are quite different from those in B2C-markets. Cooperation with customers is naturally strong, because the products need to be tested at customer plants and to some extent also designed together. The customers guide the innovation process with their direct expressions of problems/needs, or through unexpressed needs that Outotec personnel observe when visiting the customers' production plant facilities. Developing products together with the customer is also a common way of action. Visits to customer plants are frequent, and the exchange of information is relatively open. The role of the customer in the development of innovative solutions and larger innovations is central. Outotec needs customer ideas and experiences in order to have ideas for the direction to which they develop their technology or processes. Innovations spring from customer contact/feedback/ideas most of the time. Also, when testing their ideas and taken them further, customers have an important role. Outotec needs customers to take the risk with them in developing a new solution and testing it in their facilities. This highlights the importance of close and trusting relationships with customers.

2. Concept Innovation – The Case of Copper Electro-refining Concept

This case represents a concept innovation for Outotec because it resulted in the development of a new technology – actually a new concept of a factory. This was a large development effort, which during the process divided into several smaller parts, which were then developed as their own subprojects.

Outotec´s electro-refining technology is a total process and material handling concept for a modern tankhouse. It comprises Outotec permanent cathodes, all tankhouse equipments and material handling equipment with full automation. All interfaces within the process are optimized, and the process is designed to allow a high level of automation. In addition to the highest quality copper, significant savings in electricity, maintenance, personnel and investment costs were targets of the development project.

The innovation process began in 1996, and resulted in implementation at a customer plant in 2003. It is important to note that this development process involved 14 different sub-technologies that did not proceed at completely same pace. It was thus possible that one sub-technology was at the data collection phase whereas another could already be at concept ideas phase. This type of analysis is not involved in this description, but the phase is described at the project-level.

3. The Innovation Process and Business Outcome

In order to better understand how Outotec works with its customers and users, a specific example of their innovation process will be described step-by-step. In this case, the customer company belonged to the same Outokumpu group, but was a still separate entity. According to the company representatives the same type of case could well happen nowadays with a customer company not belonging to the same group. The process was not seen to differ notably from the innovation activity conducted together with customers nowadays, because the collaboration is always intense due to the nature of the products and testing processes (which is done in the customer plants with the users themselves). Because the development process is lengthy and resource-intensive, trust and long-term commitment are crucial in all development processes. Competition is still hard in the industry. In this case also other competing companies were benchmarked throughout the process by the customer.

Concept Identification (WHY? and WHAT?)

3.1 Opportunity Identification

In 1996, one of Outokumpu Technology's (OT) customers decided that they wanted to expand and improve their copper refining process. They wanted better quality, more productivity and more automation. First they had thought of doing it themselves, but then decided to call on outside help on the issue. They explored possible partners outside the Outokumpu group as well as the group's technology company: Outokumpu Technology. They finally chose Outokumpu Technology for their expertise, good track record and geographical proximity. Also the well-established and trusting customer relationship positively influenced the fact that Outokumpu technology was chosen. This trust had been created during many years of successful cooperation in joint projects as well as long-term customer relations management in the higher levels of the organisation. The initiative for the innovation effort came entirely from the customer; Outokumpu Technology did not need to push for this innovation to happen in the beginning of the process. The case represents a real win-win situation, where the customer received new technology and Outokumpu Technology new sales products.

The parties agreed that there was no use to start to improve the existing technology, but decided instead to search for a new solution. Because of the nature of the project they decided to apply for funding from Finnish Funding Agency for Technology and Innovation (TEKES), and received it. The main target of the project was to develop copper tankhouse technology for the demands of future years, both for utilization in refineries owned by Outokumpu and for sales of technology to other refineries.

The methods used at this stage were regular meetings at division management level few times a year. Outokumpu Technology's management had strived for achieving this type of regular interaction, because it provided them with a possibility to discuss strategic issues with the customers and be one step ahead of competition.

The result of this step was a vision of the project's desired outcome: to replace current technology with new technology, i.e. a new process for copper electro-refining. This process was realised in customer's existing plant facilities where users of current process were involved in the development of the new process and technology.

User involvement in *Opportunity Identification*?	No
UDI Methods/Tools used in the process	Customer involvement, user not involved

3.2 Data Collection

In this step, OT started collecting data to concretise the planning of the project. The data collection, though, was not started from zero, but the customer had already actively collected operation data from their processes before the beginning of this project. The customer provided Outokumpu Technology with this data. Due to this arrangement, the data collection phase was relatively short. The primary actor in data collection was the customer. The customer made lists of important issues, and OT provided complementary insights. At this point, the project was organised as a development project with the customer, which made regular interaction and cooperation natural and necessary. The project group met regularly to discuss issues related to the innovation project. The customer would tell their thoughts and needs to OT's representatives, which then attempted to interpret them in a way in which they could be transferred into technical requirements.

At this point of the project, observation on the user-site was initiated. A member of Outokumpu Technology's personnel was sent to work among the users for the duration of the

project. This person acted as a participant observer. He was assigned with real work tasks at customer's organisation, and at the same time he observed the needs of the users related to the project. He reported regularly to Outokumpu Technology – orally and literally (through journals and other mediums). He also gave oral feedback to the customer's organisation. This allowed OT to gain more insightful data than by direct meetings and questions and it also provided the customer additional insight. This direct and quick feedback made the development loop more rapid and efficient. The exchange of data was very open under a confidentially agreement already at this stage.

The result of this step was a project plan and the division of the project into several subprojects.

User involvement in *Data Collection*?	Customer very actively, user to some extent
UDI Methods/Tools used in the process	- Regular meetings with the customer - Participant observer working with the users

3.3 Pattern Recognition

The three next steps (pattern recognition, concept ideas and conceptualization) were perceived as difficult to separate from each other. These steps also formed a loop in which the project circled for some time. The pattern recognition step was characterised by regular product development activity conducted together with the project members from the customer organisation. There were regular meetings and the project was coordinated together. The product development team also had brainstorming sessions with the customer representatives. The observer was still present at the customer plant working with the users and giving insights and feedback to both companies.

This period was also relatively short.

User involvement in *Pattern Recognition*?	Customer involvement
UDI Methods/Tools used in the process	- Project work conducted together - Brainstorming sessions - Participant observer at the customer

3.4 Concept ideas

As an important part of concept ideas process, several diploma workers were hired to work with the project and create new concept ideas. The whole concept consisted of several sub-technologies and in this stage ideas for these sub-technologies were created and refined. For example, it was possible to utilize the normal, real size tankhouses and thus simulate and test new and different cell-cleaning systems in real circumstances. This allowed the team to create new concept ideas and improve the existing ones with hands-on activity (generating ideas and testing them as a cyclical activity → not testing and selection, but improving the ideas based on potential problems identified in the test situations). In this phase as well, the customer and users were involved in similar ways than in the previous phase: project work was conducted together, brain storming sessions were conducted together, the customer commented on Outokumpu Technology's ideas and participated in selecting the concept ideas for further development.

User involvement in *Concepts/Ideas*?	Yes
UDI Methods/Tools used in the process	- Project work conducted together - Brainstorming sessions - Participant observer at the customer - Diploma work students observing the customer

Concept Implementation (HOW?)

3.5 Conceptualization

The conceptualization was made in close contact with the customers and users. The same methods were present than in the two previous phases. Also, Outokumpu Technology's engineering unit participated to conceptual engineering at the customer's plant.

The result of these three phases was the concept of the process including 14 different sub-technologies. The conceptualization was reported with normal research and technology development (RTD) project reporting and documentation.

User involvement in *Conceptualization*?	Yes
UDI Methods/Tools used in the process	- Project work conducted together - Brainstorming sessions - Participant observer at the customer

3.6 Prototype and 3.7 Test

The prototyping and testing steps are very interrelated in this case – which makes it difficult to separate these two steps from each other. For this reason, they are discussed together. The prototyping activity in this case is much different from most B2C-cases, because of the costs involved in the prototyping activity. In this case, the costs of the prototyping activity were so large, that the Outokumpu Technology couldn't try out many prototypes, and it wasn't able to test them itself. Thus, only one basic prototype was made for the most important sub technologies each including several alternative prototypes for different sub-sub technologies. The customer offered their facilities for the testing and funded the prototype testing. The actual users (customer's engineering and product development organisations) were actively involved in the prototyping activity i.e. were operating the test in three shifts and gave feedback on the prototyping process. At this point, two more employees from Outokumpu Technology were sent to work to customer's organisation in order to prepare, supervise and observe the test. The quality of the refined copper produced in the tests controlled by customer's normal quality control methods.

Ten out of the fourteen sub-technologies were prototyped and tested at this stage. The IPR outcome from these steps was 31 invention announcements and 23 patents, including 16 people in total. Some 6 million Euros was spent on the project. The prototyping activity involved constructing three full-size cells, which were operated in three shifts for months in a real plant environment. In an actual operating plant there are hundreds of cells like this. The tests were made per cell, so it was possible to conduct three different tests.

The criteria for the successfulness of the technologies were mostly economic and involved an analysis of whether the technology brings added value compared to the product development needed to realize it.

User involvement in *Prototype and Test*?	Yes
UDI Methods/Tools used in the process	- Financial investment - Close cooperation in operating the tests and designing the prototypes - Two employees from OT present at the customer: helping and conducting participant observation

3.8 Implementation

At the implementation stage, the customer conducted the feasibility studies with the help of Outokumpu Technology. At this point, competing sub-technologies were also involved in the process for comparison with the sub-technologies developed in this project. The feasibility study was successful, but right after it was conducted the investment window of the customer closed for several years (due to difficult times at copper markets owner invested in other businesses and finally sold the customer to a new owner). At this point, the technology and the process had been fully developed and were ready to be taken into use. Luckily a new interested customer appeared conveniently at this time and Outokumpu Technology was able to supply the developed technology to the new customer. Selling the developed technology to the new customer was also in the interests of the original customer: They also needed a full scale industrial plant for reference and for the elimination of the possible teething problems. The original customer actually helped Outokumpu Technology to develop the technology to suit the new customer and their engineers contributed to the design of the new plant for the new customer. The original customer also let Outokumpu Technology to bring these potential customers in their plant to see how this new technology functioned in action. This was very crucial for Outokumpu Technology because without seeing the process operating in a plant the new customer wouldn't have had the courage to invest in this large process.

It was also in the best interest of the original customer that Outokumpu Technology was able to sell the technology to someone else, because they perceived this as a valuable opportunity to test the technology in real life. Although they did not have the possibility to invest in the developed technology at that time, they had not made a definite decision not to use the technology. Finally, in year 2007, the technology was implemented at the original customer. (By this time, the solution had already been sold to several other customers.)

User involvement in *Implementation*?	Yes
UDI Methods/Tools used in the process	- Feasibility study - Participation to the design of the new plant

In the Outotec case, the two sets of phases (the WHY/WHAT and HOW phases) formed two loops in which the project circled for some time. The first loop included the pattern recognition, concept ideas and conceptualization steps. The second loop included the prototype and test steps. The loops involved extremely deep collaboration, trust building and creative working, where the innovation sparks occurred. It is impossible to determine the moment of the "innovation spark" in more detail.

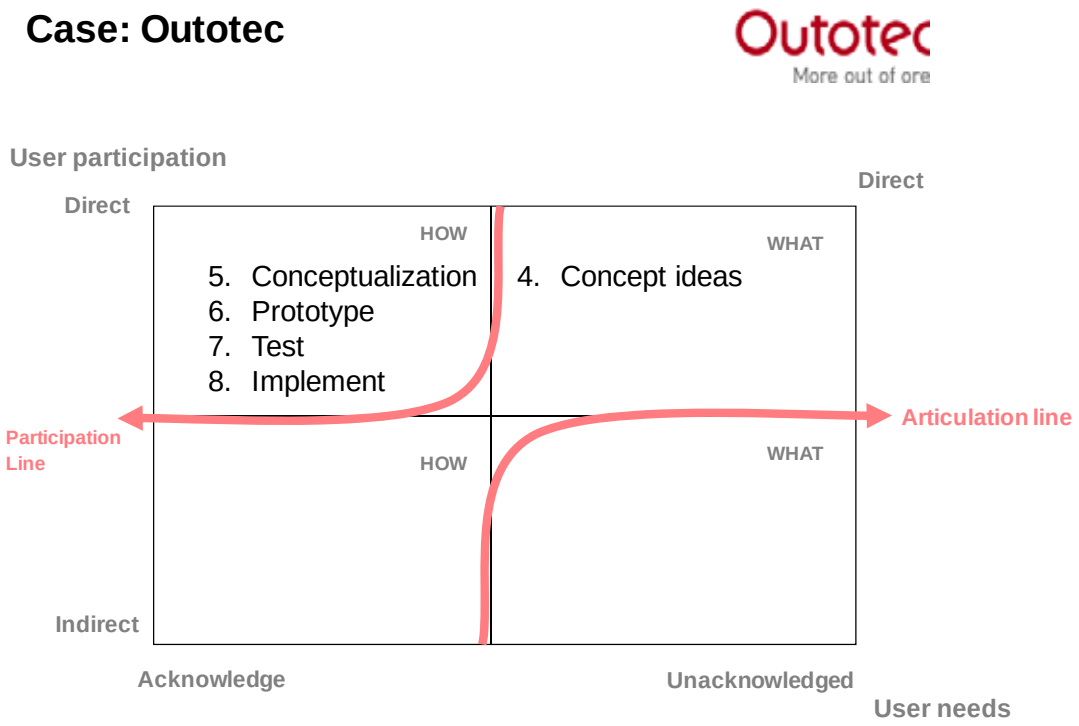
Outotec has much historical knowledge of and long relationships with the company they are working with in this case. The reason the customer chose, in the beginning of the process, Outokumpu Technology was their trust on OT's competence. This trust had been created during many years of successful cooperation in joint projects as well as long-term customer

relation management at the higher levels of the organisation. Even though the customer belonged to the same group at the time, it was also important that Outotec had been able to show successful track-record in relation to outside customers as well. This operational environment was a tool leading to the sparks in this context, and can be called an "open knowledge creation system".

The basic features of electro-refining technology were known before the project, but this project modified the previously known technologies and integrated them with new technological solutions creating a holistic solution that had not existed before. Thus, partly in its core, the project relied on existing technology, but applied it in a new field and consequently created a new solution. Aside from this core technology, several other supporting technologies were also developed.

This case example had a **high** impact for Outotec. The project lead to new insights in the user's needs and/or market understanding that contributed to innovation and change processes in the company and had an impact on the company i.e. organizational, economical, new products and/or services, change in attitude etc.. The economic impact of the project for the company was **high.**

Figure 2.5: Mapping of UDI processes at Outotec



This case illustrates a very close collaboration between Outotec and its customer in the development of a new process for refining copper. Given the long lead times and high costs of development, this type of innovation process (involving partnering activities at different levels of the company and the customer) is quite typical of this industry. Methods for 'teaming-up' (including regular meetings, brainstorming and 'idea anchoring' sessions between the company and customer representatives) are the norm. However, some of the methods that Outotec employed in order to better understand the needs of the individual user of the refinery equipment may not be as typical for this industry. The use of methods such as participant observation and written journals were helpful in order to conceptualize certain aspects – such as safety features – of the electro-refining process.

4. Key Lessons

Outotec perceived this case as an optimal example of user involvement in their process. The customer was involved throughout the project, and the activity was based on mutual trust and respect. The innovation process involved different levels of the customer organisation (from strategic to individual user levels), and multiple ways of collecting data on user needs were employed. Also, this was a case of long-term cooperation which allowed for flexible working and a high level of understanding.

Since 2006, when Outokumpu Technology was separated from the previous parent company and became a public limited company of its own, the company has been looking for additional projects like this Copper Electro-refining Concept. One crucial question is how to be in touch with or even involved in the technology strategy processes of customers. In the type of business where Outotec operates, the point is to get the customer to be involved in the first steps of the innovation process. Thus, from the concept development viewpoint, the most important is to get the customer, the strategic level in this context, to be involved in the development. We could call this approach "customer-driven innovation" in our context. And, correspondingly dealing with the more incremental, technological level, it is important to be in touch with the user. We could call this approach "user driven innovation" in our context.

The main lesson that was learned from this project is that the rules of the collaboration must be agreed on before the activity is started. Questions to be discussed include.: How to manage different situations in the market place? Who has the patent rights/how are they divided? Does the other party have the right to sell the solution for other customers? How are profits divided? The biggest reason for the failure to establish user-driven innovative activities is that these issues cannot be solved.

Iceland – National Context[70]

The term user-driven innovation is not frequently used in Iceland even though there is no doubt that many ties and informal contacts exist between the user and the producer. In our opinion user-driven innovation is much more widespread than one might expect when quickly glancing over the economy. However, it would require a more extensive survey to obtain the necessary knowledge to judge the scope of this.

1. Introduction

Focus on the users is quite evident for Icelandic companies and even in the public sector although only a few companies have been working directly with the users. This is the case for companies in the health technology sector and in the IT sector.

Research and development in the area of user-driven innovation cannot be found on the list of supported projects from the Competitive Research and Innovation funds run by Rannis, the Icelandic Canter for Research. It is difficult to find cases of user-driven innovation in the economy. Nevertheless, in our study we discovered that companies, public research institutions and universities have been working with the user as a main driver of innovation for some time.

This paper informs about our findings after searching for information about the use and knowledge of user-driven innovation. We have carried out interviews with experts across all sectors of the economy and made additional desk research on the topic. Our main results are that even though user-driven innovation is known no extensive studies have been performed in the area so far. Still, user-driven innovation seems fairly well known by many players as a topic of growing importance and interest.

2. Historical Overview

The Icelandic Centre for Research – RANNIS is a leading organisation when it comes to new features regarding research and innovation. This is caused by the comprehensive network of organisations, mostly in Europe and especially in the Nordic countries. RANNIS has been in forefront when it comes to matters like intellectual capital, open innovation, user driven innovation, Living Labs, as well as some aspects of cluster research. The FORA project on user-driven innovation is the first in this area where an Icelandic organisation takes part.

As an innovation and analytical organisation RANNIS has taken part or been in charge of Community of Innovation surveys and quite many other policy related project.

The Community Innovation Survey IV published in 2008 reveals that ideas about innovation in most cases originate from employees in companies or in the public sector department. It is also noticeable that universities are rarely counted as a source on innovation.

In connection to the CIS study the researchers at RANNIS asked some of the respondents if the company's own staff turned out to be so creative that most ideas were actually found within the company. The question was formulated to disclose whether the university research findings and recommendations might have more influence than we could see by the CIS results. Our conclusions were that companies do always trust that the source of ideas originates from within the company. This point of view was maintained even though the initial idea originally came from the users, a university or some other company external source.

We admit and recognise that it may be difficult to find the true source of innovation ideas since an innovation project typically is a long process with many people involved. We suspect

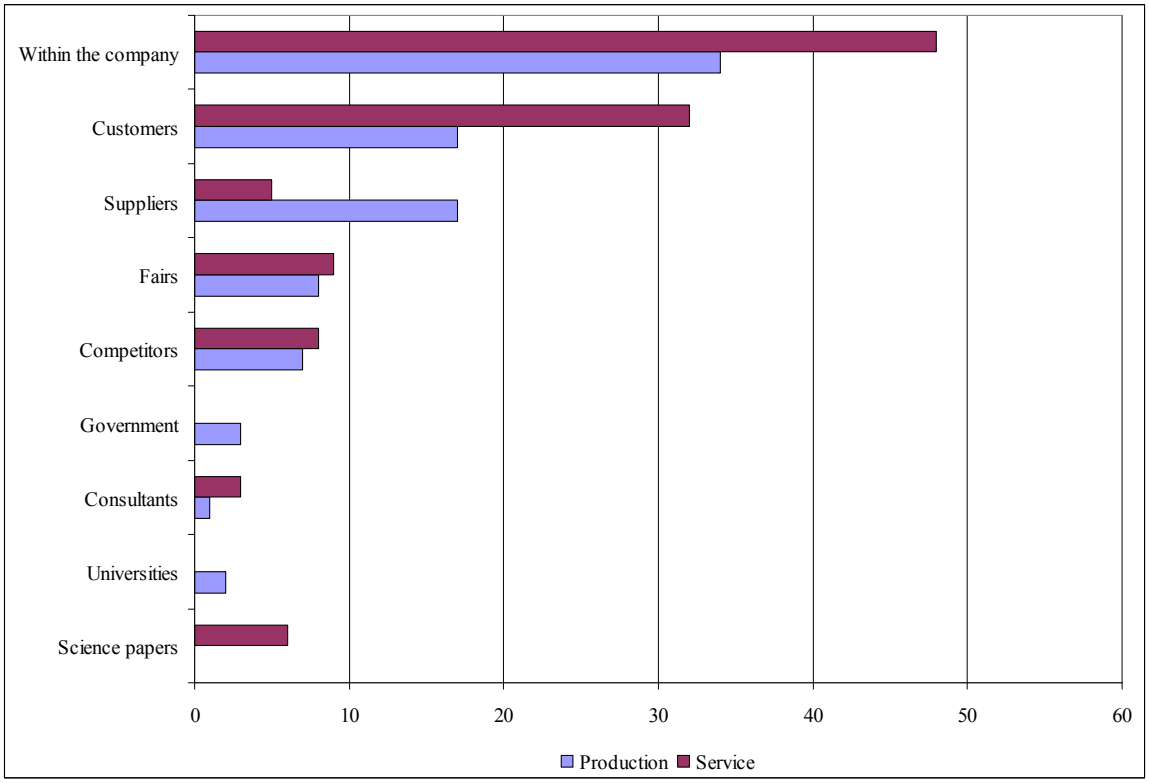
[70] The national context was written by Thorvald Finnbjörnsson, Rannis

that personal connections often lead to innovation decisions. This implies that a key person within a company has usually built a comprehensive network in which he will look for ideas or discuss ideas. It is believed that this person neglects to revile this network when he is asked for source of ideas.

According to the Community Innovation Survey IV, the most prominent source of innovation in service companies is the customer. Production companies get their ideas from suppliers, customers or from their own staff. This demonstrates that service companies are in closer contact with their customers and have minor difficulties when responding to their needs compared to other business fields.

