A Proposed Process for Generating Customer Driven Innovations

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ABSTRACT

Background Even though some inventions become a huge success, the vast majority are neither wanted nor required. In the 1980s companies started to realise that being solely technology driven was not good enough to survive in markets of ever increasing compositeness. Therefore a new way of approaching the issue of innovations began with a customer-driven focus. Companies started to conduct customer interviews and act on the feedback they received. So, why do new innovations fail even though companies and product developers are listening to the voice of the customer? Potential explanations could be that the companies don’t know what kind of information they need to gather from the customers or that the customers do not know how to communicate the right information.

Purpose The project purpose is to make a proposal for a new process that will generate customer driven innovations. Key objectives are; to study the field of innovation, to survey existing processes which generate innovations, to make a new process suitable to use for people that cannot afford either a huge amount of time or cost when surveying customer needs. The target users of the method are people working at the university, small enterprises, students or private individuals. The purpose with the process is to find the customer’s true requirements.

Method This project is different from the majority of master theses where students start with a predetermined hypothesis or a specific goal. In this project the method was instead to start at one point and then to review the results and take them in consideration when making new choices of direction, without any preconceived thoughts. Therefore the best choice was to use a qualitative approach throughout the project.

Conclusions The key basis of the finalised process is simplicity of use which has not been aimed at big industries or companies. The final process consists of seven steps and each step is carried out using a suitable tool. It starts with idea generation and for that first step brainstorming was found to be an excellent tool. In the second step a survey group is chosen with the tool selector and then in depth interviews with laddering are used to collect the data. In the fourth step the gathered data is analysed according to both the “Theme Model” and the “Spotter Model”. After analysing the data it is necessary to once again select, collect and analyse a new survey group. With the answers from the first analysis new categories are identified to progress. Then the whole procedure is repeated again which means that a new, much narrower area of investigation is identified. A selector is used to find a suitable group as respondents in a market survey and then the market research phase and analysis phases are repeated.
In comparison to existing processes, the biggest advantage of the developed process is the simplicity. It is developed for use by non professionals and doesn’t require costly experts. While existing processes are often product improvement processes, this process starts from scratch; one doesn’t even need to have an idea before starting. This process starts much earlier in innovation process than any of the existing processes and since break through products are not currently available this is one of the key advantages with this process
Acknowledgements

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During the course of our work we have encountered challenges, difficulties but also happiness, joy and rewards. This has helped us to grow, in terms of our knowledge, experiences and as individuals. The project has also given us a great experience of living in another country and meeting new cultures and people.

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## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>1</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>3</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Problem Description</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Customer Behaviour and Customer Need</td>
<td>3</td>
</tr>
<tr>
<td>1.3.1 Hierarchy of Needs</td>
<td>4</td>
</tr>
<tr>
<td>1.3.2 Perception</td>
<td>5</td>
</tr>
<tr>
<td>1.3.3 The Limitation of Listening</td>
<td>6</td>
</tr>
<tr>
<td>1.3.4 Characteristics of Innovative Users</td>
<td>6</td>
</tr>
<tr>
<td>1.4 Purpose</td>
<td>7</td>
</tr>
<tr>
<td>1.5 Scope</td>
<td>7</td>
</tr>
<tr>
<td>1.6 Disposition</td>
<td>8</td>
</tr>
<tr>
<td>2 Method</td>
<td>9</td>
</tr>
<tr>
<td>2.1 Quantitative versus Qualitative Methods</td>
<td>9</td>
</tr>
<tr>
<td>2.2 General Approach</td>
<td>10</td>
</tr>
<tr>
<td>2.3 Literature Search Design</td>
<td>11</td>
</tr>
<tr>
<td>2.3.1 Reading Books and Articles</td>
<td>11</td>
</tr>
<tr>
<td>2.3.2 Meeting with experts</td>
<td>12</td>
</tr>
<tr>
<td>3 Frame of Reference</td>
<td>13</td>
</tr>
<tr>
<td>3.1 Qualitative Methods</td>
<td>13</td>
</tr>
<tr>
<td>3.1.1 The Grounded Theory</td>
<td>13</td>
</tr>
<tr>
<td>3.1.2 Discourse Analysis</td>
<td>15</td>
</tr>
<tr>
<td>3.1.3 Protocol Analysis</td>
<td>16</td>
</tr>
<tr>
<td>3.1.4 Laddering</td>
<td>17</td>
</tr>
<tr>
<td>3.2 Market Research</td>
<td>18</td>
</tr>
<tr>
<td>3.2.1 The Market Research Process</td>
<td>18</td>
</tr>
<tr>
<td>3.3 Existing Processes for Generating Innovations</td>
<td>20</td>
</tr>
<tr>
<td>3.3.1 Use Voice-of-Customer Research</td>
<td>20</td>
</tr>
<tr>
<td>3.3.2 Two Ways of Generating New Ideas</td>
<td>21</td>
</tr>
<tr>
<td>3.3.3 Ulwick’s Ideas about Innovations</td>
<td>21</td>
</tr>
<tr>
<td>3.3.4 The Sources of Innovations</td>
<td>23</td>
</tr>
<tr>
<td>3.3.5 Ten Tools for Customer-driven Product Development</td>
<td>25</td>
</tr>
<tr>
<td>3.3.6 Quality Function Deployment</td>
<td>28</td>
</tr>
<tr>
<td>3.3.7 The Art of Innovation</td>
<td>31</td>
</tr>
<tr>
<td>4 Tools</td>
<td>33</td>
</tr>
<tr>
<td>4.1 Tools in General</td>
<td>33</td>
</tr>
<tr>
<td>4.2 Stimuli</td>
<td>34</td>
</tr>
<tr>
<td>4.2.1 Objects</td>
<td>34</td>
</tr>
<tr>
<td>4.2.2 Observation</td>
<td>35</td>
</tr>
<tr>
<td>4.2.3 Irritations</td>
<td>35</td>
</tr>
<tr>
<td>4.2.4 Brainstorming</td>
<td>36</td>
</tr>
<tr>
<td>4.2.5 Interviews</td>
<td>38</td>
</tr>
<tr>
<td>4.3 Selector</td>
<td>38</td>
</tr>
<tr>
<td>4.4 Collector</td>
<td>39</td>
</tr>
<tr>
<td>4.4.1 Depth Interview</td>
<td>39</td>
</tr>
<tr>
<td>4.4.2 Surveys</td>
<td>40</td>
</tr>
<tr>
<td>4.4.3 Focus Groups</td>
<td>41</td>
</tr>
<tr>
<td>4.4.4 Observations</td>
<td>43</td>
</tr>
</tbody>
</table>
4.4.5 Camping-out ................................................................. 44
4.5 Analyzer ................................................................................. 44
  4.5.1 The Spotter Model ......................................................... 46
  4.5.2 The Theme Model ......................................................... 48
4.6 Spotter 49
5 Empirics and Analysis of Case Study I and II ......................... 50
  5.1 Trial Procedure ................................................................. 50
  5.2 First Trial ........................................................................... 50
  5.3 Case Study I ................................................................. 52
  5.4 Conclusion for the First Trial ........................................... 53
  5.5 Second Trial ...................................................................... 55
  5.6 Case Study II ................................................................. 57
  5.7 Conclusion for the Second Trial ....................................... 61
6 Innovating the idea generation phase in the Innovation process .... 64
  6.1 The Proposed Process ....................................................... 64
    6.1.1 Implementation ............................................................ 65
    6.1.2 Mainstay of the Proposed Process ............................... 67
  6.2 The Proposed Process versus Existing Processes ............... 69
    6.2.1 The Proposed Process versus Ulwick’s Ideas ............... 70
    6.2.2 The Proposed Process versus Eric von Hippel’s Ideas .... 71
    6.2.3 The Proposed Process versus Ten Tools for Customer Driven Product Development ...................................... 71
    6.2.4 The Proposed Process versus IDEO’s Ideas .................. 71
    6.2.5 The Proposed Process versus QFD ................................ 72
    6.2.6 Business-Product Development Matrix ...................... 72
  6.3 Synthesis or Incompatibility? ............................................ 74
  6.4 Critical Evaluation of the Proposed Process ..................... 74
7 Conclusion ............................................................................. 76
  7.1 Reflection ........................................................................... 76
References .................................................................................. 78
Appendix ..................................................................................... 82
Appendix A: I Interview with an Innovator, Warwick Schaffer .......... 82
Appendix B: Example of Coding Case Study II Phase I ................... 86
Appendix C: Explanation about Library Interviews ....................... 89
Appendix D: Interviews in the University Libraries: One example using the first set of questions ..................................... 90
Appendix E: Interviews in the University Libraries: One example using the second set of questions ..................................... 92
Appendix F: Interviews in the University Libraries: One example using the third set of questions ..................................... 94
1 Introduction