It makes a difference if the source of the innovation idea is in use in production or service companies. Companies in services respond faster to customer wishes compared to manufacturing companies. However, it is still necessary to carry out more in-depth studies in the industry in order to find explanations.

Figure 2.6: Source of ideas for innovation, by type of companies.



Source: RANNIS 2008

3. Initiatives to improve conditions for UDI

General innovation policy and research on innovation policy are rather new topics in Iceland. It can be stated that the establishment of the Science and Technology Policy Council in 2003 lead to the first attempt to formulate an outline for an innovation policy. This was done by a very open and general approach where funding, cooperation and globalisation aspects were in focus. This has been gradually developing since then but without addressing more specific areas of innovation.

The Icelandic Centre for Research – RANNIS has the role of assisting policy makers within the governance system in preparing and implementing innovation policies. The implementation has mainly consisted of running the competitive funds supporting R&D and innovation. Other areas such as user-driven innovation have been monitored for possible assistance to the industry, rather than form a basis for policy making. Other examples include participation in projects like Living Lab, cluster projects and innovation in creative industries.

This means that there has not been much effort to improve the conditions for user-driven innovation yet, but Rannis has collected data in cooperation with its Nordic collaborators in the area in order to implement or utilize the important possibilities included in user-driven innovation in an Icelandic context.

4. Policy initiative to support user-driven innovation in the private sector

The public support for research and especially for innovation has so far been directed towards increasing companies' possibility for innovation. The policy recommendations issued by the Science and Technology Policy Council focused on supporting cooperation as well as efforts to establish clusters. This means that support for more specific emphasis such as user-driven innovation has not come to the table of the council. In the policy from 2003 to 2006 the council declared that The Science and Technology Policy Council believes that effectiveness of promoting public-private collaboration through so-called "innovation clusters" is useful. Such clusters involve public bodies and groups of firms in related fields working informally together so that potential users of new knowledge meet those who hold knowledge needed by the users. Some experience exists in Iceland of carrying out projects build around this concept; relevant examples here include the Fisheries Technology Forum and the Health Technology Forum.

The emphasis of the governance system of the STI system to promote clusters is rather broad and focuses on cooperation enabling innovation to thrive. It was expected that more specific measures or projects would grow out of more established innovation environments.

It has been stated that the Centre covers a major function in establishing cooperation among public bodies which comprise the support network for innovation in the economy and which shape and operate support projects tailored to small and medium-sized enterprises and individuals, particularly in regard to the realization of new business ventures. Because of the fragmented industry in Iceland the public bodies do have a more prominent role to play compared to other larger industrial countries.

One of the most important presentations of user-driven innovation is the Innovation Forum held by Rannis, Export Council and the Innovation Centre of Iceland in February 2008. The organizers usually find a suitable and relevant theme for the forum. In 2008 the theme was User Driven Innovation. The organisers got Prof. Dr. Cornelius Herstatt from Institut für Technologie- und Innovationsmanagement Technische Universität in Hamburg as a speaker.

Professor Herstatt emphasized:

- Users – Key Elements of the Open Innovation paradigm
- Qualified Users as source for innovation
- How to identify Qualified Users – how to work with and prove their contributions to innovation
- How to start a (national) user-driven innovation program? (Cases: Denmark and India)

Given the fact that user-driven innovation in Iceland is still in its infancy Professor Herstatt gave some advice on how to proceed:

- Staff some professorships in top institutions with leading specialists in user-driven innovation
- Set up a program to fund research and diffusion efforts in user-centered innovation
- Set up a program to fund user innovations (seed capital, business development, etc.)
- Professors and firms will set up a collaborative academic/industry Lab to develop, test, and diffuse best practices in user-centered innovation.
- Adapt government innovation policies to support user- centered innovation

- Support development of collaborative innovation tools and standard-setting
- Support users' rights to modify standard products

5. The Private Sector

The Company that was subject to case study for Iceland in the FORA user-driven innovation project is CCP Games. To our knowledge, this company is one of the frontrunners when it comes to user-driven innovation. The user contact is heavily relied on when it comes to innovation and to major changes in the product, an online game.

Out of 300.000 active players some 300 are involved in the development of the game. This covers both incremental and step by step development rather than initial idea for the product. It can be said that user-driven innovation has accelerated by the development of the product but testing prototypes has lead to quite extensive user contacts.

The case stated: "*User-centered approaches in innovation are used to some extent at most stages of the innovation process at CCP. However, these approaches become more systematic and routinized as the game develops. During concept development, the company seeks to protect its intellectual property rights by keeping all communication with users' low-profile. Despite this, participant observation is used to some extent during the concept development phase, although not very systematically."*

On the other hand, once the game concept has been introduced on the internet, the development relies heavily on quantitative and qualitative input and information from users. In addition to statistical analysis of users' preferences and habits, ethnographic methods such as video-sessions, participant observations and written feedback are also used.

"*CCP's managers consider user involvement in development of games as strategically very important for the company and envisage a further advancement of user centered approaches in product development*". (Jónsdóttir, Á; 2008).

At the Innovation Forum the Test Manager at Össur Ltd, Ms Lúðvíksdóttir described the user contact between the company and the user of its products. Össur Ltd. work is in the business of improving people's mobility. Being a leading global company in non-invasive orthopaedics, the company delivers advanced and innovative technologies within the fields of prosthetics, braces, supports and compression therapy.

The company is and has always been working closely with users of prosthetics. The solutions are clearly based on an idea from a disabled individual, who started to work with a specific solution for attaching an artificial leg to a human body. The development of the assortment has always been done in cooperation with and often inspired by ideas originating from the users.

6. Some final thoughts and conclusions

The fact that user-driven innovation is not a very well known term in Iceland could easily be a drawback for the understanding of a necessary connection between the user and the producer. Several companies regard the connection to be important as they actually work with the users. We have mentioned few examples of companies working actively with the user. It is our opinion that the companies may perform better if they open up to the knowledge of user-driven innovation and thereby increase their understanding of the need that the users have or will express, but this message is not always heard.

At the same time we find the absence of the universities in research or studies of user-driven innovation rather disturbing. We would like to see companies and universities working together at projects where the objective is to identify the user, his need and integrate this insight into the strategic objective of the companies. RANNIS will use more means to

introduce this term into the Icelandic industry. By doing that RANNIS needs to activate the Confederation of Icelandic Industries and the member companies there. The Confederation has a long history of being a leading position when it comes to implementing new matters to the industry in general. They have established a well functioning channel for distributing news and messages. RANNIS hopes to be able to use this network.

RANNIS will also use the good contact with the working committees of the Science and Technology Policy Council to try to influence the policymakers with this method. Finally RANNIS will seek the possibility of obtaining good experience by other countries in order to enhance the usefulness of user-driven innovation.

Icelandic Case: CCP[71]

Industry: Producer of massively multiplayer online games in the entertainment products and services industry.

Headquarters: Reykjavík, Iceland

Net Income: 6,5 million USD (454 million ISK) (2006)

Employees: 310, Around 200 in Iceland, 75 in the USA and 35 in China (2008)

From the 2006 annual report:

Mission:

- To become a leading producer of massively multiplayer online games by generating products that captures the imagination of the customers and inspires them to immerse themselves in the worlds that the company creates.

Strategic objectives:

- The expansion of CCP-produced games into new and emerging markets;
- The leveraging of the company and IP brands for new products; and
- The unitization of the company's technology foundations and operational infrastructure for the creation of multiple persistent worlds, each specifically catering to a different demography of customers.

Since the launch of its first massively multiplayer online game, Eve-online, CCP Games has focused on customer feedback and user-driven innovation as a source of growth. In comparison to many other industries, the online game industry is at an advantage when it comes to involving the users in the innovation process. The industry has direct communication with players (many of them spending considerable amounts of time in front of the computer for work and entertainment) that is relatively unproblematic and quantitative information about the preferences and habits of the customers can be gathered routinely without much effort. CCP has harnessed these advantages in the development process of their products.

This case explores the user-driven innovation process that CCP used to create their first computer game, the multiplayer game Eve-online.

1. CCP – Company background and user-driven innovation

CCP Games was founded in Reykjavík in 1997 during a time of considerable growth in the country's digital design industry. The aim of the company was to develop graphically advanced multiplayer games (M.M.O.'s). CCP's revenues are mainly derived from Internet subscriptions of Eve-online and various ancillary products.

CCP is a spin-off from Oz.com, an Icelandic company and developer of 3D graphics and virtual reality solutions. CCP's founder, Reynir Harðarson, then an Oz.com employee, envisaged possibilities in the application of Oz's solutions in the gaming industry. However, games were not on Oz's agenda, so Harðarson founded his own company in 1997.

For the first three years, CCP's focus was on financing the development of a new game, and in the year 2000 Eve-online's development took off. In the meantime, Oz.com had

[71] The case was written by Ásdís Jonsdottír, Rannis (since May 1, 2008 at TIK, Oslo)

experienced great difficulties and finally closed down its operations in Iceland following the bursting of the dot-com bubble. Many of Oz.com employees are now employed at CCP, including many of the key technical people.

CCP employs 200 people in Iceland, 75 in the States and 35 in China. Eve-online is CCP's only published game so far, but several other M.M.O's are in development and will be marketed in the coming years.

During the developing of Eve-online user-centered approaches in innovation were used at most stages of the innovation process. However, these approaches became more systematic and routinized as the game developed. During the early concept development phase of Eve-online communication with users' was low-profile in order to keep intellectual property rights for the company. Later on, once the game concept was established, the development relied heavily on quantitative and qualitative input and information from users. In addition to statistical analysis of users' preferences and habits, ethnographic methods such as video-sessions, participant observations and written feedback are used.

In general CCP's managers considers user involvement in development as strategically very important for the company and envisage a further advancement of user centered approaches in product development.

2. Concept Innovation

In Eve-online, CCP developed the concept of a one world multiplayer computer game in a comprehensive scale never seen before that included a unique dimension of social ties and networks.

Eve-online's uniqueness rests in two things. First of all the game is a single-shard game. This means that all players play the game together in "one world", instead of being in separate "shards". Other M.M.O's are split up into dozens or hundreds of copies of the "world", each with a relatively small population. Eve's population exceeds 230.000 players, with typically 30 thousand players in it at a time[72]. Although popular games such as World of Warcraft include over 10 million players, a single player might only belong to a community of around 2-3000 players. Thus, the possibilities of the development of social ties and networks are considerably more advanced in Eve-online compared to other M.M.O's.

Secondly, CCP developed a unique focus on communication and the emerging social networks within the game, and is developing ways of utilizing artificial intelligence to a greater extent, for example by including humans capable of showing facial expressions and body language. Eve is "an alternative universe", where the story line is created by the players as they interact and engage in politics. Furthermore, the "physical" things that make up the space of Eve are almost entirely created by users[73].

3. Business Outcome

From the beginning, Eve-online received good reviews, but initial sales were only moderate. CCP subsequently changed their marketing strategy and its distribution is now online. Since then, Eve's subscription rates have reached 220.000 subscribers and the subscription revenue in 2006 was roughly 1.5 billion ISK (16 million USD), accounting for around 80% of CCP's total revenue.

Since its launch five years ago, Eve online has maintained a steady growth in subscriptions whereas most games relatively quickly reach their peak. From the point of view of CCP's managers, this is a result of the game concept that relies on the users' continued creativity, as

[72] The New York Times, June 7, 2007

[73] Morgunbladid, March 23, 2008

well as the company's intensive focus up until recently on a single product that has resulted in frequent updates of the game.

4. The Innovation Process

The innovation team at CCP consists of game developers, game designers, programmers and game producers. The innovation team typically looks for feedback from other employees, for example by using the company's internal website. Employees who are proactive and show interest in development are often invited to take part in the innovation team. Furthermore, external game players who actively provide opinion and comments through special homepages where new projects are introduced are sometimes recruited to the company to take part in innovation.

In the following, the Eve-online project will be described line with the steps in the Innovation Wheel (see chapter 1).

4.1 Opportunity Identification

The first step in the concept identification, the "WHAT" phase of the innovation process is opportunity identification. Game designers at CCP are the key people in this step. They build on insight from their own experiences of various games.

During the initial phase of Eve-online, designers posted ideas and new concepts on the Internet for game-players to comment on. This was in the early 2000's when the company was still unknown and the protection of IP rights were not a concern as it became later when the company's profile had grown. The site became quite popular and some ideas that developed there were used in the game development. For example, the users selected a futuristic environment as the most interesting setting for the game.

Besides being a platform for evaluation for new game concepts the site proved to be a valuable asset in the recruitment of new employees for development.

User involvement in Opportunity Identification?	Yes.
UDI methods/tools used in the process	User comments online

4.2 Data collection

The data collection phase was conducted by CCP employees.

Ideas and feedback was initially sought through the Internet site. Very preliminary ideas about the game and the concept were posted there. Somewhat to the surprise of the people at CCP, considerable interest was shown in the site and "a grass root movement" of players with an opinion formed. These discussion forums provided CCP with feedback on initial ideas.

Besides the brainstorming with users through discussion forums information was to some extent gathered by participant observation. Employees played computer games with external players, observed them and asked informal questions during and after the sessions about the users preferences in computer games regarding interesting scenes in other games etc. This participation was informal and non-systematic.

User involvement in *Data collection*?	Yes.
UDI methods/tools used in the process	Brainstorming with users through the Internet. through discussion forums User observations and interviews

4.3 Pattern recognition

The pattern recognition step was done internally in the team.

After collecting the data game developers, game producers, game specialists and the marketing people together analyzed the information gathered. During the initial phases of the game development, pattern recognition was not a special event, but something that was integrated into other development work. Regular meetings were held where the data was discussed along with the feedback the company was getting through the Internet site and patterns were identified.

User involvement in *Pattern Recognition*?	No.
UDI methods/tools used in the process	None

4.4 Concepts ideas

The concept ideas step was done internally in the team.

The main new concept in Eve online was that it is a "single-shard" game so that all players are part of the same world. The findings so far pointed at the fact that the users would like to be part of one shared community. Eve online is currently the only single shard game on the market. In other games, the players are divided into separate worlds and thus no single person can have contact with everyone in the game. Creating a "single-shard" game has been a technological challenge for CCP, because it requires advanced hardware and complex programming. The technical requirements were solved by implementing technology that existed in other sectors that use large infrastructures, such as the banking sector

Furthermore, the findings showed that the users were interested in social alliances in relation to the game which gave the idea to the concept of including social relations in the game. The players in Eve are quickly enmeshed in a complex and dynamic social world. In the game social alliances are formed and war is waged between different groups. Players can become famous and powerful, and thereby since the game is single-shard become known among the whole population of players. Eve's concept is important to the players' loyalty, because they are not simply playing a game, but cultivating social relations and maintaining a social status. Loyalty is for example measured in the fact that about one fifth of the players who played the game five years ago, are still active.

User involvement in *Concept ideas*?	No
UDI methods/tools used in the process	None

Concept Implementation

During the development of Eve-online, the distinction between the "WHAT" phase of concept development and the "HOW" phase of concept implementation was somewhat vague. The first prototype was made very early in the development process when the concept was still not fully established.

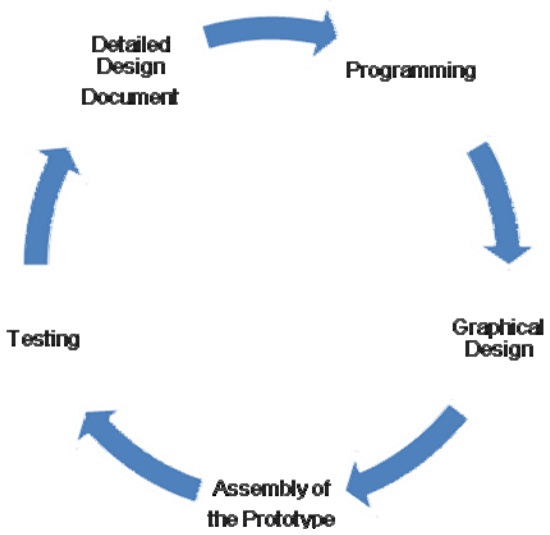
At this point, the development of the game went through carefully designed "staged deliveries", each lasting from 30 to 120 days. The stage deliveries were composed of several steps: a. Composition of design documents, b. Programming, c. Graphical design, d. Assembly of the prototype and e. Testing. Each staged delivery was a well-defined process and often earlier versions of the prototype were abandoned and new ones constructed "from scratch". The results of the staged deliveries as well as the feedback gathered was

subsequently used as basis for further prototyping, leading to the next major staged delivery. Eve-online went through a dozen staged deliveries before implementation.

User-centered innovation became more extensive and systematic with every staged delivery. Furthermore, it became more quantitative. The staged deliveries served as milestones where the results of multiple iterative prototypes were gathered to create a "vertical slice" of the game – something which represented the development group's vision and direction of the concept.

CCP's innovation strategy is thus based on rapid prototyping, staged deliveries and so-called Agile Development (SCRUM), which is a set of development processes that create the game in a lighter, faster and more people-centric way. CCP focuses on getting regular feedback from users, implementing the changes fast and testing them within an increasingly shorter period. This is "repeated ad infinitum" as one manager put it.

Figure 2.7: The Staged Delivery Process



4.5 Conceptualization

The initial description of Eve's concept came in the form of a written report. After receiving feedback on initial ideas and the concept via their Internet site, the first prototype was made on the basis of "a draft concept". This took place about six months after the very start of the project. The initial prototypes were abstract visions of the game, consisting mostly of simple forms. Decision-making based on the prototypes was in the hands of game designers, producers, creative directors and software directors.

User involvement in *Conceptualization*?	No
UDI methods/tools used in the process	None

4.6 Prototypes

Prototypes were extensively used and were considered vital in conceptualizing the original idea and in the further development of the concept.

"Prototypes have proven to be the best way to get feedback. With them we get the most useful feedback and are able to involve the external users in the most effective way"(a manager).

In the first prototypes, the concept was presented in a rather abstract way (circles and boxes instead of more graphical design) which made them inaccessible to external users. As more prototypes were developed they became more easily understandable to outside users. Thus, user testing of the first prototypes was restricted, but increased steadily as the prototypes became more sophisticated. In the development of Eve, the first group of users involved in prototype testing consisted of a few dozens of people. These people were recruited from groups of players in Iceland. Players were invited to the headquarters of CCP where they tried out the prototypes and gave written feedback. In some cases, employees watched them play and had discussions with them afterwards. The initial user involvement was informal and rather unsystematic. In the later stages of development prototypes were made available through the Internet. The interaction between players and developers then became less personal more quantitative, although, developers continued to invite people to play at their own location.

User involvement in *Prototype*?	Yes.
UDI methods/tools used in the process	- Written and oral feedback. - Observation of users playing prototypes of the game.

4.7 Tests

Two years after the first prototypes, right before the launch of the game, thirty thousand users around the world were involved in the testing of the game. At this time, the development of the game had already come far and the game designers were for the most part searching for very specific information and controlling the quality of the game.

During the testing of the game, players were occasionally video-taped while playing. The video recordings were analyzed in a very detailed manner by the game designers and others in the innovation team. Attention was paid to the player's body language, facial expressions and use of the computer keyboard and the mouse. Among other things, video-sessions provided information about unexpected user behaviour and inventiveness during playing, as well as giving insight into potential problems. Usually, new players were recruited for the video recordings, because of their "fresh vision". The main purpose of the video recordings was to see the game from the point of view of the player, because: *we don't see the same things as they do - we have been working with the game for so long* (a manager). Other methods included focus groups and written feedback, defect reporting, forum reviews and so-called "power user" feedback that is involving users who have been active in sending in comments over the Internet in the development.

User involvement in *Testing*?	Yes
UDI methods/tools used in the process	- Participant observation - Discussions with players - Written feedback - Video (used in later staged deliveries)

4.8 Implementation

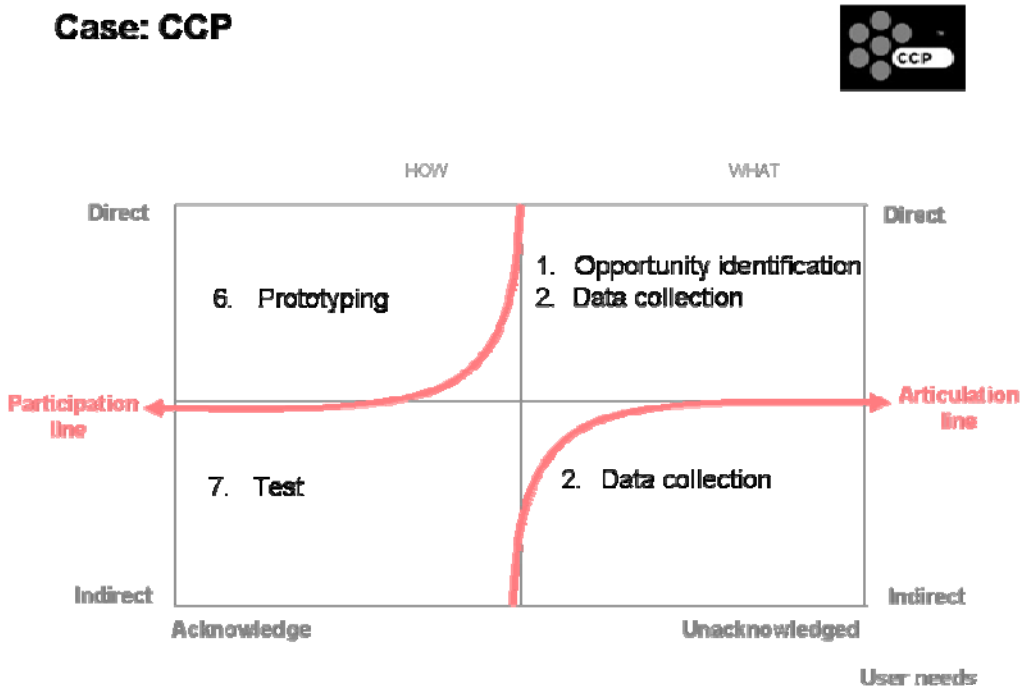
Eve-online was marketed in 2003. Since then, user involvement continues to be extensive and organized. Eve-online's development has continued after its launch in the same fashion as before (with staged deliveries). Updates are published every six months or so. Because of the on-going development, subscriptions are still growing, five years after the launch of the game. Today, the number of subscribers has surpassed 230 000 players.

User involvement in *Implementation*?	No
UDI methods/tools used in the process	None

Users are involved in the on-going development of Eve-online in several ways. First, they are able to communicate with developers over the Internet. In some cases, developers and users develop a long-lasting relationship, exchanging information and feedback over a long period of time. Some of CCP's users have been recruited to the company in this way. Second, the behaviour of users in the game is very well recorded with logging and this information is analyzed. For instance, an economist watches the economic development in the game. Third, a Fan fest is held regularly where players and developers discuss the games and focus groups are organized. Fourth, video recordings of new users playing the game continue to be used for the incremental development of the game.

User involvement in *On-going development*?	Yes
UDI methods/tools used in the process	- Communication through the Internet - Fan tests and focus groups - Video recordings of players

Figure 2.8: Mapping of UDI processes at CCP



5. Key Lessons

The case from the Icelandic company CCP illustrates the comprehensive possibilities for developing of new gaming concepts through user-driven innovation that exists in the online game industry because of the frequent direct contact between the company and users over the internet. Furthermore, the case shows how the online possibilities for developing new game concepts together with the users successfully can be mixed with observation studies of users.

Through an online user comment site, online prototypes of the game and discussion forums CCP involved the users in a large part of the development of the massively online player game Eve-online. These user involvement tools where followed by observations of players playing computer games.

Based on the insights from the users CCP development the massively player online computer game Eve-online computer game and equipped the game with a one world society in a dimension which had never been seen before in the gaming industry. Furthermore, the user involvement led to the establishing of a social and political dimension in the Eve-online game, which also was a new aspect for computer games.

Norway – National Context[74]

1. Introduction

In the following section, we will describe some of the context for user-driven innovation in Norway. This includes presentations of research and development expenditures in Norway, user-driven innovation thinking in Norway and the main actors and initiatives to improve conditions for user-driven innovation.

A recently conducted survey reveals that Norwegian managers consider themselves to be more creative and innovative than users and customers. The survey that was presented by the Norwegian Research Council shows that 95% of the managers consider that ideas and contributions to renewals and innovations in products and services originate from themselves (Perduco 2007). The respondents of this survey were business managers in Norway. The survey shows that innovations also were perceived to come from other employees (83%), the owners (81%), customers (56%) and suppliers (53%). Norwegian managers thus seem to give priority to closed, top-down innovation processes. User-driven innovation (UDI) does not seem to have a strong foothold among Norwegian managers.

Our focus is UDI in a Norwegian context. However, the UDI term is embedded in a larger discussion and several similar or related existing concepts (e.g. open innovation, customer-driven innovation, user-centred innovation, etc.). When providing input on the Norwegian context we will not only give an input related to an orthodox understanding of UDI, but also to the larger system of open innovations.

2. Innovation, research and development in Norway

Innovasjonsløftet (2005) is a policy document on innovation from the Norwegian Ministry of Industry and Trade. The document clearly states that Norway has the ambition of being one of the most venturesome countries in the world, and the Norwegian government will thus support innovation and new ventures. In this document, it is also argued that innovative firms need inspiration from users.

When doing a Google search on concepts related to open innovation processes, including user-driven innovation, we also find that the hits in Denmark and Sweden were considerably higher on the local translations of these concepts than in Norway. In Norway user-driven innovation[75] yielded 126 hits, user-monitored innovation yielded 359 hits, customer-driven innovation yielded 84 hits, customer-monitored innovation yielded 1 hit and open innovation yielded 485 hits. Comparable search on radical and incremental innovation yielded 211 and 78 hits, respectively. In the presentations below about the history, research, education, public sector initiatives and private sector initiatives we will use inputs from the Google search.

2.1. History and background of user-driven innovation

Probably the most seminal works for understanding user-driven innovation are from Erik von Hippel (1988). He mainly used the concepts user-centered innovation and lead users, and he applied an approach related to the democratization of innovation. The academic roots in Norway of the user-driven innovation concept may probably be traced back to professor emeritus Knut Holt at NTNU (the Norwegian University of Science and Technology) (Holt 2002).

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[74] The Norwegian context description was written by Morten Huse, Professor of Management and Organization, and Thomas Hoholm, Research Fellow, Department of Innovation and Economic Organization, Norwegian School of Management (BI).

[75] The following Norwegian words were used: Brukerdrevet innovasjon, brukerstyrt innovasjon, kundedrevet innovasjon, kundestyrt innovasjon., åpen innovasjon The search was conducted in April 2008.

Kjell Storvik (former Administrative Director at NICe) has been a main promoter of user-driven innovation in Norway. The concept has not always been used in firms and innovation processes, but his general impression in Norway is that users or customers have been a natural part of the innovation process (Farstad, et al. 2007). However, different approaches have been used when exploring and researching innovation in Norwegian industry (Huse 1994), e.g. in relation to different types and sources of innovation. The main Norwegian contributions to understand user-producer interactions in innovation are probably coming from Jan Fagerberg (e.g. Fagerberg, Mowery and Nelson 2005).

When exploring the UDI concept, certain aspects should be addressed (Rosted, forthcoming 2008). These relate both to the innovation and the users. Innovation attributes are the radicalism of the innovation and the phase of the innovation process. The main user attributes are the users' involvement and the understanding of their needs.

In the Norwegian context, design has also been a concept and approach closely related to UDI. Design has been defined as understanding the need of the user and offering products and services that are distinguished and provide better customer satisfaction. In the Norwegian context, there has also been an emphasis on the fact that users include other user groups in addition to the final users.

2.2 Norwegian industry and user-driven innovation

Innovation has often been studied by the number of patents or the expenditures in research and development. Research and development expenditures in Norway are to a large degree concentrated within a few industries. These are a) oil products and chemical products, b) communication and medical equipment, c) IT services, and d) technical consulting. These four industries amount for roughly half of the total Norwegian expenditures in research and development. This is illustrated in Table 2.1..

Table 2.1: R&D intensive industrial sectors in Norway

Industry sector[76]	Employment in industry sector	Values billion NOK in industry sector	% of total Norwegian R&D expenditures
Oil products, chemical products, plastic and rubber products (23-25)	19,850	106 production value	10%
Communication and medical equipment, etc (32-33)	10,400	22 production value	13%
IT-services (72)	36,106	49 sales value	17%
Technical consulting (74)	29,955	46 sales value	8%

Total research and development expenditures in Norway amount to about 30 billion NOK. About 46% are used in industry, 23% by research institutes, and 31% by universities and colleges[77].

A recently published study by the STEP group (Herstad, et al., 2008) shows how open innovation approaches are employed in industry in Norway compared to other countries. Comparisons were done among Austria, Belgium, Denmark and Norway. The findings

[76] Official statistics of Norway, Statistisk Årbok 2007, tables 381, 451 and 188

[77] Official statistics of Norway, Statistisk Årbok 2007, table 186

generally showed the highest degree of open innovation and user involvement in Danish companies and lowest in Norwegian companies.

3. Initiatives to improve conditions for UDI

It is not possible to present all actors in Norway within the UDI arena. The various definitions and concepts related to UDI make that impossible. We will therefore only give some examples that may provide glimpses from the Norwegian arena in this section.

3.1 Research

It is generally considered that few Norwegian companies have extensive cooperation with universities or research centres in innovation processes. However, some research centres have given input to the understanding of user-driven innovation.

The *STEP* Group (Center for technology, innovation and culture at the University of Oslo) has been an important actor in Norwegian research about innovation. They have found in various studies that the most successful innovation is conducted in close collaboration with customers, suppliers and competitors (Granstrand 2004; Smith 2004). The STEP group has, however, only to a limited degree applied the UDI concept directly. They rather use the "open innovation" concept, and UDI seems to be considered by them as an alternative word for open innovation (Hersted, et al., 2008).

Østlandsforskning (Eastern Norway Resarch Institute) is a main actor among on the topic of user-driven innovation among the Norwegian research institutions. Østlandsforskning has studied user-driven innovation in the IKT and the media sector. User-driven innovation is found to be particularly important in the early and late phases of the innovation process. Information from users or customers are collected widely, but advanced or sophisticated methods are used neither in data collection nor in data-analyses. This kind of data is not much used in strategic or operative decisions (Bergum 2004). Østlandsforskning now also conducts a study of user-driven innovation in the sports equipment industry. Design is also a main area at Østlandsforskning, and they have for example studied how design should be championed to create competetive advantage for SMEs (Bråta, Hagen and Vaagland 2007).

Agder University, Nordland Research Institute, BI Norwegian School of Management and TRD Innovation Lab at NTNU are among the actors having several researchers doing work in relation to innovation. UDI research also takes place related to oil and shipping (LUP in Stavanger), in industry electronics, systems in agro- and aquaculture, and actors/networks in telecom.

3.2 Education

Teaching in UDI seems to be very limited and it almost only has an ad hoc character. The *Oslo School of Architecture and Design, BI Norwegian School of Management, Bodø Graduate School of Business, University of Oslo* and *NTNU in Trondheim* are among the actors having systematic teaching related to UDI. BI Norwegian School of Management also has a separate department of innovation.

3.3 Other public sector initiatives, some examples

There are various public sectors initiatives taking place in Norway in addition to what is stimulated directly by the ministries or by Nordic Innovation Centre. We will present some of them here.

The objective of the state-owned ***Innovation Norway*** is to support profitable business development throughout Norway and to promote commercial opportunities by encouraging innovation, internationalisation and profiling. Innovation Norway has several programs that favour UDI. They include:

- IFU/OFU (User-driven research and development contracts)
- Forny (Renew)
- Arena
- BIT programme (Business Intelligence and Technology enabler)

The main objective of the BIT programme is to help SMEs produce and sell smarter through market and user-driven process innovation.

Innovation is a main research focus for the ***Norwegian Research Council***. They have established various programs that may foster user-driven innovation. These programs include BIA and VRI. *BIA* is an abbreviation for *User-driven innovation arena*. BIA is the largest research programme of the Norwegian Research Council. BIA is a consortium where firms and researcher groups collaborate about results. Some of these projects have also included close innovation development collaboration with user/customers. Scrum is a concept that is used to describe innovation and development activities in closer collaboration with the customers.

VRI is an abbreviation for *Instruments for user-driven innovation*. VRI supports research projects that are developed in collaboration between local or regional companies, policy-makers and researchers.

The ***Norwegian Design Council (NDC)*** promotes design as a strategic tool for innovation. NDC is one of the main actors in the Norwegian UDI debate. The aim is to increase businesses understanding, knowledge and use of design. DogA is the Norwegian Centre for Design and Architecture. DogA was established in 2004 by NDC and Norsk Form. It is a meeting place for design, architecture and related subjects.

InnoMed is short for the national network for need-driven innovation in health care. It is established by the Directorate for Health and Social Affairs. Users are important actors in this network.

3.4 Private sector, some success stories of user-driven innovation

There are various private sector initiatives that use the user-driven innovation concept, included are also various consultants (e.g. Nofas Management, Innoco, etc). Akerselva Innovation is another constellation developed as a collaboration between architects, artists, firms and BI Norwegian School of Management and the University of Oslo. ”At-one” is a user-driven method for idea generation. Akerselva Innovation focuses on network based activities.

Among hits in our google searches we found references to firms as Xeed, Fast, Heatwork, Ørsta Stål, Umoe Mandal and Bengal. Xeed AS creates an IT-instrument for user-driven innovation through collective creativity. Fast is a software supplier. Heatwork has developed heating and towing methods, and their products are produced in close cooperation with the user. Ørsta Stål is a steel producer focusing on road safety. Umoe Mandal is a specialist yard for naval ships. Bengal is a trend and innovation company that helps their customers to identify and develop future solutions based on the final user needs.

Farstad et al. (2007) presented user driven involvement in various Norwegian firms as well as some firms from other Scandinavian countries. Their list includes firms like Bergans (3), Helsport (3), Norrøna (3), Stokke (3), Jordan (3), Ringnes (2), Nidar (3), Glamox (2), Lilleborg-Define (3), and Siemens Power Electronic Center (1). The number in parantheses indicates “Potentialinyou (dk) 5 levels of user involvement”. These levels are:

(1) To imagine and let the knowledge of the user be based upon feelings and imaginations,

(2) To hear through asking the customer's opinion on products or services, and improvements that he/she think is necessary,

(3) To watch the customer's actions and interactions with the product,

(4) To test by visiting the environment where the customer is using the products, and observe the customer in action, and

(5) To let the customer be involved in developing the product – not only through delivering information.

In addition to the firms mentioned above, we have examined eight additional firms. They are described in Table zz.

Table 2.2: User driven innovation in Norwegian firms

Company name	Industry	Potential inyou level	Description – innovation characteristics
TINE	Food products	3	Focus groups/panels/surveys
Jordan	Hygiene, etc	3	Design based
Håg	Office furniture	3	Design based
Trolltech	Software platforms	4	User driven innovation Open source
Lærdal Medical	Medical equipment	4	User driven
Tomra	Recycling	4	User testing
Hardrocx	Sports equipment	4	User innovation
Funcom	Computer games	2	User innovation

The table shows the industry, the Potentialinyou level (Farsted, et al, 2007), and a short description of the innovation characteristics. Using the framework for mapping user-driven innovation processes (from this report), TINE's activities are found to occur in the 'experiments with users' and 'user tests' quadrants. Additional detail on this case follows in the next section.

Norwegian Case: Tine – "Innovating Food"[78]

Industry: Norway's largest food company, a dairy cooperative owned by 17,400 Norwegian milk farmers

Headquarters: Oslo, Norway

Net Revenue: NOK 15.9 billion (2007)

Employees: 5,540 (2007)

Strategy (from 2006 annual report):

- The TINE Group intends to maintain and develop its role as the country's leading supplier of foods, promoting the enjoyment of food and develop Norwegian food culture.
- The TINE Group seeks to create value through close interaction between nature, farming, and the market.
- The company has for the last 15 years included innovation as a gradually more important part of their overall strategy, to compensate for a stagnated market for traditional dairy products, and to meet increasing national and international competition. In spite of decreasing volumes of milk sold, TINE has steadily increased their revenues year by year.

In this case we describe TINE, a highly industrialized food company, and how they use their competence along the whole value chain – from the farm to the consumer – to innovate and improve solutions for business customers through the TINE Ingredients business unit. Based on concepts of user-driven innovation, the research question pursued has been: To what extent and how is TINE Ingredients involving users in innovation?

1. Company Background and "User-Driven" Innovation at TINE[79]

TINE has, for more than 100 years, been the dominant cooperative within the Norwegian dairy-sector with between 90 and 99% of the market (Espeli et al, 2006). Being organized as a farmers' cooperative and at the same time serving as a political instrument for national supply and quality assurance of dairy products, TINE has been in protected and totally dominant position through most of its existence. However, as national customs barriers are weakened, and new national and international actors have entered the market, the movement from monopolist to competitive full-range actor nationally, and niche market actor internationally has started.

As in other Nordic countries, the historic position of the dairy cooperative has enabled the development of a highly competent organization throughout the value chain.

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[78] The TINE case was written by Morten Huse, Professor of Management and Organization, and Thomas Hoholm, Research Fellow, Department of Innovation and Economic Organization, Norwegian School of Management (BI).

[79] Norwegian School of Management BI is the host for a research centre for Cooperative Research, in which TINE is one of the industrial partners. This case study is partly based on a 4 year study, where ethnographic methods have been used to trace innovation processes over time. Interviews, observations, and documents have been used to get 'thick descriptions' of innovation practices from idea generation through product development to market. For the purpose of this particular report on user-driven innovation, we have assembled relevant knowledge from the ethnographic work, and then done new interviews with key personnel in TINE Ingredients, based on the project's interview guide.

- A service unit involved in advising and systematizing breeding and feeding of cattle
- A large in-house R&D department with close relations to the University of Life Sciences
- A logistics system covering the whole country with cold-chain technology
- Marketing of what has become one of Norway's strongest consumer brands

The increasing threat from present and future competition has led TINE to incorporate and explore innovation strategies on all levels of the company. Through the 1990's the consumed volume of dairy products decreased significantly, forcing TINE to think strategically about innovation. From this, they have been able to increase their revenues in the same period, and maintain their position as the leading supplier of foods in Norway. Internationally, TINE has become a fast growing exporter of cheese, with the Jarlsberg cheese as the locomotive. It is now the largest imported cheese in the US, and growing in several other regions.

User-driven innovation approaches have not been a central part of TINE's activities for most of its history, instead selling standardized large-scale products for national distribution. However, the general movement in TINE towards more focus on innovation, has brought the customer (both the distributor/industrial customer, and the end-consumer) into the picture. In an industrial food company like this, there are a set of rather common methods in use for customer and market research. Surveys and focus groups are frequently used to get user feedback. More interestingly, the combination of more direct involvement of end-consumers with these methods is often in use, including:

- Focus groups where the participants get to taste and evaluate new products, sometimes also asking them to explore the product in use in the kitchen
- Tasting panels in a sensorial lab, for scientific testing of user responses to different product variants
- Survey/home testing of new products to learn how consumers put the product in use, how it 'fits' within the consumers' cooking and eating customs, and their (somewhat) more qualified responses to the new product.

In addition, professional and industrial partners and customers are often involved in many phases of innovation:

- Chefs, as lead users, from the Culinary Institute and various acknowledged restaurants, as well as expertise from The Food Research Institute are frequently used for advice and participation in product development.
- Industrial partners and customers, from retail chains to industrial producers of ready-meals and other food products, often participate in recognizing needs, and developing concepts, products, and technical solutions.

2. Concept Innovation

In this case, we have chosen to use TINE Ingredients (TI) as an example of systematic user involvement in the food sector. TI is TINE's business unit for dealing with industrial customers needing dairy-based ingredients in their recipes. Recently they have also expanded their business to include bio-marine ingredients, in particular high-quality omega 3 from cod, and hyper-fresh salmon loins. Although having a portfolio of piece goods, TI increasingly see its core competence as one of collaborating with their customers in solving their needs. This is both done by their in-house specialists from various technical fields – sausage makers, bakers, confectioners, and general nutrition, as well as having active dialogue and collaboration with key customers. User-involvement in TINE Ingredients is often about simplifying and

rationalizing industrial production for the customer, but also about enabling the customer to expand their portfolio with new products.

The typical pattern of user involvement in TI is based on a continuous dialogue with their core customers, through which understanding of the needs of the customer can be expressed and understood. Sometimes these projects are simple customer requests that TI seek to solve on their own, while other times they are common product development projects involving the user established during the development phase.

Salma cured and fresh salmon has been chosen for the case presentation due to its radical break with existing products and categories, and the different UDI methods that have been used through the different project phases. Around the year 2000, corporate management in TINE identified bio-marine innovation as one of their main innovation strategies for the years to come. They saw the lack of industrialization in the fish industry as an opportunity for taking a position, both in product development and in marketing/branding of value-added products. On a strategic level, this is a conceptually innovative move of corporate management; crossing the boundary to another industry, with which there had previously been little or no interaction. On the other hand, it was the implementation of this strategy that opened for (several) conceptual innovations. One of the paths that was explored led to a novel concept of processing and branding high-quality salmon, combining novel technology from the fish industry with the expertise on micro-biology, distribution, and brand building of the dairy cooperative. In partnership with Bremnes Seashore, an innovative fish farm, a concept of 'hyper-fresh' salmon loins for the high-end market (such as sushi/sashimi, gourmet restaurants, and high-end supermarkets) was developed.

3. The Innovation Process and Business Outcome – *The Case of Salma*

Concept Identification (WHAT?)

3.1 Opportunity Identification

On a strategic level, the corporate management chose aquaculture as one of their new strategic areas of innovation – a radical break with a 100-year history of processing and marketing dairy products. This triggered many different projects exploring potential synergies between dairy and fishery. TINE R&D already had a collaborative project with Professor Erik Slinde on stabilizing fatty acids from fish with agricultural technology (fermentation, milk proteins, etc). With this technology, a number of different products could be made from fish, e.g. 'salami'. TINE found this novel technology promising and bought it from Slinde, to start the commercialization process (product development, conceptualization, and marketing). There was no user involvement in starting up the project.

User involvement in *Opportunity Identification*?	No
UDI Methods/Tools used in the process	Brainstorming, lab experiments in collaboration with biologists, food technicians, product developers, and sensorical experts.

3.2 Data Collection

Data collection was done in several rounds. First, a quasi-anthropological study tour to potential market regions was done by the project team: Italy, Belgium, Korea, Japan, etc were visited to learn about their food cultures, market and distribution structures, etc. Later, when the technology had been further developed, more 'conventional' market research was done via focus groups and home testing/survey. Finally, a continuous learning process in the interacting with potential customers during commercialization efforts gave valuable information.

However, when developing something radically new, like a 'salami' from salmon, a number of questions have to be handled: Who would buy something like this? Is it a product for a mass market or a high priced gourmet product? Is it something for conservative and price sensitive Scandinavians, or for the Mediterranean traditional salami culture, or for the innovative and fish loving Asian markets? And more importantly: would it be best to start out with retail actors, or actors within the catering/restaurant industries?

User involvement in *Data Collection*?	Yes
UDI Methods/Tools used in the process	Observation (field studies), interviews, focus groups, home testing (survey) of product alternatives in use-situations.

3.3 Pattern Recognition

After buying the patent from Professor Slinde, TINE R&D immediately organized a project to develop and get in control of the complex technology. Technological development to stabilize the technology, both for nutritional standards and large scale production took around 2 years. In parallel, they did a lot of sense-making on potential concepts and markets for the technology/product. In the technical development of getting the technology to work and exploring various possible recipes, there was no user involvement.