This chapter provides the reader with an introduction to why this thesis was written. The chapter includes background, problem description, purpose and the scope of the project.

1.1 Background

When looking up the word innovation in a dictionary one will get results similar to:

“The act of introducing something new”

“Something newly introduced”

Innovations have always been and are still the major factor that is leading society forward. They make life easier for the humanity and have sometimes even been the life surviving factors. Some of the oldest and most well known innovations are the fire and the wheel. Fire itself was not invented by the human but the use of it for different purposes like for getting warmth in the winter, defence against dangerous animals and for preparing food certainly is. The wheel gave the human the opportunity to travel faster, transport things easier, getting water from the rivers quicker and nowadays one can see the circular shape of a wheel in many different contexts. One of the newer innovations is internet that has not yet been used for much more than a decade but has already become a part of almost each humans every day life.

Even though some inventions become a huge success most of them are unfortunately neither wanted nor required. In the 1980’s companies started to realise that being technology driven was not good enough. Before this the common way of introducing new products was to let engineers come up with ideas and then create or find a market were the product could be flourishing. The failure rate for new products was almost 90 percent in the US and using this trial and error approach to innovation was very costly for the companies. A new way of approaching innovations started and a customer-driven way of thinking was introduced and the companies started to conduct customer interviews and act on the feedback they received. This is called the Voice-of-the-Customer approach. Still a lot of innovations were failing though, 50-90 percent in the US companies. One example is the introduction of New Coke which was a customer-driven product initiative where a huge amount of money was invested in a big market research done before the product was introduced to the market. Despite all the effort the product ended up as a big failure so obviously only being customer driven is not good enough to gain success.

So, why do new innovations fail even though companies and product developers are listening to the voice of the customer? Some reasons can be that the companies don’t know what kind of information they need to gather from the customers or that the customers don’t now how to give the right information. The language the customers are using when telling about their requirements is not the same as the language used when creating new breakthrough products. Today almost every company still have

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1 Ulwick, Anthony W. (2005)
2 Robert M. Schindler, (December 1992), 25
problems with loosing money when new innovations are failing and the latest research in the area is about finding a method generating the right information from the customers to be sure that the new product will be exactly what the customers want and desire.

1.2 Problem Description

Today there is no good way to in advance know if a new product or innovation will fail or succeed. Companies are trying to do market researches to capture customer knowledge and develop products that are wanted by customers but they end up anyway with products that no customers want to buy. Success is more often unpredictable and random then a known fact. If there was a way for companies to in advance be assured that a specific product is wanted by the customers that would save a lot of money and time.