User involvement in *Pattern Recognition*?	No
UDI Methods/Tools used in the process	Internal activities focused on understanding the uses of new technology

3.4 Concepts/Ideas

Concept ideas were under continuous development throughout the development/R&D phase, and therefore were in continuous interaction with the ongoing data collection and pattern recognition. Paradoxical ideas and goals of both making a gourmet concept for demanding and high-spending customers, and of making a new mass market 'sandwich filling for the people' were developed. During interaction with potential customers, especially in the retail sector, the marketers in TI increasingly felt that it would have been easier to sell their high-end quality salmon fresh, than curing it into a 'salami'. Chefs, both in-house, from the Culinary Institute, and from acknowledged restaurants were involved. They have both worked as expert advisors and discussion partners, and experimented with the product as an ingredient in different dishes. This has also led to pictures of *use* situations (recipes/dishes) that has been a central element, both in the conceptualisation and marketing materials.

User involvement in *Concepts/Ideas*?	Yes
UDI Methods/Tools used in the process	Lead users (chefs) had crucial impact on conceptualization by suggesting how the products could be used.

Concept Implementation (HOW?)

3.5 Conceptualization

When moving the project from TINE R&D to a line organization (TI), much of the original R&D based team was replaced with more user-oriented partners. A design agency was consulted for developing the market concept and segmentation (leading to an award-winning packaging design). An innovative fish farm, with documented quality on their salmon processing was made TINE's strategic partner in a joint venture.

User involvement in *Conceptualization*?	No
UDI Methods/Tools used in the process	None

3.6 Prototype

When they finally managed to stabilize production of a prototype in the laboratory and then in large scale production, potential customers could be approached for presentation, which again could be fed back to further development of the product.

User involvement in *Prototype*?	No
UDI Methods/Tools used in the process	Internal company activities

3.7 Test

Once a prototype was available, international food fairs and international established customers (of cheese) were visited with the products. Both versions, cured and fresh, were brought, and the clear feedback from most users was that they found the fresh version highly attractive, while finding the cured version too unfamiliar.

When an attempt at selling the cured version to an international restaurant actor and to end-consumers in German hyper-markets failed, all attention was shifted to Salma Fresh. Jakob's, the most famous high-end supermarket in Oslo, associated with a large retail chain, Norgesgruppen, immediately caught interest, and launched a test campaign with in-store demonstration of the product. The response was very good, and after a few adjustments of the product (adapting the package to standard sized fridges, improving production routines, etc), test campaigns with Salma Fresh was launched in another three high-end supermarkets in the Oslo region. At the same time, collaboration with leading chefs on various events continued, representing the product to other lead-users internationally.

User involvement in *Test*?	Yes
UDI Methods/Tools used in the process	- User tests at fairs, events, and industrial customers - Test sales of cured in selected supermarkets (Germany), and later of fresh (Norway and Germany), to see how lead-consumers/early adopters responded. Use of Salma Fresh in events with international gourmet chefs.

3.8 Implementation

The acclamation of Salma Cured by high-end consumers and leading chefs opened the doors to national and international distribution, both in retail and in restaurants. Hence, implementation is here to be seen as the gradual expansion from test sales and onwards, gradually expanding both production capacity and market distribution, to ensure product quality and hence a sound brand development. Salma Fresh has step by step been introduced to new supermarkets, now exceeding 30 stores in Norway and 60 in Germany – still in the high-quality segment – but gradually moving towards mainstream supermarkets. It is rolled out step by step, with high-end first, largely because of the opportunity for dialogue with customers in such stores.

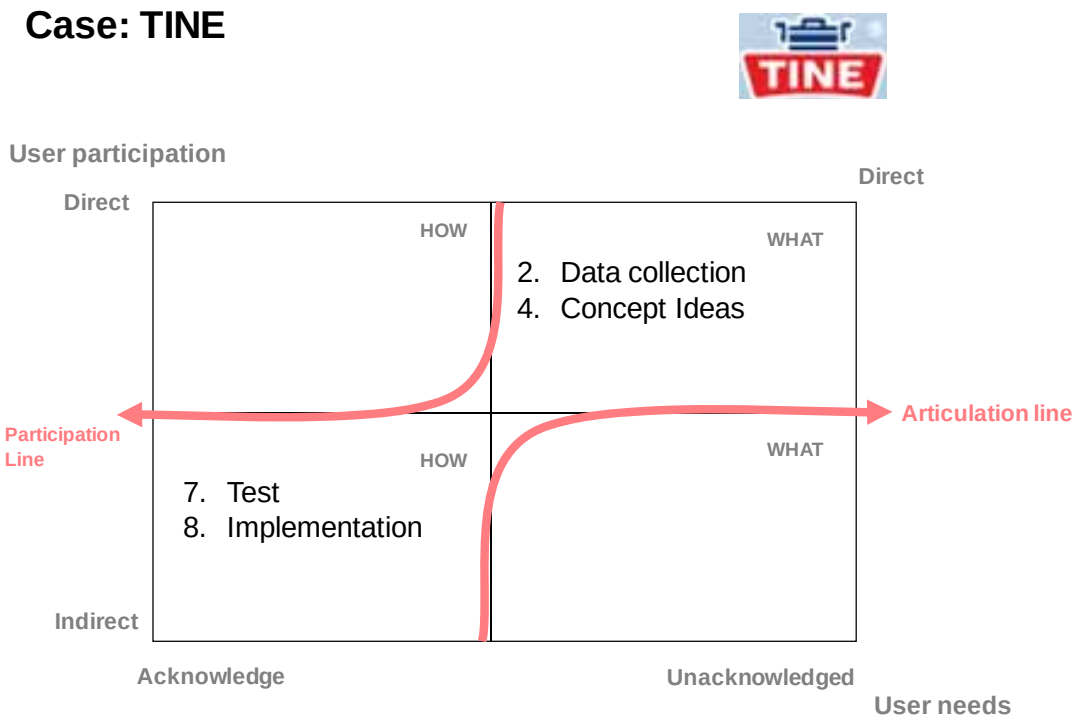
Recently, Bagatelle, a Michelin-star restaurant in Oslo, has made an agreement with Salmon Brands for supply of Salma Fresh, putting the product as a permanent ingredient on the Bagatelle menu. The signal effect of this has opened the door for Salma to many other restaurants, hence continuing to take advantage of lead-user in the marketing introduction phase.

User involvement in *Implementation*?	Yes
UDI Methods/Tools used in the process	Same as in *Test*

Impact

After exploring a number of different projects in aquaculture, it has been crucial for the survival of the bio-marine innovation strategy in TINE to finally produce a success story and grow the profitability of the Salma product. The project has been of very high impact for the company in learning about how to use their (agricultural) competence in combination with aqua-cultural resources, both technically and commercially. Related to the market, they have learned how hard it is to establish new product categories (salmon 'salami'/cured), and how much easier it is to commercialise products closer to users' (industrial and consumers) established categories (fresh).

Figure 2.9: Mapping of UDI processes at TINE



4. Key Lessons

Companies may choose different user-involvement strategies related to what challenges they face, and organize the innovation process accordingly. It is not only a matter of what phase the project is going through, but also where in the organization things happen. Are UDI methods acknowledged and used in R&D? In commercial units? In corporate management? Is it an organization-wide commitment? Who is the user? The business customer distributing the product to end-consumers, the 'gate keepers' to markets, so to speak? Or the end-consumer? Different methods have to be employed in order to involve both these types of customers. In business to business markets, user involvement and close collaborative relations often are more the rule than the exception.

In many industries and settings, it is hard to think of situations *without* user-driven innovation (as documented by e.g. Håkansson and Waluszewski 2007 and 2002). On the other hand, even within B2B there are loads of piece goods for sale, sometimes in segments where more tailored and holistic strategies might be a way out of the price competition trap.

Salma serves as an example of how a company may use a wide range of methods according to the needs and availability of users in different phases of the project. It also serves well to show the fundamental uncertainty of (radical) innovation, with new technology and new market at the same time, making it a huge challenge to find appropriate methods for user-

involvement. In the beginning, they chose to seek learning about potential markets and product alternatives by study tours, using observations, meetings and interviews with many different actors – both experts, users, and institutional actors. After developing the core technology, they used focus groups and home testing (taster + survey) of the product to get consumers' evaluations and learn about how they would prefer to *use* the product: for what meals, in combination with what other products, and how they would treat it (cold, warm, in slices, dices, with spices, etc). Throughout the project, they have involved different chefs, contributing with expert evaluation and creative advice on recipes and presentations. In particular, the 'second version', the Salma Fresh has been praised by some of Norway's best chefs (e.g. Eivind Hellstrøm at Bagetelle Restaurant), serving as ambassadors for the product. What users were *not* involved in the innovation process? There is an important difference between end-users and industrial customers, and it is of little use to team up with consumers, if not at the same time convincing the distributor – whether being a restaurant chain, a retail chain, or a catering actor.

Sweden – National Context[80]

1. Introduction

Historically, Sweden's business sector has been commodity-based. Wood, iron ore and hydroelectric power formed the base of Sweden's economic and export growth. Later, a number of inventions and innovations (in telecommunications, industrial bearings, processing equipment, etc.) – coupled with a need to reach beyond the small domestic market – sparked the development of key Swedish multi-nationals (e.g. Ericsson, SKF, Alfa Laval, etc.). Over time, investments in education and research, as well as advances in information technology (IT), have had a positive impact on company operations and productivity. All these factors have contributed to Sweden's current position as a globally-leading, knowledge-intensive economy.

Today, these industries are still key drivers of the Swedish economy (see table below) – albeit in different ways. Greater internationalization, mergers and continuing development of the use of IT have affected companies' operations and organizational structures. Now, knowledge-intensive services (largely linked to manufacturing) and collaborative business development are two key themes of Swedish industry.

Table 2.3: Major Industrial Sectors in Sweden

Industrial Sector	Example Companies	Key Figures (2005)
Telecommunications	Ericsson Sony Ericsson	Value-added: SEK 150 billion (20% of total SE) Employment: 72,000 Exports: 15% of total SE
Transportation Equipment	Volvo Saab	Value-added: SEK 74 billion Employment: 100,000
Forest Products	StoraEnso (Finnish-based) SCA Holmen	Value-added: SEK 70 billion Employment: 80,000
Mechanical Engineering and Machinery	ABB (power and automation equipment) Atlas Copco (mining and construction equipment Electrolux (appliances) Tetra Laval (liquid food packaging and dairy equipment)	Value-added: SEK 61 billion Employment: 95,000
Iron, Steel and other Fabricated Metals	Svenskt Stål AB (SSAB)	Value-added: SEK 55 billion Employment: 106,000
Pharmaceuticals	AstraZeneca (British-based) Pharmacia (part of Pfizer)	Value-added: SEK 45 billion Employment: 20,000
Food Processing	Absolut	Value-added: SEK 35 billion Employment: 56,000

Source: *Swedish Industry*, Swedish Institute Fact Sheet 124, June 2006

The rise of importance of the service sector and collaborative innovation processes has led to the need to understand and 'master' different approaches to innovation in Sweden. These needs are expressed (although somewhat indirectly) in Sweden's innovation strategy and latest annual report on innovation policy trends.

The national innovation systems SWOT overview lists the lack of support structures for radical innovations, especially service innovations, as a weakness. Yet there seem to be relatively few national innovation policy objectives that are directly targeted at addressing this

[80]The Swedish context has been written by Emily Wise (Consultant at IEC and Research Fellow at Research Policy Institute, Lund University).

weakness. Many strategic objectives (and hence public investments) are targeted at research, strategic cooperation between industry and universities, and technical skills' development. Although various strategy documents communicate the understanding of the need to link research with industrial needs in order to generate growth and competitiveness, there is pronounced focus on technical research, and little attention on user-driven innovation (UDI).

The innovation strategy puts forth a number of policy objectives that can be perceived as relevant to UDI: prioritize strategic areas in research and industry, develop support for product development and design, and develop new solutions to meet new social needs. And there are a number of programme activities relevant to UDI.[81] Although there are increasing interest and activities focused on 'open innovation', 'new' product development methods, and 'new' business models for innovation (in e.g. the service sector, multi-sector/cluster initiatives), user-driven innovation is, on the whole, only indirectly incorporated in Sweden's national innovation strategy.

2. Historical Overview

The general view is that 'user-driven innovation' is nothing new. With a rather long history (and globally-recognized research) in participatory design and computer-human interaction (CHI) – or interactive design, there are justifications to the belief that this isn't something 'new' for Sweden. At the same time, the importance of certain perspectives is being re-discovered. There is acknowledgement that, in general, Sweden is tied to a traditional manufacturing logic and needs to strengthen service logic (understanding user needs and defining new development processes and business models that involve users).

In Sweden today, IT-enabled innovation, service innovation, service design and strategic design are the "new" terms one hears more often than user-driven innovation. Possible drivers of this include:

- The increasing use of the internet and other digital media in innovation and co-creation processes
- The rising importance of the service sector in Sweden (couple with the increasingly-recognized research and industrial projects on service innovation at, for example, Karlstad University)
- The development of design education, research and practice – from being 'simply' about form and function to being focused on user value, through the identification of unacknowledged needs and the ability to combine these insights with companies' technology and business skills in the innovation process

Increasingly, user-driven innovation is being woven-in to public sector discussions and operational programmes, research initiatives, education – as well as companies' innovation strategies and actual innovation processes. However, the term user-driven innovation is still not broadly-recognized or used in Sweden.

The sections below (on research, education, public sector initiatives and private sector) provide a more detailed overview of how user-driven innovation is understood and applied within the Swedish context. These sections are followed by a case study which provides an in-depth description of how a company is integrating and applying user-driven innovation methods into its organization and product development.

[81] see section on Other Public Sector Initiatives below

3. Research

Research plays an important role in the Swedish innovation system. In the area of user-driven innovation, there are a number of research groups and networks which serve to develop knowledge and catalyze activities in the field. These are described below.[82]

The *Center for Distance-spanning Technologies (CDT)* at Luleå Technical University[83] is the home of the Botnia Living Lab[84] for user-centric development – Sweden's largest open Living Lab for development of IT-based products and services. User investigations, research and development are conducted in Sweden and internationally, in cooperation with other Living Lab sites.

The *Umeå Institute of Design* at Umeå University has been ranked as one of the best design schools in the world. The institute pursues a design research agenda that is pro-active, creative, innovative, and collaborative. The institute also offers a doctoral programme in industrial design. The *Design Research Group* is a unique studio-based design research organization, working with high-profile projects in close collaboration with leading industry partners. The multi-disciplinary group has core competencies in industrial design, interaction design, Human-Computer Interaction, and design research. Current areas of particular interest include inclusive user experiences and creative group processes. Daniel Fällman is the research director. Applied research and development work is carried out through the Interaction Design Lab (IDL) and the Volvo Research Programme (SET).

The *Umeå Center for Interaction Technology (UCIT)* at Umeå University is a research platform for multi-disciplinary research grounded on interaction technology and centered on its use from a human perspective. UCIT builds on a concept of interaction that brings forward the importance of the interconnections and interdependencies between the three basic categories of humans, information (captured in various media), and (material) objects, and the benefit of considering them in their entirety. UCIT is engaged in the whole chain of research and development from applied and use defined down to basic, theory and technology defined research and development. UCIT serves as a catalyst in bringing together different branches of technological science, cognitive science and human-related research, in the task of developing the concepts, theories, methods, technologies and tools that will facilitate the passage from industrial society to information society.

The *Service Research Center (Centrum för Tjänsteforskning, CTF)* at *Karlstad University* is a leading research group in this area.[85] The center focuses on service management and value creation through service, and includes the following research areas: service quality and quality development; work environment and competence issues; service development and customer involvement, customer satisfaction and customer experience; and service concept and added-value through service. In the area of user-driven innovation, scholars at CTF have published

[82] These groups and networks have been identified by internet searches and consultation with members of the Swedish reference group. The author cannot claim that this is a fully comprehensive list, but rather an overview.

[83] see http://www.cdt.ltu.se/

[84] see http://testplats.com/doc/aboutbotnia/se/article/3115

[85] see http://www.ctf.kau.se/

several articles in worldwide recognized journals. Established in 1986 and led by Bo Edvardsson, CTF now has more than 50 researchers and research students from a number of disciplinary areas (including business administration, working life science, sociology and psychology). Since 1988, CTF is responsible for the International Academy of Service Research and Education (IASRE). In 2002, KK-Stiftelsen (the Swedish Knowledge Foundation) awarded CTF with one of its national research profiles. The "new service economy" is the first field of research within the social sciences to receive large-scale support.

At *Linköping University*, several research groups work with user-driven innovation. Two of the main research groups are *Interaction and Service Design (IxS)*[86] at the department of Computer and Information Science, and *Knowledge Integration and Innovation in Transnational Enterprise (KITE)*[87] at the Department of Management and Engineering. Typically, research has been performed on service design methods, design in user-driven innovation, user participation and involvement, after-market as a driver for product development, large firms as innovators, open-source development, integrated product-service innovations, project management, innovations and entrepreneurship, and knowledge processes within firms and organisations. A research programme from Riksbankens Jubileumsfond was awarded the KITE research group, and VINNOVA funds several projects in both groups based on applied research problems, e.g. ICE - Innovative Services in Health and Home-care. IxS also particpates in the Ludinno project, and runs Sommardesignkontor with a focus on user-driven innovation.

The *User-Centred Product Design (UCPD) research group*[88] at the *University of Skövde* aims to enhance knowledge about, and to develop methods for, the successful integration of user aspects in industrial product development processes. The research group supports a holistic view, where user needs and concerns are the starting point for product development, and user requirements are in focus throughout the development process. This small research group (of five people) is led by professors Keith Case and Leo DeVin, and collaborates with other universities within and outside of Sweden.

The *Business & Design Lab*[89] *at University of Gothenburg's School of Business, Economics and Law* is a platform and meeting point for integrating the fields of strategic design with different management areas such as strategy, marketing, leadership, and accounting. The lab cooperates with companies and public organizations in research, education, and experiments. The group currently includes about a dozen researchers who have backgrounds in various fields, including financial management, knowledge management, psychology, architecture and design.

The *Future Applications Lab (FAL)*[90] at *Viktoria Institute* in Göteborg is grounded in innovative design methods and open-ended user studies. The FAL develops and studies the applications that could become part of everybody's lives, working with two main themes: mobile media and ubiquitous displays. Lars Erik Holmquist founded the lab in 2002, and continues to lead the group of six researchers. Holmquist defines FAL's approach as user-driven innovation (distinguished from participatory design and ethnographically inspired methods) "in that potential users are regarded as a resource in the design process" (Holmqvist, 2004).

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[86] see http://www.ida.liu.se/divisions/hcs/ixs/

[87] see http://www.liu.se/kite/

[88] see http://www.his.se/templates/vanligwebbsida1.aspx?id=6898

[89] see http://www.hgu.gu.se/item.aspx?ID=11531

[90] see http://futureapplicationslab.blogspot.com/

Viktoria Institute is part of the *Interactive Institute*, Sweden – which is owned by the Swedish Institute of Computer Science. The Interactive Institute[91] is a non-profit, experimental IT-research institute that challenges traditional perspectives through combining art, design and technology in research projects and strategic initiatives. Through exploring and integrating these three areas the institute contributes to innovation, creativity and sustainable development. The institute has about 60 employees organized in a number of research studios/groups located in Kista/Stockholm, Piteå, Eskilstuna, Norrköping, Växjö and Göteborg. Each research group has its own focus area that relates to the overall focus of combining technology with art and design

The *Art, Culture and Communications (Konst, Kultur och Kommunikation – K3)*[92] department at *Malmö University* is a multi-disciplinary research and educational organization, focusing on two broad areas: design, and culture and media. The school is committed to a variety of pedagogic devices, implying a mix of old and new media, and a combination of traditional lectures, online web interaction, group work, temporary productions, exhibitions and performances. The school believes in strong interaction with surrounding local communities, municipalities and companies/organizations mostly in the culture and media sector. The research programme on interaction design is led by Pelle Ehn.

Other research groups working in areas related to user-driven innovation include:

- The HCI group at the Royal Institute of Technology (KTH) in Stockholm[93]
- The Product and Production Development (PPD) group at Chalmers University in Gothenberg[94]
- Certec (part of Lund Technical University) working on topics related to UDI – primarily in the field of rehabilitation[95]

The *Swedish Design Research Network (D&R)* is a consortium of universities, focused on furthering design research and education in Sweden.[96] Additionally, Swedish researchers participate in a number of other international networks related to user-driven innovation (including the Nordic network Nordes[97] and international user innovation networks[98]).

4. Education

User-driven innovation is starting to appear on the course offerings of a number of universities – internationally[99] as well as in Sweden. For the most part, courses related to the topic are offered in one of three main academic schools: business, design or technical. However, in some cases, different schools collaborate to offer courses related to user-driven innovation.

A very broad overview of university programmes and course offerings in Sweden highlighted a number of programmes/courses (and professors) relevant to user-driven innovation (see

[91] see http://www.tii.se/

[92] see http://www.mah.se/templates/Page____13026.aspx

[93] http://hci.csc.kth.se/

[94] http://www.chalmers.se/ppd/EN/reserach

[95] http://www.english.certec.lth.se/

[96] http://www.sdrn.se/

[97] http://www.nordes.org/

[98] see http://userinnovation.mit.edu/ and http://userinnovation.ning.com/

[99] Examples from the Swiss Federal Institute of Technology (http://www.mtec.ethz.ch/education/msc_mtec/lv_msc_mtec_ss07/show_entry?semkez=2006W&unitId=17145/17326/37283) and IMD, in cooperation with Sloan Business School at MIT (http://www.millian.nl/mgie/minimal.phtml?cid=8929&p=mgie+Overzicht+Opleiding)

table below).[100] It appears that very few of the courses uses this term or mentions this topic specifically. Rather, there is a broad range of "uni-disciplinary" programmes (e.g. industrial design, interaction design, human factors engineering, human-computer interaction, ubiquitous computing, etc.) scattered over different schools within the different universities.

Table 2.4: Overview of Swedish Programmes relevant to UDI

University/School	Programme/Course	Professor(s)
Luleå Technical University	Need-driven IT Design Processes	Birgitta Bergvall-Kåreborn
Umeå Institute of Design	- Interaction Design - Industrial Design	Bengt Palmgren Niklas Andersson Mike Stott
Karlstad University	Service Science (combing social sciences and technology)	Bo Edvardsson Patrik Larsson Per Kristensson
Royal Institute of Technology (KTH)	Human-Computer Interaction Group within School of Computer Science and Communication (CSC)	Yngve Sundblad Bo Westerlund
Linköpings University	- Interaction Design - Design - Service Design - User-Driven Product Development	Stefan Holmlid
Chalmers	- Technical Design - Human-Technology-Design (PhD)	Ulrika Rahe
Blekinge Technical University (BTH)	- Interaction and System Design - School of Management	Bo Helgeson Klas Hallqvist
Lund University	- Industrial Design (LTH) - Technology Management (EHL+LTH)	Claus Eckhardt Lena Sperling Robert Bjärnemo Fredrik Nilsson Carl-Henric Nilsson
Malmö University	Interaction Design	Pelle Ehn Jonas Löwgren

Increasingly, courses from other disciplines are being incorporated into the undergraduate and master's programmes mentioned above. Also, a number of the programmes above have activities (courses or projects) integrated with industry.[101]

It seems that there are few courses or programmes which are designed to present perspectives and methods from many disciplines; however, some examples include:

- Karlstad University provides the only example of a course specifically titled user-innovation.[102] This advanced-level course – requiring previous coursework in design, behavioural sciences, business economics, technique, or media and communications – will have its first offering in the fall of 2008.
- Södertorn University College in Stockholm offers a bachelor programme on business, technology, and design.

[100] These groups and networks have been identified by internet searches and consultation with members of the Swedish reference group. The author cannot claim that this is a fully comprehensive list, but rather an overview.

[101] As an example, the HCI group at KTH has worked with the usability and interaction lab at Ericsson Research.

[102] http://www.kau.se/utbildning/kurs_detail.lasso?ID=KU10331

- Linköping University offers a (bachelor level) course on user-driven product development, as part of the Design and Product Development programme, as well as an advanced-level course on Service Design (focused on user-driven service innovation).
- The Business and Design Lab at Gothenburg University is in the process of developing a master's degree in Business & Design (strategic design/design management), planned to start in two years (2010).

5. Other Public Sector Initiatives

VINNOVA (the Swedish Agency for Innovation Systems) aims at promoting growth and prosperity throughout Sweden by funding needs-driven research and strengthening the networks that are such a necessary part of this work. VINNOVA funds a number of programmes related to user-driven innovation. Within the competence areas, the working life, and services and IT implementation departments fund programmes related to user-driven innovation.

The Working Life department has recently selected a number of projects within its programme on *Open and Distributed Innovation Processes*. The programme aims to generate scientific-based knowledge which will contribute to strengthening companies' ability to develop and introduce new products (goods and services), therefore strengthening their growth and competitiveness.

The Services and IT Implementation department aims at setting-up inter-disciplinary projects in new areas and revitalising thinking about, for example, the use of IT in the service sector. The department has two ongoing programmes related to UDI: the service innovation programme and the living labs programme.

The *Service Innovation* (2007) programme aims at supporting the development of service innovations, focused on one of the key principles that the customer/user should be involved in the innovation process.

The *Living Labs* programme aims at improving the ability of Swedish companies and organisations to develop competitive, IT-based services or products in cooperation with users. The programme finances six living labs in Sweden, and is linked to both the Nordic-Baltic and European networks of living labs.

In addition, VINNOVA co-finances the *Product Innovation Engineering Programme (PIEp)* – which is a 10-year (2007-2016) national programme with the purpose of strengthening the ability in innovative product- and business development. PIEp encompasses the field from theory to practice, from research in innovation systems to pro-active work to strengthen innovative development. The programme engages several Swedish universities and research institutes (KTH – project leader, Lund University, Jönköping University, Umeå Institute of Design, and Luleå University of Technology), together with a number of companies and organizations. Recently-initiated research projects include "Design methods in creative innovation work" and "Sweatshops – creative concept development".[103]

The ***Swedish Industrial Design Foundation (SVID)*** is a publicly-financed organization with the aims of supporting Swedish industrial development and innovation through the use of design as a competitive tool and encouraging the integration of design methodology into companies' and organizations' activities. SVID was founded in 1989 by the Royal Swedish Academy of Engineering Sciences (IVA), the Swedish National Board for Industrial and Technical Development, NUTEK, and the Swedish Society of Crafts and Design (Svensk Form).

[103] see http://www.piep.se/home.php?lang=eng for additional information

SVID is engaged in research and networks with universities and other bodies conducting research projects. SVID supported the establishment of the Research School in design together with Design and Research Network D&R. SVID supports and participates in innovation research projects, for instance PIE-p (Product Innovation Engineering program, run by KTH), and SVID is the project owner of LUDINNO (Labs for User-Driven Innovation), run by Design Studio Värmland. In recent input to Sweden's coming research strategy[104], SVID recommends that the government prioritize inter-disciplinary education and research – with design in a leading function – in order to support industry's ability to work strategically and operationally with design.

KK-Stiftelsen (the Swedish Knowledge Foundation), ***Riksbankens Jubileumsfond*** (The Bank of Sweden Tercentenary Foundation) and the ***Swedish Foundation for Strategic Research*** are examples of organizations that finance research in areas related to user-driven innovation. KK-Stiftelsen finances the research profile on "The New Service Economy" at Karlstad University. Riksbankens Jubileumsfond finances research through the research programme "Knowledge Integration and Innovation in an Internationalizing Economy" at Linköpings University, where one of the research themes is 'Innovation and Integration of External Knowledge'.

Catalyzed by ongoing discussions and the desire to take steps forward on a national level, VINNOVA is organizing a two-day workshop on user-driven innovation.[105] This workshop will include a number of different sessions, involving external international experts, representatives from companies, representatives from a number of ministries (and other policymaking organizations), and management levels at VINNOVA.

6. Private Sector

The private sector in Sweden has previously been dominated by large companies in ICT, automotive, and pharmaceutical sectors. Research and technological leadership have been key drivers of this dominance. A number of general trends (globalization, increased competition, etc.) have presented new challenges for Swedish companies. Examples include:

- Electrolux has been challenged by the need to manage increasing market pressures (on price and operational efficiency) while at the same time strengthening their international position by defining new products/services that offer a distinct value.
- SonyEricsson has been faced with the need to manage globally-distributed research (and other) assets, take advantage of knowledge/ideas from other stakeholders (partners, customers, users), and differentiate their offering in order to survive competition from new entrants (Apple, Google).

Companies experience product development success by collaborating with lead users/loyal customers (e.g. Hasselblad, Volvo), using internet forums for better understanding market trends and identifying development opportunities (Propellerhead, BooSieBo), or finding neutral ground (universities) to try alternative approaches (e.g. living labs).

A number of Swedish companies have maintained – or grown – their market share by focusing on addressing user needs in unique ways. Some companies that stand out include:

- **Electrolux** with a number of new products, developed based on a new, consumer-insight-driven product development process
- **Volvo** with its female-designed car

[104] Design för hållbar och innovativ tillväxt – SVID's förslag till regeringens forskningsstrategier 2009-2012 (December 2007)

[105] preliminarily scheduled for August 25-26th, 2008

- **BoSieBoo** with custom-designed products for parents, babies and children
- **Propellerhead** with lead-user-developed software musical instruments

Today, most companies realize that it is no longer enough to focus solely on technological leadership or organizational efficiency – and are initiating efforts to re-define attitudes, processes and business models so that resulting products and services better meet user needs.

In some cases, companies attend conferences or training sessions to gain a better understanding of user-driven innovation.[106] In other cases, industrial leaders (like Ericsson and SonyEricsson) are teaming-up with related companies, research institutions and the public sector to explore new innovation paths. In general, Swedish companies will need to lever traditional strengths in design, participatory and collaborative processes – together with technology and business know-how – in order to succeed in the future.

Of the companies listed above, Electrolux has been chosen as the case example – given its relatively longer experience in working with user-driven innovation methods, and given its success in defining several new concepts for the company. The case study is presented below.

Swedish Case: Electrolux – "Thinking of Users"[107]

We have returned to a consumer focus – meaning that rather than selling what we produce, we produce what sells. There is an important distinction. Hans Stråberg, CEO Electrolux[108]

Industry: Globally-leading producer of appliances and equipment for kitchen and cleaning

Headquarters: Stockholm, Sweden

Net Revenue: SEK 105 billion (2007)

Employees: 56,900 (2007)

Strategy (from 2006 and 2007 annual reports):

- Competitive production, new products based on consumer insight, and a strong and global brand are components of the strategy.
- The company focuses on innovations that are thoughtfully-designed, based on extensive consumer insight, to meet the real needs of consumers and professionals.
- Consumer insight is the foundation of product development at Electrolux.
- "Always put the users first and foremost…By offering products and services that consumers prefer, which benefit both people and the environment, and for which consumers are willing to pay higher prices, Electrolux can achieve profitable growth."

This case provides an example of a globally-leading company that is redefining its position in a mature, consumer products' industry through the systematic use of consumer insight. Electrolux continues to transform its company operations – pursuing cost-saving and value-producing strategies in parallel – with very positive results. Their consistent integration of

[106] Examples include: abilitypartner conferences held 29-30/8, 2007 and 30-31/1, 2008 on "Innovation and Product Development"; Halmstad living lab workshop on "User Involvement in the Innovation Process" to be held May 29-30, 2008; and inuse and Malmö University conference on "From Business to Buttons – Designing for Effect" held June 12-13, 2008.

[107] This case has been written by Emily Wise (Consultant at IEC and Research Fellow at Research Policy Institute, Lund University), with strong support from Victoria Aramayo, Martin Hörnqvist and others from the Global Consumer Insights Group at Electrolux.

[108] In an interview with *Teknikföretagen*, issue #8, December 2005.

new consumer insight processes into product development can provide inspiration to other companies.

1. Company Background and "User-Driven" Innovation at Electrolux

Electrolux was founded in 1919 as a merger of two companies: Lux AB and Svenska Elektron AB (led by Axel Wenner-Gren). Wenner-Gren was not an inventor or an engineer, but rather an insightful salesman. The designs of the early vacuum cleaners were developed based on Wenner-Gren's own consumer insights. Electrolux expanded their product range and established a global market position based on specific competencies in engineering and industrial design. The post-war years (particularly the 1960s, 70s and 80s) were marked by international acquisitions and diversification. In contrast (in the late 90's), CEO Michael Treschow (appointed in 1997) led efforts focused on operational restructuring and consolidation.

In 2002, Hans Stråberg was appointed CEO and faced a number of challenges including increasing costs and competition from low-cost producers in Asia and Eastern Europe. In response, he further consolidated Electrolux's operations and shifted work to lower-cost locales, as well as initiated a number of activities including global councils for product development and sourcing, and the Electrolux Design Lab (an annual international design competition in future appliance design and innovation). In 2003, Stråberg also initiated a process to transform Electrolux from a traditional engineering company to a more consumer-focused organization. *Instead of letting Electrolux engineers dominate the development process, Stråberg opted to go with another model – teams of designers, engineers, marketers, and salespeople working together to design consumer-friendly products* (Business Week 2006b).

This model had been initiated a number of years earlier in the floor products and small appliance unit. The team-based approach became known as the Consumer Innovation Program[109]. In 2003, the Consumer Innovation Program team surveyed 500 managers globally, identifying four major problems:

1. Managers didn't know enough about their customers, so they couldn't figure out what to develop.
2. Products were well-engineered, but weren't filling consumer needs.
3. R&D wasn't in sync with commercial product launches. There was no strategic and systematic approach to innovation.
4. Executives were afraid to take risks. There was a weak innovation climate.

To address these problems, the Consumer Innovation Program[110] was rolled-out globally, backed-up by a new set of innovation metrics to measure unmet consumer needs and how well new products meet them, through what Electrolux terms "value market share" – which is the portion of the consumer's wallet going to Electrolux versus other competitors.

Results have been remarkable. Electrolux has nearly doubled the number of product introductions since 2002. Net sales and operating income have also been increasing since 2004. This – at the same time as the number of employees has been decreasing – has led to a very positive development in earning per share. Electrolux's stock price has also had a positive development until the second half of 2007 (see below). Although 2007 was marked

[109] The approach was inspired by a class at Harvard Business School and an IDEO presentation, and was further developed (with the help of innovation/design consultant IDEO) to be an integrated and systematic part of the company.

[110] now called Marketing Strategy

by a record number of new product launches worldwide, a 10% increase in investment in development of new products, stronger brand name, lower costs, and continued increases in net sales and operating income, the stock price was adversely affected by expensive raw materials in Europe, an overall market decline in North America, and uncertainty over the global economy in 2008.

Figure 2.10: Five-Year Development of Stock Price (ELUXB)

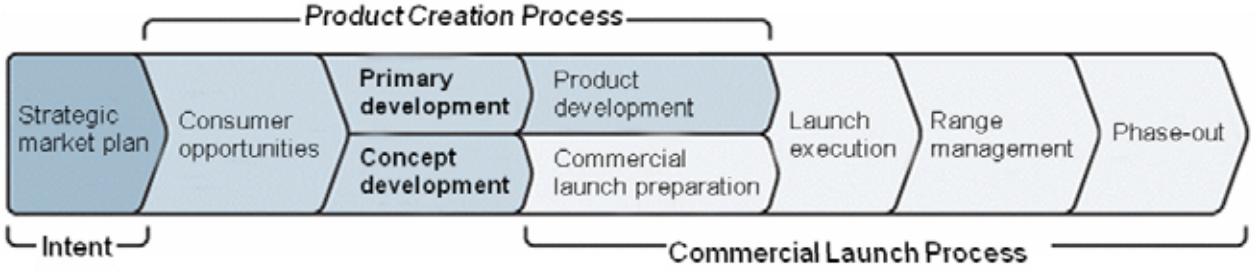
Source: Business Week

2. Concept Innovation

Electrolux defines concept innovation as innovation that addresses user needs, or solves users' problems, in new ways. From Electrolux's perspective, the only way to accomplish this is through a deeper understanding of the users.

Consumer insight is the foundation of all product development at Electrolux. Understanding the needs of consumers as well as how they think, feel and act when they use household appliances enables development work to be more accurate. Even better products are developed, and sales rise for products that consumers are willing to pay a higher price for. The common denominators for all the products developed by Electrolux are ease of use, high quality and exciting design, as well as user and environmental friendliness. (2006 Annual Report).

Figure 2.11: Electrolux Innovation Process – Product Management Flow (PMF)



Source: Case Ergorapido Power Point presentation

The Electrolux consumer-focused innovation process, now referred to as product management flow (see above illustration), was introduced in 2004 and is unique within the industry.

Electrolux Innovation Process – Product Management Flow

The Product Management Flow (PMF) is a holistic process for managing products – from cradle to grave. It describes all areas of creating and selling products, and encompasses of three sub processes – Market Plan, the Product Creation Process and the Commercial Launch Process.

The mission of the Consumer Innovation Program is to implement Product Management Flow in all product lines in the Group over the years to come. Throughout the entire process **consumer needs, wants and desires** are in focus – in setting strategy, in developing products, and in launching them on the market.

STRATEGIC MARKET PLAN

The objective of the Strategic Market Plan is to ensure clear innovation intent - clearly identified opportunity areas and priorities that are expressed in a Strategic Road Map with a corresponding product generation plan.

The Strategic Road Map is built on 3 main analyses:

- The **industry lens** (market overview) covering market development, price points, competitors, etc.
- The **consumer lens** looking at the category from the consumer's perspective, identifying consumer needs related to appliances in different contexts.
- The **macro trends** analysis considering general consumer trends such as increasing health/wellbeing awareness, demographic trends, governmental policies on e.g. environmental effects etc, to identify how they affect consumers' needs for appliances.

This year, an extensive global trend report covering the concurrent global drivers, micro and consumer trends will be created, with the aim of ensuring a clear and consistent vision of the future to drive innovation focus. This internal document will be accessible for use by all staff members globally.

The combination of industry, consumer and macro trend analyses allows the product line to set priorities and take the strategic decisions that will be translated into the Strategic Road Map and the following product generation plan.

PRODUCT CREATION PROCESS:

The objective with the Product Creation Process is to efficiently and effectively define and develop consumer relevant, innovative and trusted solutions addressing well-understood consumer needs.

The Product Creation part of the Product Management Flow involves four steps:

- During the **Consumer Opportunity,** a deep understanding of consumer needs in prioritized areas is developed. The consumer understanding and insight is the foundation for the success of the subsequent development processes.
- Through the **Concept Development** phase a feasible product idea addressing the identified consumer needs is developed, with a distinct positioning, consumer value based pricing and a solid business case.
- In **Primary Development,** technical solutions within targeted innovation themes are developed producing verified ideas or hardware solutions that can be applied to relevant concepts in product development.
- The objective of the **Product Development** phase is to cost efficiently specify, design and verify the product idea and prepare for launch of the market.

THE COMMERCIAL LAUNCH PROCESS

The commercial launch process has been developed in order to make sure that the product idea is properly introduced in the market with a consistent and consumer relevant message.

The launch process is articulated around the following steps:

- Development of an overall project time plan that will run in parallel with product development time plan
- Clear launch window target (This includes product market introduction with clear USP vs. competition and with clear handovers to sales organization.)
- Effective range roll-out
- Tailored communication: A clear and consistent communication plan is in place for each product launch
- Strong in-store execution
- Product phase out well planned
- Consistent follow-up

The transformation of the innovation process at Electrolux has included a number of factors:

1. an increase in overall investments in product development (from approximately 1 percent of sales in 2002 to nearly 2 percent of sales at the end of last year)
2. a considerable share of the investment is devoted to the early phases of the process – prior to making large investments in production – in order to ensure that the product is successful
3. the early phases of the process are focused on gathering and interpreting consumer insight in order to determine what currently unmet consumer needs Electrolux can address
4. global product development teams are multi-disciplinary – made up of designers, engineers, marketing and salespeople (rather than only focusing on one skill set)

The new innovation approach at Electrolux has involved a shift from using marketing surveys that ask consumers what they want to actually visiting consumers in their homes to see how they use their appliances. The Global Consumer Insight group, led by Martin Hörnqvist, is a 6-person core team who works closely with Stråberg. The group has responsibility for helping the whole organization learn about customer insight methods and adopt new structures and processes for innovation. By the end of 2007, more than 1400 managers and nearly all top executives have been trained in the methods of the Consumer Innovation Program – focused on working in small, multi-disciplinary teams (including designers, engineers and marketers) from the beginning. This approach helps *designers avoid developing products that can't be engineered, engineers eschew technological solutions that aren't visually appealing, and marketers help shape products* to be commercially successful (Business Week 2006b).

Now, the innovation process at Electrolux includes observation (home visits, video filming, etc.) to determine latent consumer needs, mapping and classification of the different consumer needs (identifying various customer types and defining contextual trends or themes), and finally brainstorming and prototyping solutions to meet the needs of each specific segment. In many cases, Electrolux has also incorporated lead users and other external partners in the development process.

The integration of home visits and other ethnographic research in Electrolux's innovation process has resulted in a number of new concepts at Electrolux:

- the Twinclean vacuum (launched in 2005), the bagless vacuum cleaner
- the Iron Aid dryer (launched in 2006), using steam to de-wrinkle shirts
- two new refrigerators, Glacier and Source (launched in 2006), with automatic icemakers that are smaller than usual (freeing-up refrigerator space) and carbonated water dispensers, and
- Market fresh refrigerator (launched in South East Asia in 2007), with ample space and functionality to preserve the freshness and nutritional value of food

3. The Innovation Process and Business Outcome – *The Case of Ergorapido*

The transformation of Electrolux's innovation process started with the Floor Care Group – where the Consumer Innovation Program originated. The process was rolled out to Core Appliances and other business groups in 2006. Today all business groups should follow the product management flow; however the implementation remains a work in progress and will continue to be a pivotal focus for all groups in the years to come (Sofia Rudbeck, April 2008).

In order to understand in more detail how Electrolux works with consumer insight, a specific example of their innovation process will be described step-by-step. The description will be structured using the project's eight-step "innovation process model" (described in the previous section of this report).

The *Ergorapido* vacuum cleaner – which was the first product developed through the consumer innovation process – is an example of concept innovation, based on a number of factors:

1. new 'instant cleaning' product category – a hand-held 'duo' vacuum cleaner that was powerful, as well as easy to use and clean, ***so that users could clean a little every day***
2. new design – ***attractive enough to leave in view***, rather than storing it in a closet (making it more 'usable' on a daily basis)
3. new product positioning at a premium price point, as users placed higher value on a product that truly met their needs

The innovation process began in May 2002 and resulted in a product launch in 28 markets 2004.

Concept Identification (WHAT?)

The first phases of Electrolux's innovation process (opportunity identification through concept development) typically last 3-8 months.

3.1 Opportunity Identification

Each year, Electrolux conducts a process to identify strategic opportunities for the company. There are three components of this process:

1. Macro trend analysis – including both traditional market research and 'less traditional' ethnographic research on user needs and behaviours
2. Consumer segmentation analysis – where consumer needs and behaviours are analyzed together with the company's target segments (personified by four archetypes)
3. Industrial analysis – identifying opportunities areas in the industry (e.g. which markets are growing/shrinking, which product categories are growing/shrinking, etc.)

In this case, comprehensive surveys and ethnographic research showed a change in consumer behaviour (cleaning a little every day instead of cleaning the entire home once a week). In addition consumers were proven to be willing to pay a premium price for quality and design, however the perception of the category was suffering from poor product performances. The industrial analysis found that that there was a large market in Europe, although the products were relatively low-priced, and the majority were hand held cleaners. These insights, combined with the other analyses, resulted in the identification of ***instant cleaning products*** as an opportunity for Electrolux.

User involvement in *Opportunity Identification*?	Yes
UDI Methods/Tools used in the process	Ethnographic research

3.2 Data Collection

Once the opportunity was identified, and before proceeding too far with product development, Electrolux needed additional insights in consumers´ behaviour and attitudes regarding this type of commodity. The overall purpose of the study was to understand:

- the consumers attitudes to instant vacuum cleaners; advantages and disadvantages (based on existing products)
- when, where and for what an instant vacuum cleaner preferably can be used
- how the ideal instant vacuum cleaner should perform and be designed (based on consumer responses to four Electrolux Instant Vacuum Cleaner concepts)

Six focus groups were created in France (Paris) and Germany (Munich).