Even though companies do big efforts in finding new break through innovations the best and most revolutionary ideas are often born among people who work in smaller companies, people employed by universities or private persons. Established companies often rather buy new ideas from smaller innovators and start ups than staking money on R&D since it is very risky and resource demanding when looking for break through innovations. They don’t want to spend money at development of products since they would just throw away money when the have a secure position selling things. Can not afford the risk so few innovations is made by big companies.

Smaller innovation sources can more freely try different ideas and here totally new ideas can more easily come to surface since no strategy is involved to constrain the free thinking. Therefore many companies avoid trying to find new products and instead they put effort in improving already existing products. On the other side, when engineers and product developers are working on their own they often come up with new products but since they have not been listening to customers the products are often not designed to fulfil customer needs. Therefore a theory that makes it possible to first discover customer needs and then make a specification of those needs and give it to engineers and inventors, to let them find the solution, would be a great advantage for innovation-interested businesses.

Many researchers are addressing the problem of finding the real needs a customer have, some examples are Tom Kelley, Von Hippel and Ulwick, and even though they have come up with methods to generate successful innovations the methods are complicated and time consuming. A big amount of knowledge and help from experts are also required. Another problem with the above mentioned processes is that they start at a stage where a narrow area of investigation is chosen in advance, for example to investigate a specific process in a hospital. A process starting at an earlier stage could give problems that are common among a lot of people and solutions can therefore be break through products that are needed by a huge market.
The very first step, the idea generation phase (see figure 1), is a crucial stage when generating new innovations. If the researchers fail with finding the right ideas, ideas for products that can solve problems and needs that customers have, the wrong products will be developed and there will be no market for the new innovation.

### 1.3 Customer Behaviour and Customer Need

A human need is a state of felt deprivation. Humans can have different types of needs. The three of the most basic and important needs are physical, social and individual needs. Physical needs include food, clothing, warmth and safety. Social needs define needs for affection and belonging while individual needs stand for knowledge, self approval and self expression.

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As a consequence of the needs a more concrete thought is taking place. A human wants are those objects that needs express with regard on culture and individual personality. A hungry person in China might want rice while a hungry person in USA might want a hamburger. Wants are described in terms of objects that will satisfy needs.

A human’s basic needs are actually consisting of only food and shelter while wants are unlimited in number. When they depend on buying power wants turn into demands. People demand the things that are giving most satisfaction and value for the money. A poor person buys Lada while a wealthy person buys Jaguar\(^4\).

Peoples needs motivate a person to act in a specific way. A need reflect a gap between what consumers desire and what they already have. The needs are expressed through a persons wants that occur in actual situations. Unsatisfied wants represents a problem and if the problem is found it is sometimes possible to solve it for the customers by creating a new product.

Every need a human has is never fully satisfied why there is always space for new products to enter the market. The needs are changing all the time and it is important to be aware of new customer needs that come up to surface. This also means that there is always room for new innovations, when one need is attendant another one come apparent.\(^5\) People always have different goals they want to fulfill and if they don’t succeed it results in irritation.

1.3.1 Hierarchy of Needs

Abraham Maslow, a psychology researcher and teacher from the US, has developed one of the most accepted theories for human needs (see figure 2) and in his theory the needs are ranked in five different levels.

\(^4\) Armstrong, Gary & Kotler, Philip (2001),

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Physiological needs: Basic life needs - air, food, drink, shelter, warmth, sex, sleep, etc.
Safety needs: Protection, security, order, law, limits, stability, etc
Social needs: Family, affection, relationships, work group, etc.
Esteem needs: Achievement, status, responsibility, reputation
Self-actualisation: Personal growth and fulfilment

Each of us is motivated by needs. Our most basic needs are inborn, having evolved over tens of thousands of years. Abraham Maslow's Hierarchy of Needs helps to explain how these needs motivate us all. The Hierarchy of Needs states that we must satisfy each need in turn, starting with the first, which deals with the most obvious needs for survival itself. Only when the lower order needs of physical and emotional well-being are satisfied are we concerned with the higher order needs of influence and personal development. Conversely, if the things that satisfy our lower order needs are swept away, we are no longer concerned about the maintenance of our higher order needs.\(^6\)

1.3.2 Perception

Perception signifies “how we understand the world around us”, what we subconsciously add to raw sensory inputs to produce our own individual picture of the world. A stimulus is any unit of input to any of the senses. Even though two persons are the subject for exactly the same stimulus under the same conditions the way how they see them, organize them and are affected by them is different based on each individuals needs, values and expectations.