The target groups were medium/upper income levels who were involved in the cleaning of their home but lacked the time for household cleaning, in spite of feeling that it was important to have a clean and tidy home. The participants were also owners of an instant battery vacuum cleaner or intended to buy one in the near future (NFO). In addition, experts were consulted in order to determine if existing products were meeting user needs.

In addition to employing professional ethnographers, Electrolux personnel (designers, engineers and others in the product development team) are also required to conduct home observations. The purpose of this is to develop both insight of and empathy with the consumer. This helps Electrolux personnel to move their point of departure from the company's shop floor to the consumer's perspective.

User involvement in *Data Collection*?	Yes
UDI Methods/Tools used in the process	- Home observations - Brainstorming sessions with users - Interviews with experts

3.3 Pattern Recognition

The results from the data collection phase served as input to internal brainstorming sessions (within the consumer insight team) and a one-day workshop involving many competency groups throughout Electrolux: consumer insight and strategy, designers, engineers and marketing. The internal brainstorming sessions and workshop concluded that existing hand-held vacuum cleaners were underpowered, too noisy, broke down frequently and had filters that were difficult to clean. In addition, existing products did not fulfil an identified user value of pride in their home environment. (Users wanted their home to look good, as it was a reflection of them.)

User involvement in *Pattern Recognition*?	No
UDI Methods/Tools used in the process	Internal one-day workshop

3.4 Concept Ideas

Based on conclusions from the pattern recognition phase, Electrolux developed a number of concept ideas. These concepts were pre-screened with users (through focus groups, tests of packaging and design and pricing studies) and adjusted based on input from the users. As an example, user input in this phase highlighted the need for a different method for emptying the dust collector and a stick with telescopic features. After a number of iterations (working from many ideas to a few, making adjustments along the way), this step resulted in one concept that then moved into product development.

User involvement in *Concept Ideas*?	Yes
UDI Methods/Tools used in the process	- Detailed text and a simple sketch - Six focus groups (with core users)

Concept Implementation (HOW?)

3.5 Conceptualization

At this step in the process, functions, features, color and form are defined more concretely – at the same time as the product's business model (how best to produce and distribute) is determined. Product development is aligned around certain key themes (responding to user needs and behaviours) throughout the process.

The hand-over from the concept to commercialization phases (from the consumer insight program manager to the market research team) takes place during a 2-day workshop to ensure that the market research team truly understands what the consumer insight team has learned. This is followed by a 2-3 day workshop where all members of the market research team work intensively with a number of activities (segmentation exercises, de-briefing from external market research companies, and conceptualization exercises) focused on making the research meaningful. Conceptual solutions are developed and discussed/debated during this workshop.

User involvement in *Conceptualization*?	No
UDI Methods/Tools used in the process	- Market research - Business research (business case) - Technology research

3.6 Prototype

Protoypes of the product are developed internally (except in the case of professional products, which involve lead users).

User involvement in *Prototype*?	No
UDI Methods/Tools used in the process	None

3.7 Test

The prototypes are testing with users through focus groups and detailed interviews.

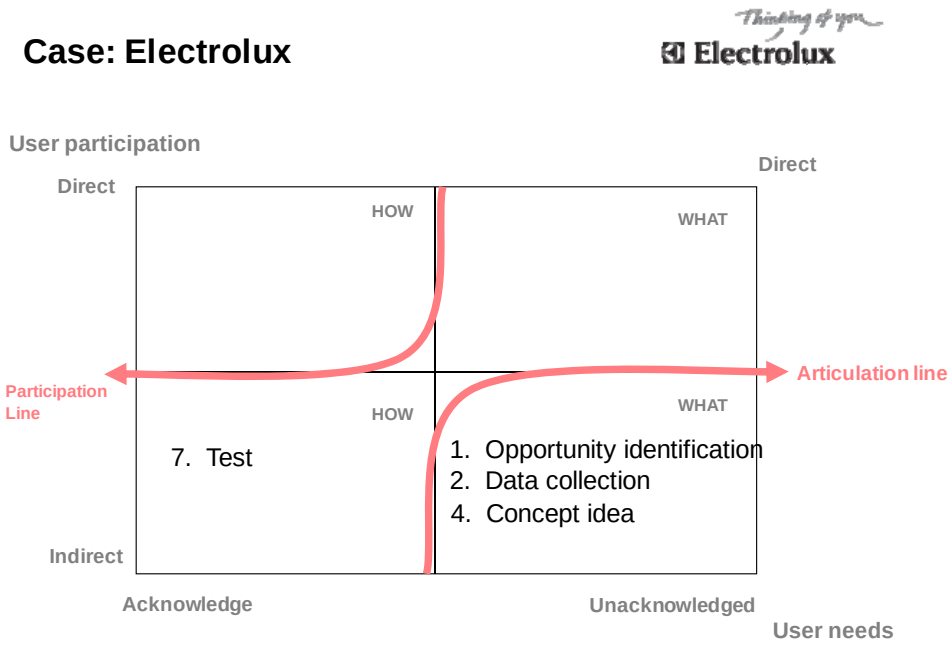
User involvement in *Test*?	Yes
UDI Methods/Tools used in the process	- Focus groups

3.8 Implementation

The Ergorapido hand-held vacuum cleaner was launched in 2004. Production took place in China, whereas the brand management process was led from Stockholm. The commercial launch strategy had the objective of initially creating category awareness and change perception. By building preferences through product benefits, these preferences would then attract customers who would proclaim a demand for the product in retail stores. The media plan increased awareness through repetition with an inter-linked PR program.

User involvement in *Implementation*?	No
UDI Methods/Tools used in the process	None

Figure 2.12: Mapping of UDI processes at Electrolux



In general at Electrolux, the "spark" in most product development processes occurs during the concept idea phase – when Electrolux's team has worked together with users for a period, and product ideas have become more concrete. New technological developments are not an important part of most product development at Electrolux. Rather, existing technologies are combined in new ways in order to solve currently un-solved problems and better meet user needs.

It is difficult to assess the impact of a particular innovation. In the case of the *Ergorapido*, however, there are a number of reasons that motivate Electrolux's perspective that that the product has had a high impact for Electrolux:

- After the launch of the *Ergorapido*, the market for hand-held vacuum cleaners in Europe doubled. *Ergorapido* captured 60% of this market.
- *Ergorapido* was launched at a 40% price premium (over existing products in the category), with success – proving that users place a high value on the product.
- *Ergorapido* has maintained its high market share and premium positioning over the last three years.

Overall, with the Ergorapido, Electrolux succeeded in:

- changing the perception of a category by initiating awareness and creating consumer confidence,
- show-casing what and how a consumer-centric innovation process can contribute with (with regards to design, launching, concept development etc.)
- encouraging multidisciplinary collaboration processes
- upgrading the positioning of the Electolux brand through the creation of superior value, and
- offering the company a best practise case, from which essential eruditions can be drawn and utilized in future product development.

4. Key Lessons

After nearly five years of global roll-out and recognized success of Electrolux's Consumer Innovation Program, senior management feels that they have come quite a long way in transforming the company from a traditional product development focus, to a consumer-insight focused company.

There are still a number of ongoing challenges, including: the adaptation from focusing on the customer/channel to focussing on the consumer; the need to adjust one's way of thinking – starting the process with user problems and needs, rather than with solutions; and the continued scepticism about the change from 'the regular way' of producing and selling things to a process that is driven by consumer insight. These will surely be addressed with the same level of ambition and success as the challenges that faced the company when Stråberg took the helm more than five years ago. Some of the lessons learned from Electrolux's experience so far include:

- Innovation does not have a single home. Rather, innovation is about thinking about things in a new way and developing an innovation culture throughout the company. This requires top management (CEO) leadership, and concrete activities implemented in a very systematic way in order to achieve results. At Electrolux, this way of thinking was promoted by the highest management levels, right from the start. The consumer innovation program was addressed in regular intranet communications. In addition, the company implemented an intensive (3½ day, 8:00-21:00) training programme throughout the company.
- Market leaders have a responsibility to lead the market. If companies fail to find ways to increase the value-added of the whole industry, then commoditization will eventually happen. Electrolux has chosen to pursue consumer insight-driven innovation as the way to bring increased value to consumers (and thus to the industry as a whole).
- In the end, to deliver profit for the company, the company must deliver value for the consumer. It may be difficult to measure if investments in innovation/product development processes are delivering results. At Electrolux, however, a few measures have been developed and used with success – proving to employees and shareholders that the increased investment and transformation was worth it.
- Product developers and designers at Electrolux do not typically have a deep understanding of user needs. In order to develop products that deliver value to the user, it is necessary to provide these people with deeper consumer insight and a better understanding of the problems that they should solve.
- Investments in consumer insight research do not necessarily lead to high impact. For consumer insight to have a high impact, it must become integrated into the company's own innovation and branding strategy.
- The hardest part is not understanding user needs, or involving users in developing products. Rather, the hardest part is bridging the gap in understanding within an organization, and transforming the mindset of everyone within an organization.
- There are a number of general challenges that need to be addressed:
    - There is a lack of people who are educated/skilled in ethnography for design and product generation.
    - Access to appropriate market data is limited. Broad consumer insight research – on a global scale – is a strategic tool which is in high demand. Now, many companies (e.g. Electrolux, Intel, Shell, Nokia) are pursuing this individually.

In summary, the Electrolux case provides an excellent example of the systematic use of consumer insight and strategic design in the innovation processes of a global leader in a mature industry. New innovation methods were combined with traditional operational efficiency and cost-savings measures in order to produce Electrolux's successful re-positioning.

International Cases

Two company cases have been selected to illustrate international examples of systematic user-involvement in concept innovation: Intel and Valve. These two cases are presented below.

Intel – "Innovation Inside"[111]

Industry: World's largest semiconductor chip maker

Headquarters: Santa Clara, California, USA

Net Revenue: USD 35.4 billion (2006) (approximately 230 billion SEK)

Employees: 94,100 (2006)

Strategy (from 2006 annual report):

- The company's goal is to be the pre-eminent provider of semiconductor chips and platform solutions to the worldwide digital economy.
- The company strategy focuses on taking customer needs into account in developing the next generation of products and platforms that will enable new form factors and new usage models for businesses and consumers.
- The success of the strategy to offer platform solutions is dependent on Intel's ability to select and incorporate ingredients that customer's value, and to market the platforms correctly.

This case provides an example of a globally-leading, technology-driven company, which has succeeded in initiating the systematic incorporation of a user-driven focus into its innovation processes. From the outside, it is difficult to realize the complexities of the transformation that has taken (and is taking) place…and the wealth of knowledge (and lessons learned) that can be drawn from this case.

1. Company Background and "User-Driven" Innovation at Intel

Intel was founded in 1968 by Robert Noyce and Gordon Moore. The company's business idea was based largely on *Moore's Law* – the prediction that the number of transistors on a chip would double about every two years. This prediction of technological change has held true, and has powered Intel into becoming the world's leading producer of semiconductor chips.

Although the company has maintained strong sales and a dominant market position, Intel has realized that technology is no longer the delimiting factor. Utility (the ability to meet un-met user needs) is the differentiator. This realization has catalyzed efforts to increase the value of Intel's products – and the total size of the market. This is accomplished both by continuing to make technological and business improvements, and by incorporating new elements and methods into the innovation/development process at Intel.

Intel's history of working with user-oriented approaches dates back to 1992-93, when three people (with backgrounds in human factors) began working at Intel. In 1995, the first ethnographic-style techniques were introduced within development projects. In 1996, the end user driven concepts group (EUDC) was formed. (This group would later change its name to People and Practices Research Group, PAPR.) After a re-organization in 2001, this team of

[111] The Intel case has been written by Emily Wise (Consultant at IEC and Research Fellow at Research Policy Institute, Lund University).

user-centred design specialists began working to define how ethnography connects with the "standard" technology roadmap. This work contributed to the development of the three-circle model (of business value, user value, and technology) and a clearer rationale for incorporating user value as a key element in development processes. (The model is illustrated below.)

The rationale for looking at usability: ***Intel's technology is only as valuable as the user perceives it. Therefore, the company should start by defining what they want to make possible (i.e. what values they wish to address or problems they wish to solve for their users) and then define what piece of the solution Intel can provide.***

You have to start by thinking about the things people want to do with computers and work backward. (Quote from Paul Otellini)

In 2004, Intel's (then) president and COO, Paul Otellini,[112] launched "Intel 3.0" – the vision of transforming Intel from a microprocessor company to a platform company, designing solutions that meet real user needs.

A part of the transformation was a re-organization (in 2005) from business units based on technological platforms to business units based on user groups. A number of the user-centred design experts[113] were incorporated into three business units: digital health, digital home and emerging markets. These people had the objective of incorporating user-centred insight into the business unit's development process.

Others remained in the *People and Practices Research Group* (within the corporate technology group), focusing on longer-term, exploratory ethnographic research on user value. A third (small) group formed the user-centred group within corporate sales and marketing. This group is a service group, focusing on the "user value dimension" of Intel's strategic planning processes and providing input to the other groups through short-term projects.

Initial efforts by the Corporate Platform Office to "legitimize" user-centred processes in the company's technology roadmap lost momentum in late 2005/early 2006 when the company entered into a complete efficiency overhaul. The various groups of "user value experts" – totalling more than 40 people – continue to work towards incorporating their skills and insights into the "standard" product development process at Intel.

2. Concept Innovation

Intel defines concept innovation as an innovation that is new to the company. This can encompass a broad range of things: a new technological platform, a new organizational structure, a new business model, a new market, etc.

The goals of the "user value experts" at Intel are all focused on catalyzing concept innovation. The People and Practices Research Group focuses on exploring new domains and identifying potential opportunities (new markets or business areas) for the company. The "user value experts" within the business units focus on translating opportunities into business value by working in collaboration with business and technology experts to define not only new forms or features, but also new markets, business models and development processes. The "user value experts" within the corporate marketing group conduct market research and short-term assessments of current products (employing, for example, "use cases" and scenario analysis as a complement to the objective engineering requirements within the product development process).

Members of the original People and Practices Research Group have, over time, developed a framework for illustrating Intel's innovation process – and the role of people-centred/usability

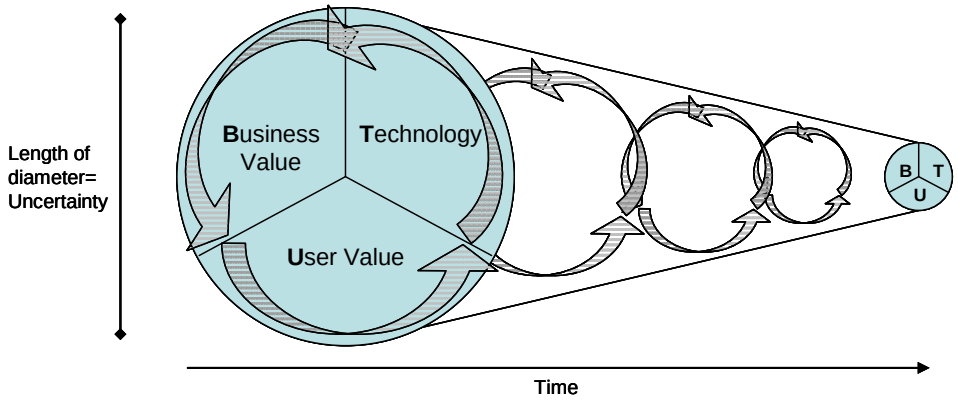
[112] Currently CEO of Intel

[113] including industrial designers, ethnographers, human factors engineers, interaction designers, etc.

research in relation to other elements. The Three-Circle (business value, user value, technology) Model (shortened to the "BUT Model") is illustrated below.

Figure 2.13: The Intel 'BUT Model'

The innovation process is an iterative one – incorporating knowledge and capacity from all three elements (user value, technology and business value) over time, in order to decrease uncertainty and increase the probability of success.



The three elements are represented by different people (with different skill sets) on the same product development team. Team members trade off "leading roles" over time – depending on the stage of the innovation/development process.

Source: Interviews with Herman D'Hooge (Innovation Strategist, Desktop Platforms Group) and Tony Salvador (Design Ethnographer, Emerging Markets Business Unit), Intel

The model illustrates the importance of incorporating all three elements (user value, business value and technology) throughout the innovation process, in an integrated manner. The model also illustrates the inductive nature of the process – moving from high levels of uncertainty to lower levels of uncertainty over time.

The process is dependent on a shift in thinking over time. In initial stages of the process, the objective is to identify issues or reasons for a product concept or idea to fail; whereas in later stages (when a new product concept exists), the objective is to identify business value or reasons for a concept to succeed.

As the process moves along in time (through stages of exploration, planning, development and implementation on the market), the different elements – and the skills sets that they encompass – have different roles. For instance, in the exploratory stage, the user value skills (including ethnography and design) have a leading role as the objective is to identify problems and translate these into opportunities that the company can investigate. In the later development stages, the technology and business skills have a more dominant role.

3. The Innovation Process and Business Outcome – *The Case of the Classmate PC*

In order to better understand how Intel works with UDI methods (or methods to determine user value), a specific example of their innovation process will be described step-by-step. The description will be structured using the project's eight-step "innovation wheel" (described in the previous section of this report).

As described above, Intel defines concept innovation as an innovation that is new to the company. In the Emerging Markets business unit, innovation is defined as entering a new

business ecosystem (new markets and new business models). The *Classmate PC* is an example of this.

The innovation process began in 2000/2001, and resulted in a product launch in January 2007. Research on new opportunities in this market continues.

The "WHAT Phase"

3.1 Opportunity Identification

In 2000/2001, the People and Practices Research Group (PaPR) at Intel initiated a project to explore the "next billion users of computing". This project, conducted over 2-3 years, used a number of ethnographic research methods and concluded, among other things, by identifying education/schools as a domain of potential interest for Intel. The research done during this "domain identification phase" (as termed by Intel) is considered a "pre-concept" research phase. During this phase, new domains where there is an un-met market need – and which could be of interest for the company – are identified. Those areas which are of interest to the company are then examined further.

User involvement in *Opportunity Identification*?	Yes
UDI Methods/Tools used in the process	Ethnographic research

3.2 Data Collection

In June 2004, the newly-established Emerging Markets Business Unit identified classrooms as an opportunity area – based to a large degree on the earlier research done within PaPR. The business unit then conducted additional, more targeted, ethnographic and design research in order to describe the different kinds of opportunities that existed and brainstorm computing ideas with the users. The ethnographic research (including photo journals, interviews, etc.) looked at user behaviours, power structures in classrooms, design and technology constraints, etc.

User involvement in *Data Collection*?	Yes
UDI Methods/Tools used in the process	- Ethnographic research - Brainstorming with user groups

3.3 Pattern Recognition

Based on the data collected and discussed with users in the field, internal brainstorming sessions – gathering both ethnographers and designers – were conducted. The key question at these sessions was whether there was a meeting between the world of user needs and the world of the company's business and technology competencies. Based on these internal brainstorming sessions, a number of concepts emerged.

User involvement in *Pattern Recognition*?	No
UDI Methods/Tools used in the process	Brainstorming between ethnographers/social scientists and designers (within the company)

3.4 Concepts/Ideas

The concepts that were identified in the pattern recognition step are then discussed, tested and revised with direct user involvement. The product concepts are built as very rough "mock-ups" and are tested in specific user settings. Methods used in this stage can include feed forward (discussing and testing concepts with users), or informant dramas (where product concepts are illustrated in a particular context and users critique the characters).

User involvement in *Concepts/Ideas*?	Yes
UDI Methods/Tools used in the process	- Feed forward - Informance dramas

The "HOW Phase"

3.5 Conceptualization

During the first four steps, the business unit's focus was on managing uncertainty (i.e. identifying and testing the various reasons for a product to fail). The process involved the business and technology elements, but was primarily focused on determining and testing user value. Once a concept has been identified and "anchored" with the users (through the use of various methods), the business unit's then turns to testing the concept on business and technology aspects (see Intel "BUT" model in previous section).

In the case of the Classmate PC, the process returned to step two of the process (data collection) in order to conduct market research, business research and technology research. With additional, more detailed information, the process moved onto conceptualization. The product development team (in the business unit) "filled in" the product concept with the business case and technical specifications. The specific value proposition for the product was defined.

User involvement in *Conceptualization*?	Yes
UDI Methods/Tools used in the process	- Market research - Business research (business case) - Technology research

3.6 Prototype

The Intel team then developed a number of mock-ups to test with various focus groups (groups of students, groups of parents, groups of teachers). In addition, more detailed interviews were conducted with teachers, students and parents.

User involvement in *Prototype*?	No
UDI Methods/Tools used in the process	Internally-developed prototypes

Following this step, the team then returns to steps three (pattern recognition) and five (conceptualization), conducting a number of iterations matching up user needs, design and technology. It was during this step that an internal request on the product design was made. It was requested that a keyboard be added so that the product "would look like other things (the company) makes".

This design change meant that the development team had to spend additional time in step five (conceptualization) in order to re-evaluate the market, the competition, and the value proposition. At this stage, the business element of the innovation process took a dominant role.

At the same time, Nicholas Negroponte (founder of MIT Media Lab) came into the media limelight by launching the concept of $100 computer[114]. Intel's development process was put into high gear – pushing the technology and skipping a number of product development steps (primarily in the prototype and testing steps) – in order to position the Classmate PC as a competitor on the market.

[114] see http://news.bbc.co.uk/1/hi/technology/4243733.stm

3.7 Test

Due to the market context, the tests had a more limited scope than usual (i.e. there were no large-scale pilot programs, etc. before launching the product). The tests were primarily focused on the technology, rather than usability.

User involvement in *Test*?	Yes
UDI Methods/Tools used in the process	- Focus groups - Interviews

3.8 Implementation

The Classmate PC was launched in January 2007. The launch of the Classmate PC required Intel to adapt its product development processes, enter a new market, and develop a new business model for selling the product.

User involvement in *Implementation*?	No
UDI Methods/Tools used in the process	None

Since its launch, the product development team has gone back to earlier steps in the innovation process (from step five – conceptualization) in order to incorporate research and analysis on user needs into the product concept. In this "second round" of product development, users have been involved in the process through: living labs (field tests), interviews and focus groups.