If a person is exposed to a specific stimulus often it is very likely that the person after some time doesn’t really notice stimulus. At this stage the person has reach sensory

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\(^6\) Maslow, Abraham H (1970)
adaptation which means that he has become used to a sensation. This is a big problem for many TV advertisements but the same phenomenon can also happen for ordinal people in their every day life. They become so familiar with the conditions that they don’t see things that can be approved in their surroundings and they can no longer see needs that are not full filled.\(^7\)\(^8\)

1.3.3 The Limitation of Listening

It is very important to listen to the voice of the customer but there is even more important to see the difference in what a person wants to say and what the person can say. There are often unspoken desires and demands that the companies and product developers need to find by going well beyond listening. Customers can say what they want to have as long as they can chose between already existing products that they are familiar with but when they are asked about a totally new product area they do not have the knowledge to do such a thing\(^9\).

When asking customers of solutions they often focus on product specifications, giving interviewers detailed instructions on particular design characteristics: size, weight, color, shape, look, or feel. Razor user may request “a wider handle” or “a lighter weight” or “a sleek look”. Again by accepting this input from customers, companies assume that the customer knows the best solution—which is not always the case. (This is the problem with the Voice-of-the-Customer Approach to innovation that was discussed in 1.1 Background.) A wider handle for example may have been requested to prevent the razor from slipping out of the user’s hand when shaving. Although a wider handle may be helpful in solving the problem, a better opportunity might be a regular-sized handle with a ribbed, rubberized grip. So, accepting specifications as customer input inherently prevents engineers and designers from using their creative skills to device break through products\(^10\).

1.3.4 Characteristics of Innovative Users

From a survey investigating how end users in the market are influencing the innovation process, “Characteristics of innovative users in a consumer goods field”, the conclusion could be drawn that there are a high level of innovative thinking among them. The survey investigated the innovation activities and characteristics of 153 users of out-door related consumer products and it was found that 37 percent of the end-user customers reported that they have developed ideas for new or improved products and that 9 percent had been building their own new prototypes. Conclusions from the survey was also that the innovating customers can be distinguished from non-innovating ones by characteristics such as the benefit they expect from using their innovation and the level of expertise they have in using the product. The group of innovating people can, when they have been identified, be an important source for new product ideas as well as for ideas in how to improve already existing products. The survey showed that more than two thirds of the respondents generated ideas for improved or new products and the result showed that the main reason for new

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\(^7\) http://sv.wikipedia.org/wiki/Perception
\(^8\) Winding, Robert E
innovation among the customer was the chance to execute their sport more efficiently. The main trigger to think about new solutions was dissatisfaction with existing products at the market and the goal to be able to perform the sports more easily and with more fun\textsuperscript{11}.

1.4 Purpose

The main purpose with the project is to make a proposal to a new process for generating customer as in end consumers driven innovations. The process will be directed to universities, private persons and smaller firms which all have in common that they can not afford either a huge amount of time nor of money in surveying customer needs.

The overall purpose is broken down into several sub purposes which are:

- To survey the field of innovation and find the most relevant of the already existing processes for generating product innovations.
- Find building blocks that can be used to put together a process for generating innovations ideas.
- Find a simple process in how to generate innovations that everyone in the target group can use. Therefore the process should be easy to carry out and it should not be necessary too achieve a lot of knowledge before using it.

1.5 Scope

One of the delimitation is that the survey will comprise just the technical solutions and subjects of issues. That limitation is made of obvious reasons since we are engineers and can solve only technical problems.

The time is another limiting factor. Since most of the books we read is based on years and years of research we have only been able to make a very first trial, a scratch at the surface, to see if ours ideas are working or not.

The proposed process is managing the very first phase in the innovation process which is the idea generation phase. This since it is a crucial phase and without a good idea it is not possible to develop a successful product. There is no existing process working satisfying in this phase yet why it is interesting to investigate it further. Beside this, there are already existing good methods for product specifications.

1.6 Disposition

Chapter 1: Introduction
Chapter one gives an introduction to the Master Thesis and consists of background, problem description, purpose and scope. There is also some theory about customer behaviour and needs since it is much easier for the reader to understand the rapport if they have some previous knowledge about this.

Chapter 2: Method
Chapter two starts with an insight in qualitative and quantitative research methods. It ends with a description of the course of action for the project.

Chapter 3: Research Design
Chapter three describes literature search approach and methods used to gather information. Also specific qualitative methods of interest are described.

Chapter 4: Theoretical Study
In chapter four all existing innovations processes are explained with the purpose to map what is already done in the field and to have something to compare the proposed process with.

Chapter 5: Tools
In chapter five all the different tools that have been considered to be a part of the process for generating innovations are gathered. The model consists of five different kinds of tools: Stimuli, Selector, Collector, Analyser and Spotter.

Chapter 6: Empirics and Analyses of Case Study I and II
Chapter six gives a description and analyses of the two case studies that lead to the proposed process.

Chapter 7: Innovating the Idea
In chapter seven the proposed process is drawn and discussed. It is also compared to the existing investigated innovations processes. The chapter ends with a critical evaluation of the proposed process.

Chapter 8: Conclusion
In chapter eight the reader finds the conclusions from the analysis.
2 Method

This thesis differs from the ordinary engineering thesis and is more like a research project. Therefore the theoretical reference frame will be different comparing to the one in a regular engineering thesis. Instead of having a problem that is solved by applying a few suitable, already existing, theoretical models the purpose here is to find a model and since this will be done through research, where the result is not known in advance, a qualitative perspective is used. The methods used when doing the project and the literature search to gather knowledge and to get information is described.

2.1 Quantitative versus Qualitative Methods

The gathered information during research needs to be systematised, compromised and analysed in order to answer the asked questions. There are two types of methods for doing so, quantitative and qualitative methods. Quantitative methods are statistical methods for analysing information in numerical form while qualitative methods are used for interpreting text material.\textsuperscript{12}

When doing a project the researcher should not start with choosing and deciding evaluation methods. Instead the starting point is to choose a problem of interest to study. Thereafter a purpose for the project and an investigation method are drafted. The purpose can be broken down into one or several concrete questions at issue. The detailed design of the method should be done after defining problem and purpose with the investigation.

Characteristic of the qualitative perspective is that it at the start of the project is unknown which precise results that are conceivable. Choice of method might have to change during the progress of the work. What is studied is often about quality and not numbers, distributions or an exact measurement which is the case with quantitative studies. The result from using a qualitative method might be a set of new aspects to a problem. The advantage with a study using qualitative methodology is that it takes into consideration the entirety in a way that is not possible with a study that uses quantitative methodology.

In a study using a quantitative method it is in advance known which possible conclusions the study can lead to. Quantitative methods have two advantages. An objective measurement for probability that the made conclusions are correct is obtained. That is not possible to get when using qualitative methodology. Also, if in a given situation the researcher can choose between using qualitative and quantitative perspective the last one is significant easier and less resource enquiring.