User involvement in *Test (second round)*?	Yes
UDI Methods/Tools used in the process	- Focus groups - Interviews

In addition to this, the Emerging Markets business unit has launched a new round of *opportunity identification* (step one) activities – conducting research on schools around the world, focusing on the distribution of power in these eco-systems.

Over a period of time, Intel and the One Laptop Per Child (OLPC) initiative teamed-up to address computing needs in emerging markets; however, since January 2008, the Classmate PC[115] and the OLPC are two competing products targeted at fulfilling educational needs in developing countries.

The Innovation "Spark"

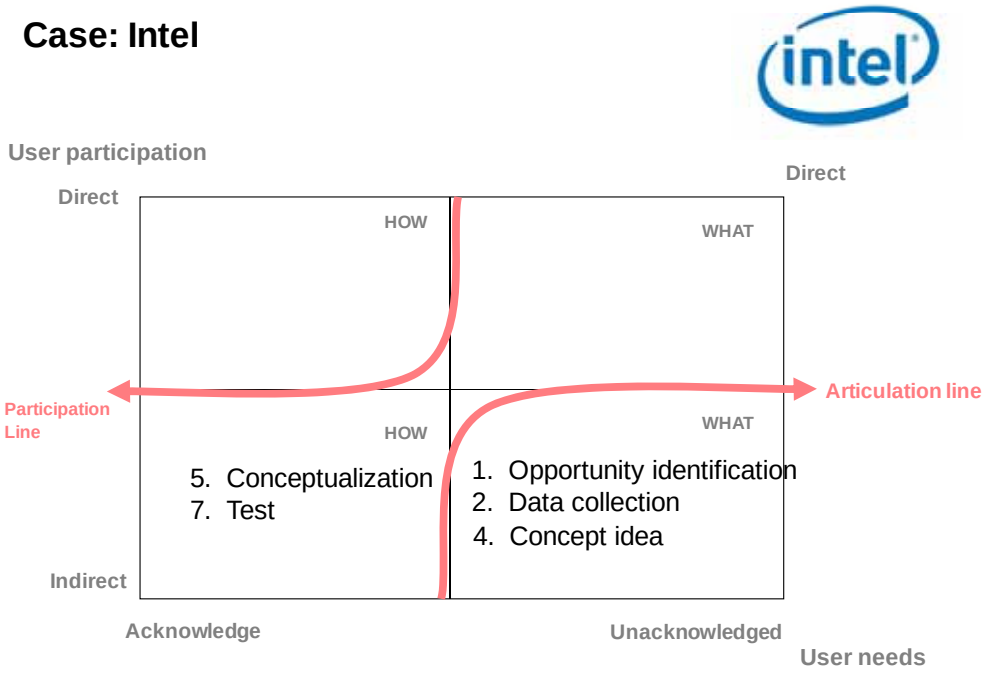
Innovation in product development is a continuous process. In this case, there were multiple sparks (not just one) during the innovation process. The project did not rely on new technology, but rather new combinations of existing technologies.

Impact

Based on the current situation, this case example has had a medium impact for the company, but has quite high potential for delivering higher impacts for Intel – including large, global markets and additional new products.

[115] see http://www.classmatepc.com/

Figure 2.14: Mapping of UDI processes at Intel



4. Key Lessons

Although a "user-driven" approach to innovation had a number of benefits, Intel also experienced a number of challenges to employing UDI methods/approaches. After ten years of initial "outlying activity" and two years of being a more integrated part of Intel's development processes, some of the "user value experts" believe that the company has only completed 20% of the transformation. Some of the lessons learned from Intel's experience so far include:

- The culture and innovation processes in technology-driven companies are well-rooted – and difficult to change. Even if there is a well-defined rationale, skilled personnel willing to lead the process, and top management buy-in, the journey toward an innovation process that incorporates usability (on equal footing with technology and business considerations) is a long one.
- The importance of a multi-disciplinary team, and an environment that encourages different perspectives and insights throughout the innovation process, cannot be under-estimated. A key success factor to reaping the rewards of user-driven innovation methods is the ability to integrate this element as an equally important part (on par with business and technology elements) within the company's "standard" innovation process.
- In addition to top management buy-in, skilled personnel, and financial resources, a number of "simple tools" can be used to support acceptance of new (user-driven) approaches in a company:
    - Develop and consistently communicate one simple framework (or model) that illustrates how "user-driven approaches" fit in with the rest (e.g. within Intel, it's the "BUT model")
    - Always "link up" (or refer) to known processes within the company
    - Use success stories to exemplify the model
- It is crucial for those responsible for "user-driven approaches" to earn a legitimate voice on development teams – and "stick it out" through the process, rather than become

marginalized. Within a company, "user value experts" need to find ways to establish credibility (e.g. through outside awards, publications, international networks, etc.).

- Often times, ethnographic research is done incorrectly. It is important to find appropriately-skilled (and experienced) personnel.
- In order to combat scepticism, one needs to find ways to link the insights from qualitative research to quantitative measures. Within Intel, this is a work in progress.

In summary, the Intel case is one of the best examples of a globally-leading, technology-driven company, which has succeeded in initiating the systematic incorporation of a user-driven focus into its innovation processes. From the outside, it is difficult to realize the complexities of the transformation that has taken (and is taking) place…and the wealth of knowledge (and advice) that is available from those who are guiding this transformation.

Valve – Innovative User Communities as a Part of a Business Model[116]

Industry: Valve is a producer of computer games

Headquarters: Bellevue, Washington

Sales in 2007: 10,5 million $)

Employees: 50 (2007)

This case study describes Valve Software, a computer game company founded in 1996 and located in Bellevue, Washington. The particular business model of Valve Software is based on product modifications by users and is an example of user-driven innovation in which the innovative work is carried out by users organized in global "mod teams". The word "Modding" originates from "modification". Modding is the act by which users modify an existing hardware or software programme to perform a function that is not necessarily authorized (or imagined) by the original manufacturer.

This case illustrates how manufacturers can establish a innovation driven process led by users and profit from the outcome. This case looks at how it is possible for manufacturers to hand over product development tasks to innovative user communities. It focuses on the phenomenon currently known as "modding".

In this case, modding led to the creation of one of the most popular first shooter games ever made, Counter-strike, which was based on moddings of the Valve game "Half-Life". The case will illustrate how Valve made most of the codes and tools available for modders when buying the Valve game Half-Life. The success of Counter-strike led to a sale of more then 11 million copies of the original game Half-Life to players that wanted to play the modified game Counter-strike. The estimated profit of Half-Life is $300 mill. US.

1. Valve Software's creation of Counter-strike - The evolution of modding in the computer games industry

Late 1990s - A business model emerges - Valve Software and Half-Life mods

In the late 1990s two former Microsoft programmers established Valve Software. Without much prior industry experience, Mike Harrington and Gabe Newell decided to create the computer game "Half-Life" (1998). From the beginning the strategy was clear: resources in the user community were to be integrated actively in the development process and users should be facilitated in continuously extending the product.

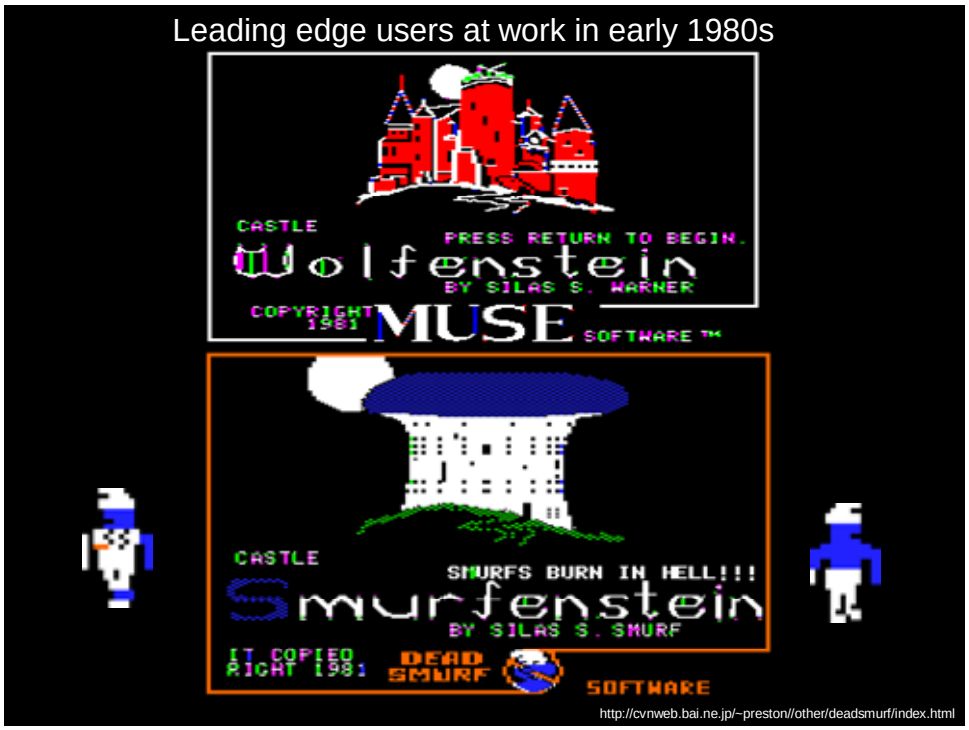
To turn intentions into action, Valve purchased the right to a third party software engine, which they tailored specifically to Half-Life. Also, a number of key tools were obtained from the existing games user community's private tool builders. Half-Life was based on a combination of already existing assets: a slightly modified engine from third-party developers, tools from varies existing user communities, and added Valve development capabilities. This process made the creation of Half-Life low cost for the industry as development cost of Half-life was only about $1 mill.

[116] written by Lars Bo Jeppesen, Associate Professor, Copenhagen Business School

Perhaps because the founders of Valve did not have much experience from the gaming context they were able to rethink the conventional business model. But, what led the founders of Valve spend time and resources on rethinking the business model of computer games? The answer is that they had seen the potential of user innovation and the benefits of being able to access and tap innovative user communities in the world of "modding".

The spark of inspiration might have come from initial experiments with modding carried out in computer games. One of the first examples of modding recorded is Castle Smurfenstein. It started in 1983 with a "hack" by Andrew Johnson and Preston Nevins with help from Rob Romanchuk. Castle Smurfenstein was a hack and a parody of the original computer game "Castle Wolfenstein". "Castle Wolfenstein" was a classic arcade-style action game written by Silas Warner (Muse Software) for the Apple II, Commodore 64 and several other computers. The player played an Allied spy fighting with Nazi combatants, who would shout in German as they opened fire. However, the inspiration for the mod Castle Smurfenstein was not so much WWII as a cartoon that ridiculed Silas Warner's original game. As the modders behind Castle Smurfenstein said; "Nazis just didn't seem that threatening to a suburban high school kid in the early 80s. Smurfs did. The Nazi guards became Smurfs, the mostly unintelligible German voices became incomprehensible Smurf voices".[117] The modders created a new title screen, new ending screen, new opening narration, and an opening theme, and changed the setting from Germany to Canada. This early conversion was straightforward, needing only a paint program, a sector editor, and Muse Software's own voice program. Castle Smurfenstein was a hack that had little effect on the original game.

Figure 2.15: Original Castle Wolfenstein on top. The modded version Castle Smurfenstein at the bottom.



In the 1990s the modding movement began to influence the computer games industry. However, especially the products made by ID Software were a source inspiration. In this case players had figured out how to create their own levels (new worlds to play in), which they had distributed to the entire community of players. In 1996, alterations to ID Software's product

[117] http://cvnweb.bai.ne.jp/~preston//other/deadsmurf/index.html.

"Doom" resulted in modified versions whose popularity came to influence ID Software's product development strategy. This situation, in combination with the founder of id John Carmack's commitment to the principle that the source code for software programs should be made available to the general public, led to the decision to release the code for "Doom" in late 1997.

A crucial decision made at the time when Half-Life was released, was that Valve also decided to make available a significant chunk of the product's game code for modification by users. Approximately 80 per cent of the code for Half-Life was released for alteration by modders. The code was restricted so mods still required the core engine of Half-Life. The original product, Half-Life, thus became the platform on which mods were built and on which mod complements had to be played. To match the publication of the code Valve further released a number of tools to the user community, again, many of which Valve initially acquired from users and polished in-house. At the time of the release of Half-Life, Valve obviously did not know whether users would take up the challenge it is to build mods to their platform or what the actual impact of such mods would be.

Valve learned early on how modding is organized – knowledge that became central in the latter development of a new business model that leverages user communities as a source of innovation. These early experiences were valuable as modding is a multifaceted phenomenon that requires in-depth company knowledge to govern. What can be learned in this context is that user innovators are usually highly motivated consumers with technical abilities and specific needs for a novel product feature or a solution to a given problem regarding a product.

It turned out that Valve had been making a lot of right guesses. The early success that convinced Valve that they were on the right track with their business model came early after the release of Half-Life. Less than eight months after the release, British Columbia based student Minh "Gooseman" Le and his mod-team had built "Counter-Strike". While Half-Life is a linear, first-person shooter with some puzzle solving, the total conversion, Counter-Strike, is a team-based, multi-player game, taking place in realistic settings between Terrorists and Counter-Terrorists. Practically the only thing that Counter-Strike has in common with Half-Life is that Counter-Strike requires Half-Life to be installed for it to run. The mod Counter-Strike quickly became so popular that it far surpassed the original game Half-Life.

The creation of Counter-Strike is an example of a user innovator showing a firm the value of opening its product code up to the public for further development. Eventually Valve ended up acquiring Counter-Strike. Valve paid Minh Le's and some of the core members of the Counter-Strike Mod-development team for their work and hired Minh Le to continue the development of the mod in-house at Valve. One of the things Valve did with the newly acquired mod was to "package" it and then release it as a new commercial game (complete with engine/platform). In fact, the new packaged version of Counter-Strike sold over a million copies while remaining a free download to Half-Life. Furthermore, Valve also "ported"[118] Counter-Strike to different commercial hardware platforms such as PlayStation. By doing so, Valve could reach a hitherto overlooked but potentially lucrative (mass-) market of players who do not use PCs for gaming.

[118] In computer science, porting is the process of adapting software so that an executable program can be created for a computing environment that is different from the one for which it was originally designed (Wikipedia, http://en.wikipedia.org/wiki/Porting)

2. Concept Innovation

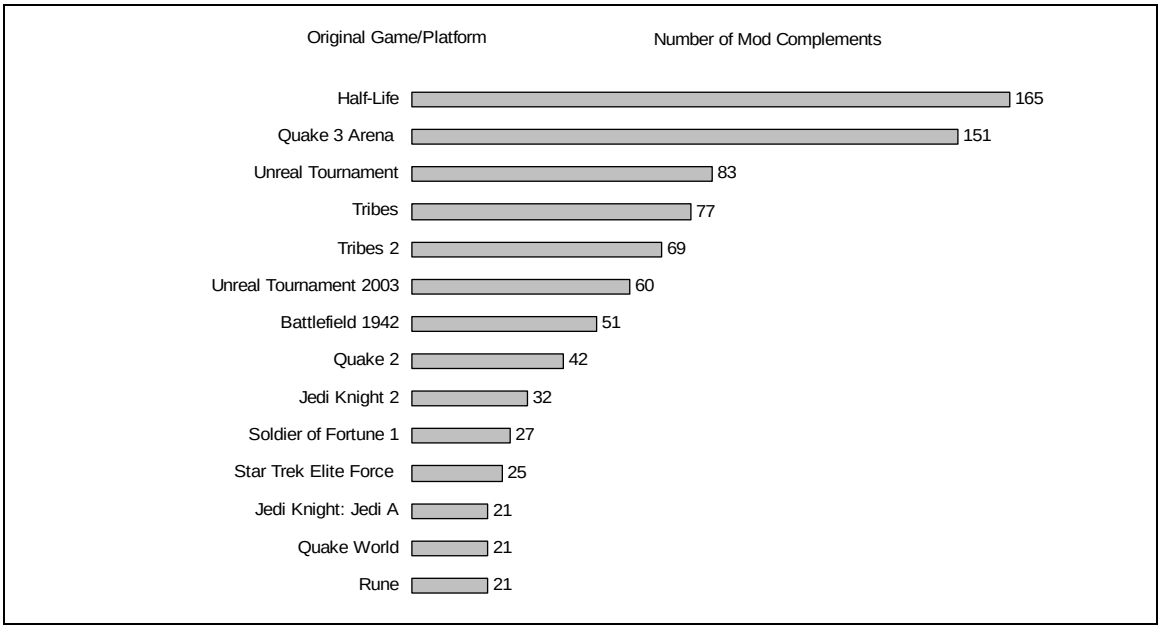
The transformation that took place when users built Counter-Strike as a mod to the game Half-Life and turned it into a massively successful first shooter play experience demonstrates how a company, by creating the concept of openness of technologies can build a business model that motivate the production of complements from which the company can benefit in terms of constant.

The case is an example of concept innovation because of the new concept for a business model where Valve creates a system that allows users to modify and improve existing computer games which in some cases result in production of and subsequent releases of new commercial games.

3. Business Outcome

Figure 2.14 below shows the range of different game platforms to which mods can be made.

Figure 2.16: Different platform products and their number of complement mods found in two week period (Dec. 2003)

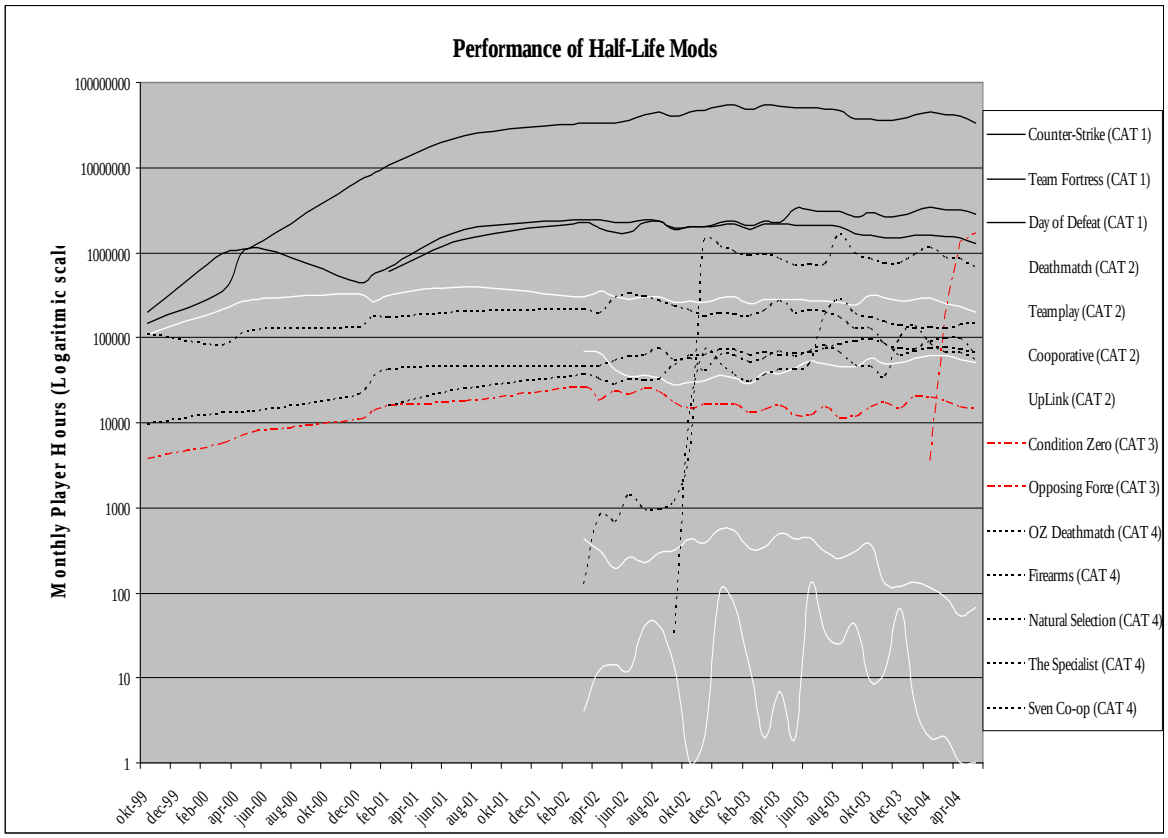


Source: csports.net

The number of mods to each platform comprise four different types of mods: 1) mods that were user-made, but which at some stage got picked up by the manufacturer; 2) "in-house mods" made by the manufacturer (i.e. those that are included in the original game); 3) supplier-made mods, and; 4) "autonomous" user mods that drift freely in the community. In the case of Half-Life 3 mods are of the first category, 7 are in-house made mods, 4 are supplier-made and 165 user's mods. As figure 3 below shows, within the Half-Life universe mods have now out-grown the original games. However, manufacturers benefit from mods since their platform sales increase as mods grow popular. Manufacturer supplied mods/levels are often initially the most popular because they are presented first and users have time to get good at them. If a game provides a modding option for users, user mods tend to increase in importance as the game gets older and can be very important after some months. User mods tend to refresh a game and extend its popularity. Half-Life came out in 1998. As can be observed from Figure 3, already in 1999 user mods had taken over. Especially Counter-Strike

quickly increased its share of player hours online (the upper curve). So did Team Fortress. Both of these mods were user created and appeared as autonomous mods online, but were also both picked up by Valve in 1999. The main points of the figure are that user mods that were picked up by Valve (labeled CAT 1) outperform the three other categories by far, and further that "autonomous" mods (CAT 4) perform at the level and or even better than in-house made mods (CAT 2).

Figure 2.17: Performance of selected Half-Life mods



Source: Csports.net

As shown in Figure 2.15 above, although 98 million total player hours (March 2002 - May 2004) are still generated by the in-house made mods, autonomous user mods are performing at a total of player hours of approximately 403 million (all 165 mods counted), while user mods that were picked up by Valve remain is in it own league with a total of 12967 million player hours generated in this period.

Table 2.5: Activity generated by four categories of mods

	"Picked Up" User mods	In-house Made Mods	Supplier Made Mods	User Mods	Half-Life Total
Active mods 2002-2004	3	7	4	165	179
Players hours 2002-2004 (in millions)	12967.25	98.05	43.35	402.64	13511.29
Share of total	96.0%	0.7%	0.3%	3.0%	100%
Players hours per mod 2002-2004 (in millions)	4322.42	14.01	10.84	2.44	

Source: Csports.net

The superior performance of Counter-Strike, Team Fortress, and Day of Defeat (CAT 1) shows that users can be a source of products that make a success in the mainstream market.

The benefits in terms of sales of the basic platform derived from having users adding mod complements can be illustrated by the following example. In a typical scenario, even if a game is a mega hit, within eight to 12 months, it disappears from the store shelves. In the case of Half-Life, on the contrary, sales increased year after year. During the first year two million units were sold, in the second year, sales ramped up to 3.5 million units, and in the third year, sales were at 3.8 million units. In total, the entire Half-Life franchise has sold over 11 million units and made an estimated profit of Half-Life is $300 mill. US.

Another indication of the success of the mods to Half-Life is that it generated more player minutes in 2002 than, for example, AOL Time Warner's viewer minutes and more than twice the amount of viewer minutes of the Top 10 TV show, "Friends". The number of player hours on Half-Life mods in 2002 amount to more than Italy's total Internet the same year and Half-Life occupied approximately 35,000 servers and took up a total of 2% usage of the bandwidth globally during this period.

In sum, at the outset of product development Valve prepared its product architecture to allow for modding. As the process of modding progressed the business developers discovered the strategies available to derive benefit from modding. Through his creation of Counter-Strike, the talented user Minh Lee showed Valve the potential of selectively opening their product architecture to allow modding and the sharing of mods among users. What this story tells is that the wish of users to have modifiable products has basically "pushed" some firms in the industry towards strategies of user-centered innovation strategies. Ideally many firms would wish to be able to make all mods in-house and sell them to consumers. However, competition in the industry has lead firms to a search for a new strategy in which firms may profit at the same time as it complies with user demands for modifiability. Firms that specialize in games that allow modding have over time rolled their activities back to a more platform development focused model, compared to firms that still seek to benefit by making expansion packs in-house.

4. The Innovation Process

Valve software developed an innovation process that allowed the company to orchestrate a product development process in which user self-select to create substantial new content on Valve's original product platform (Half-Life). The development model was coupled to an overall business model that allowed Valve to capture significant benefits generated in the process.

The Innovation Wheel

In the following the innovation process will be run through according to the 8 steps of the innovation wheel.

4.1 Opportunity Identification

Inspired by earlier examples of unintended user involvement in the development of other company's games Valve recognized the opportunity of letting the users develop their product further. Valve saw an interesting opportunity in letting the users develop on its existing game "Half Life". The opportunity identification was done internally in the company.

User Involvement in opportunity identification	None
UDI tools/ Methods used in the process	No

4.2 Data Collection

In the data collection step Valve Software developers looked at the experiences of other computer gaming companies that had experienced modding on their games. For example, ID Software who's game success QUAKE had been taken over by users and changed without direct intervention by the company and thereby actually creating new content and thus adding value to the existing product – a process potentially resulting in additional sales for the company. The data collection step was done from within the company.

User Involvement in data collection	None
UDI tools/ Methods used in the process	No

4.3 Pattern Recognition

Based on the findings from the data collection Valve Software understood that the players made their own modifications of computer games and played them online. Furthermore, Valve Software realized that several companies - like ID Software – that had their games modded didn't seem to have negative impact on the company. By contrast, often the modding activity seemed to create a new and growing interest for the games that were modified, thereby potentially creating additional sales.

User Involvement in pattern recognition	None
UDI tools/ Methods used in the process	No

4.4 Concept Ideas

Based on the findings in the pattern recognition process a new concept idea was developed by Valve software –Valve software should facilitate mod-teams modding activities related to the existing game Half-Life. Most of the code and tools to the company's PC game Half Life should be publicly available for the users of Half Life. By making the code and tools to Half-Life available for users Valve Software hoped to for new user generated content production to

happen, more value of owning the game and finally for increase in sales of "Half Life". Furthermore, Valve could use the users modifications of the Half-Life to develop new games online that later on could be commercialized on game consoles like Xbox and Play Station.

User Involvement in concept ideas	None
UDI tools/ Methods used in the process	No

4.5 Conceptualization

In the conceptualization step about 80 % of the code and tools to "Half Life" are made public available. Users get access to code and software development tools to "Half Life" that makes it possible for them to do their own modifications of the game on the internet.

Using server statistics Valve were able to monitor gaming activity of the various mods available to Half-Life and obtain valuable information on most popular modifications of Half-Life that could represent future commercial potentail. The most popular modifications of Half-Life could then be picked with great certainty, ported to and sold on other platform consoles apart from PC (for which they are available for free).

User Involvement in conceptualization	None
UDI tools/ Methods used in the process	No

4.6 Prototyping

In the cases where most popular mods are turned into commercial products Valve Software take the popular mods – the candidate for commercialization which has been developed by a mod team in collaboration with Valve - and port them to other platforms like Play Station and Xbox. The most well-know modification of this type is Counter-strike.

By hiring the lead users of the game Valve Software not only got access to the code of the modified version of Half-Life but also to the group of lead users that were working together with the leader (see more about the characteristics of modders in appendix 1). This way some highly skilled modders have worked with Valve through the development process up until mods were perceived as ready for launching as commercial game versions on consoles.

User Involvement in prototyping	Yes
UDI tools/ Methods used in the process	Lead users Software development tools and codes Server statistics monitoring

4.7 Test

The testing of the newly developed modifications based on Half-Life mainly Counter-strike was tested in two ways:

First of all the modifications were tested and modified by the populations of users that played the mods. Some, if not many, of these were themselves modders and can be considered lead users.

Secondly, it was possible for Valve to track the popularity of mods on the internet through monitoring server statistics on the intensity of use of various mods.

User Involvement in test	Yes
UDI tools/ Methods used in the process	Lead users Server statistics monitoring

4.8 Implementation

During the process 13 million copies of ”Half Life” were sold. Porting of the highly popular modification “Counter-Strike” to other platforms than PC was also carried out by Valve Software.

User Involvement in implementation	None
UDI tools/ Methods used in the process	No

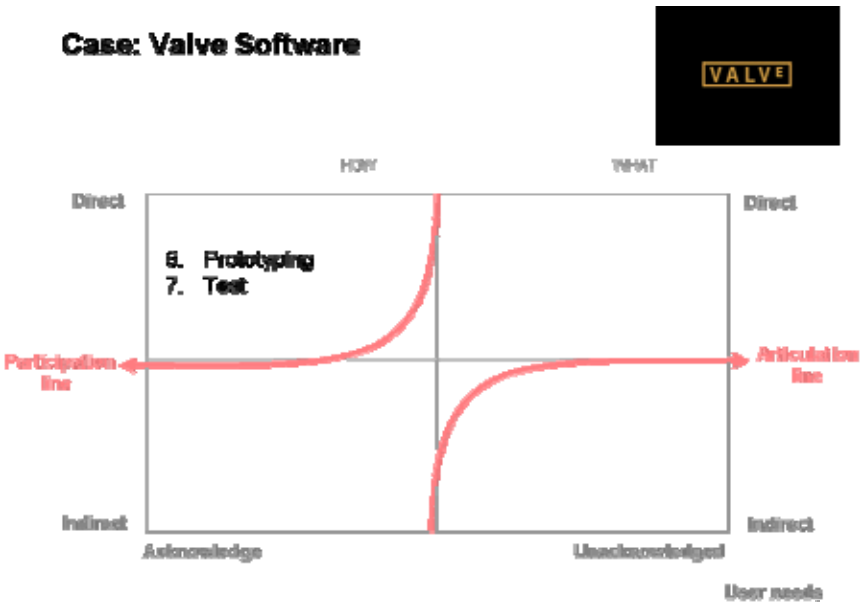


Figure 2.18: Mapping of UDI processes at Valve Software

5. Key Lessons

The manufacturer can derive great benefit from modding when users make innovations which manufacturers either are unable to make or find too costly because of difficulties of sourcing information from users. It requires however that the company is able to build up user communities. Then modding offers value, when the information held by consumers is **transferred** from the users to the manufacturers. When users make the complements, and when manufacturers are given access to user-developed prototypes, manufactures no longer require a deep understanding of user needs.

In a situation where modding has been adopted more broadly in the computer gaming industry, the better the original product technology is prepared to allow users to fulfill their needs the more likely it is that user innovators will be attracted to making innovations for that particular product. Therefore, manufacturers adopting the modding model may compete on their ability to attract users to their platforms. As users do not gain (monetarily) from innovation in this context, they are attracted simply by the quality of the tools and product technology offered by manufacturers for serving their needs and desires. To achieve a profitable business model, manufacturers should focus on tool building and how to facilitate innovation and manage their community of users in order to motivate them to create valuable innovations. Firms may also compete on their abilities to monitor and identify promising mods of commercial value. Through this process of modding, the manufacturer externalizes and reduces not only production costs when out-sourcing the product development to users, but also the important risk of costly failure of innovation in the given field.

The effect of modding in a manufacturer's product market is that user innovations will tend to fill out existing niches in the market for complements. Users tend to fill out market niches of highly specific individual needs in the periphery of the market that remain unfilled by manufacturers. However, as shown by the example of Valve Software, users' complements do not necessarily find niches outside core segments of the mass-market. The case shows that users' innovations may often become much more popular than the original. It is attractive in itself for manufacturers to have peripheral niche segments and mass-market segments filled by users on the condition that such segments do not rob manufacturers of their own sales.

Challenges to the user community based innovation model

Another challenge to manufacturers' attempts to benefit from modding can arise if users go one step further in their efforts and create (and share) game platform technology. The key

element of the modding business model presented is the protected core asset - the platform. Unlocking the platform would (as in most platform-based business models) lead to a disintegration of the business model in its present form. Therefore, the most credible nuisance to commercial-based modding business models would come from a potential high quality "open source platform".

Part Three: Summary Observations and Policy Implications[119]

Summary Observations

This study focuses on user involvement in the innovation process – both user involvement to identify opportunity areas, and in development. Users include end users, end user facilitators (doctors, nurses), or – if the process involves B2B – other companies.

The innovation process can be split into 2 phases: a pro innovation phase where the company focuses on why and what to offer their customers in the future, and a second phase where new ideas are transformed into concrete goods or services.

There is a long-standing tradition for involving users in the innovation phase that deals with transforming new ideas into concrete goods and services. The methods applied in this phase resemble the methods used when adjusting and improving existing goods and services in line with the customer's experience – referred to as incremental innovation.

When applying traditional methods for user involvement, the company will attempt to test ideas to shape and adjust products and services to best fit the user's functional requirements and taste. Thus, the companies will attempt to utilise the users' acknowledged needs on functional requirements and preferences. It should hardly be surprising that this approach to user involvement will rarely lead to new insights which, in turn, create entirely new solutions and concepts.

For user involvement to lead to entirely new solutions, other methods for user involvement are required – methods which may lead to new concepts or platforms…*breakthrough innovations*.

The new form of user involvement adopts an exploratory approach to identifying user behaviour and, in turn, uncovers perceptions which may lead to entirely new solutions and concepts. The user is rarely conscious of their behaviour, and it's only seldom that the user can imagine alternative solutions which have not yet been developed. Approaching the user directly will rarely lead to a new understanding of their behaviour or their perceptions of alternative solutions. Hence, other methods must be applied in gaining knowledge on what can be referred to as the user's unacknowledged needs.

This study introduces a number of cases where companies use an exploratory approach and involve users in new ways. This is done either by allowing users to actively and directly take part in the innovation process or by involving users indirectly by exposing them to experiments in which their actions will uncover new and unknown behaviour and needs that can be used to create platforms for new solutions and concepts.

Examples of direct user involvement can be seen in the Valve-case and the CCP-case. In the Valve-case the active participation of users led to the development of the Counter Strike computer game where players developed a first person shooter game concept where one group of players could play against another group of players. This was only possible since Valve made the programming codes and tools available for users ("modders") in order for the users to continue the product development task. The result was a new dimension offered for the first time by a computer game.

In the Eve-online computer game from CCP, the users' active participation led to the creation of a massive multiplayer online game with a one world society which had never been seen before in the gaming industry. Furthermore, user involvement led to the establishing of a

[119] Part Three has been written by Jørgen Rosted and Tanja Bisgaard, FORA.

social and political dimension in the Eve-online game which also was a new aspect for computer games.

The companies were not capable of producing these ideas themselves and could hardly have developed the ideas by simply asking users why they played computer games and what they preferred, which would have been the traditional approach.

Examples of companies which apply methods in order to understand users' unacknowledged needs can be seen in the cases from DSB, Danfoss, Electrolux and Intel. In the DSB case the observation of users gave the company a new understanding of how travellers use the train. The same understanding would not have been achieved by simply asking the users about their behaviour. By understanding that users work in the morning on their way to work, and prefer to relax or sleep on their way home, DSB created 2 zones on the first class carriages: one zone where travellers could talk on the phone etc. and one zone where travellers could be quiet.

In the Danfoss case, users were not able to express how they worked when controlling the various instruments in the wastewater plant. Through observations, it was discovered that the plant operators not only used the control panels, but they also used their senses, such as smelling and keeping an eye on the systems when controlling the flow meters. These observations led to the suggestion of moving the control panels outside, where the workers could use their senses while looking at the control panel.

In the Electrolux case, users were observed in their homes in order to understand their cleaning habits. Users were seen to clean more often than previously anticipated. For this "everyday cleaning," users did not feel like getting out their large and heavy vacuum cleaner, which in most cases was perceived as being ugly and therefore was hidden far away. Based on these observations, Electrolux designed a two-in-one vacuum cleaner with a small hand held part which could be used easily and frequently. Electrolux also gave the vacuum cleaner a new and modern design so users would be proud to have it out in the open.

In the Intel case, classroom and home observations of various user groups in the educational eco-system in developing countries helped Intel to understand the specific needs of students, parents, teachers and schools. The needs for collaboration and information exchange, for tracking progress, for monitoring classroom activity and providing interactive material, and improved parent-teacher communication were all addressed through a new, holistic concept for an inexpensive, portable computer. The *Classmate PC* is specifically designed for children to use in the classroom environment in developing countries – and aims at improving education and opportunity around the world.

To involve users in the creation of new solutions and concepts thereby creating new solutions together with the users is a relatively new phenomenon and one which will certainly gain in prominence in the future. However, this will require significant changes within the individual company, which will have to abandon the perception that the company itself has the knowledge and resources necessary to create new solutions and concepts that the company subsequently may convince the users the value of. And the company must possess entirely different innovation skills compared to traditional innovation skills.

In the future, companies will have to open themselves to the user and find partners outside the company that possess an entirely different set of skills in order to create new solutions and values in collaboration with the user. This emerging type of innovation can be called the "new nature of innovation" and has also been branded The New Age of Innovation[120] .

[120] *The New Age of Innovation* (Prahalad and Krishnan, 2008).

Policy Implications

The role of national and regional authorities

The public sector plays an important role in this transformation process. It is a role which resembles the one played by the public sector during the innovation of the Industrial Age, where the most important factor was to gain a technological advantage.

One can point to five areas where national and regional authorities may help create better conditions when facilitating the companies' transition to the "new nature of innovation".

1. Attracting attention to the challenges caused by the new nature of innovation and strengthening knowledge of new methods
2. Investing in education and research on innovation partnerships and user involvement
3. Creating collaboration between knowledge institutions and companies regarding innovation partnerships and user involvement
4. Establishing platforms for user involvement
5. Applying user-driven innovation in welfare benefits and public services

In recent years, the Danish government has implemented initiatives in all five areas. All of the Danish regions and many municipalities are also involved in the efforts as detailed in the section on Danish experiences in user driven innovation. The Government Platform from November 2007 states that the Government will introduce a new innovation strategy in 2009, which will further improve the conditions for companies in their transition to the "new nature of innovation".

A Nordic dimension

One may point to three areas where a Nordic dimension could be relevant in terms of strengthening governments and regional authorities' efforts to create better conditions in the transition to *The New Nature of Innovation*:

- Building knowledge institutions with specialised skills in the area of user involvement
- Establishing platforms for user involvement
- Applying user-driven innovation in welfare benefits and public services

New knowledge institutions

The knowledge and skills necessary to work with user involvement in the innovation process and to create solutions based on users' individual needs have both a generic and a specific character. There is of course knowledge and skills that are necessary regardless of sector, but there is also knowledge and skills related to user involvement that are specific to individual sectors and business clusters.

One good example is the food sector. The understanding of the users' relation to food is vital to the food industry. Substantial research has been made into consumer's relation to food.[121] A significant portion of this research has focused on the consumer's attitude towards new foods including which critical factors determine consumer's choice between different kinds of food. On the other hand, there is only limited research as to why these factors are critical.

[121] The MAPP centre at Aarhus University is one of the world's largest research institutions within development, marketing and distribution of foods. MAPP works with two main research areas one of them being "Understanding Customers". See more:
http://www.asb.dk/research/centresteams/centres/mapp/about/researchareas.aspx

Why is it that so many people say that they want to eat healthier, but fail to do so, or why do so many people eat unhealthy food knowing that it is unhealthy?[122] Due to questions of this nature, the Danish Authority for Enterprise and Construction is considering the possibilities of increasing the priority on research and competence building in user-driven innovation together with leading Danish food companies across the food industry. Of course the research should be of the highest international quality and will therefore be resource-demanding.

Similar initiatives may be required across most business sectors. However, this will be an extremely resource-demanding task so that one will have to give priority to areas with a significant business concentration. A similar thing took place in the Industrial Age when applied research was established within the scientific disciplines. Here there will be a natural discrepancy in terms of how research is prioritised across countries which in turn will reflect country differences in business structures. One should expect a similar discrepancy in terms of how new research and education in user involvement is prioritised.

Since the business composition varies across the Nordic countries, it might make a lot of sense for the Nordic countries to collaborate on creating sector-specific competencies in the area of user-driven innovation. This is relevant for collaboration between various public authorities as well as across the Nordic business community.

A platform for user involvement

Digital products and services which may be accessed via the internet share several common features that are independent of the sector which delivers the digital products. One of these common features is methods for user involvement.

There is a significant potential for user involvement when developing new digital products and services - and at a very low cost. One good example is open source operating systems, where the users are involved in the ongoing development of the systems without being paid for their services. In recent years, we have seen similar examples in other areas including computer games (see Valve and CCP).

In many cases, companies may locate internet communities where interested "super-users" volunteer for development projects; however, there are also examples where dedicated platforms are built to gain the required digital dialogue with users when developing new digital products.

All this will help explain the establishment of numerous Living Labs[123] across many countries including the Nordic region. There is some level of collaboration between the various Living Labs[124], which could be further expanded. All of the Nordic countries have a significant and growing business activity level in the area of digital products and services, and in some niches, the Nordic countries hold leading roles. Furthermore, the area is characterised by multiple start-up companies which add to the dynamics of the market. Start-ups are often faced with financing challenges, which make them particularly interesting in terms of establishing low-cost platforms for user involvement.

There will probably be some variation in terms of which users can be accessed across the different platforms. This will apply to age, geographic location and employment. Are they private users or business customers? Companies that develop digital services may therefore be interested in accessing different user involvement platforms.

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[122] *User Orientated Food Research – a study of innovation practice in the food industry and the user practice of the research "hot spots"* (ReD Associates for Vitus Bering, 2008). The report can be acquired via FORA.

[123] See list over European Living Labs; http://www.livinglabs-europe.com/

[124] http://www.nim.ax/files/Workshop/Kari%20Mikkel%C3%A4.pdf

Hence, there is much evidence to support the further investigation of the need and potential for a more comprehensive collaboration across the Nordic platforms for user involvement in the future development of digital products and services.

User-driven innovation in the development of welfare services

User-driven innovation in the area of services is closely related to service design which in recent years has undergone rapid development[125]. Recently, an international conference on service design was held in Copenhagen. The Nordic countries were highlighted as lead markets for the application of service design when developing welfare services[126].

The argument is based on the unique Nordic model for welfare services and the tradition and the cultural development that support the Nordic welfare model. The Nordic market for welfare services is one of the most sophisticated of its kind, and a market where it might be of interest to experiment with user involvement in the continued development of welfare services.

A decisive element in experiments of this kind would be the inclusion of digital technology. How can the application of digital technology strengthen the quality of welfare services while at the same time lowering the public sector's resource consumption?

The Nordic countries might also be one of the places in the world which host the most competencies and service design companies that work within this area.

All of this would support the further investigation of the area of service design and the application of welfare services with the purpose of uncovering the potential and possible collaborative efforts across the Nordic countries.

In addition to these three areas, further efforts to raise awareness and develop a better understanding of user-driven innovation processes and methods are still in demand. Some specific research topics or projects which have been requested include:

- Collection and description of additional company cases in order to better understand what methods can be used in which business contexts (and with what success)
- Quality checks (or standards) for living labs (and other co-creation environments)
- More detailed understanding on what approaches and business models can be appropriate to involve different types of users (including individual users, groups of consumers, customers, etc.)

And to complement research activities and disseminate new information, educational programmes should incorporate different aspects of the 'new nature of innovation' (including inter-disciplinary education and closer links with companies).

Most of the activities suggested above should be undertaken by research and/or analytical groups who can work side-by-side with companies in addition to working in academic contexts. In order to develop useful (and timely) research findings, projects should be undertaken in inter-disciplinary teams together with companies.

[125] *Designing Interactions* (Bill Morridge, 2007)

[126] http://ciid.dk/service-design-symposium-recap

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norden

Nordic Innovation Centre

Nordic Innovation Centre

The Nordic Innovation Centre initiates and finances activities that enhance innovation collaboration and develop and maintain a smoothly functioning market in the Nordic region.

The Centre works primarily with small and medium-sized companies (SMEs) in the Nordic countries. Other important partners are those most closely involved with innovation and market surveillance, such as industrial organisations and interest groups, research institutions and public authorities.

The Nordic Innovation Centre is an institution under the Nordic Council of Ministers. Its secretariat is in Oslo.

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