When carrying out a sample selection according quantitative studies a representative selection is made. In the qualitative studies on the other hand the selection is based on choosing the informants with knowledge about the phenomenon. In the quantitative studies a decision about the sample size is made while the investigation in the qualitative studies keeps on going until the data gets saturated.\textsuperscript{13}

\textsuperscript{12} Davidson Bo & Patel Runa (2003)
\textsuperscript{13} Steven J. Taylor & Robert Bogdan (1998)
2.2 General Approach

This project is different from the most master theses where the students start with a hypothesis decided in advance or a specific goal to aim for from the beginning. In this project one important thing was instead to start at one point and then to wait and see the results from the start step and take them in consideration when making new choices of direction, without any preconceived thoughts. Therefore the best choice was to use a qualitative approach when doing the project.

One of the targets was to find a simple process why every step in the process was considered after five criteria:

- Customer driven
- Target population
- Resource demand
- Communicability

Another important goal was to consider weather the result searched for was really the one captured in the end, if the process generated needs a person is not aware of but that can be solved with a technical solution.

The project is performed through different steps performed conjointly: literature search, surveying of existing processes for generating innovations and testing of outlined processes.

The literature search is done using internet and library services to get relevant information that is world spread. In surveying existing processes for generating innovations the inception was Dr Keith Alexander who had read about Ullwick’s ideas. Using this as a starting point Ullwick was contacted and asked about his thoughts about the most important theories to generate innovations. Another source for tracking theories was to look at references from Ullwick’s work as well as the work of people he recommended. From this von Hippel was found as well as Tom Kelley and Hannu Karkkainen, Petteri Piippo and Markku Tuominen. Also researchers found at internet or from reference lists was contacted and asked about their ideas of the most important sources of theories for generating innovations. To better understand how far in the innovations process the proposed process should go QFD was investigated. This since it was in advanced decided that the process only should cover the first phase until methods for concept generations could take over the product development. (See figure 1, the process is only to be used during the idea generation phase and not during the concept feasibility phase.)

The testing of outlined processes consists of two parts, the first trial and the second trial, each trial containing four different steps:

- To collect data
- To analyze and describe the information
- To interpret the results
- To evaluate the interpretations

The method for the whole project is:
1. Starting Point: The meaning was to do the project using the Grounded Theory.
2. Second step: Doing a brief literature study
3. Third step: Designing outline for first trial. Realized that Grounded Theory could not be used in the way expected.
4. Fourth step: Case study I: Testing method for first trial
5. Fifth step: A deeper literature study
6. Sixth step: Designing outline for second trial using the experience earned from the first trial in combination with knowledge from the literature study.
7. Seventh step: Case study II: Testing method for second trial

2.3 Literature Search Design

2.3.1 Reading Books and Articles

Innovation related books and articles
Since the intention with this project is to find a new way for creating and generating ideas for innovations we tried to survey the most important processes for doing that that exist today and to find the most recent research done within the area.

To understand what innovation was about and to get hold of the subject we started our study by reading several articles and books about innovation. Books about innovation in general that were read are “Mastering the Dynamic of Innovation; How Companies can seize opportunities in the face of Technological Change” by James M. Utterback and “Harvard Business Review on Innovation”.

The next step was to continue our literature search with investigating already existing ways and processes for innovation generation. One of the more interesting books that we found was Von Hippel’s “The Sources of Innovation” and an article by Hannu Karkkainen, a professor in knowledge management at Lappeenranta University of Technology, “Ten Tools for Customer-driven Product Development in Industrial Companies”. We also read articles and a book (“What Customers Want”) written by Anthony Ulwick in which he is criticizing the view of innovation from the perspective of companies.

Data collection related books and articles
After attaining understanding for the subject we continued by doing studies about how to do a market research before being able to go out and collect data in case study I and II. We also talked with several persons and read books about how to compile a questionnaire and alternative ways to gather data and information.

Analysis and product specification related
We tried to survey the most significant processes for analysing data and the first method investigated, which also was the method influencing our project the most, was the Grounded Theory. For the product specification QFD, Quality Function Deployment, was studied in combination with meeting people working with product specifications at the University of Canterbury.

Beside this we found many electronic articles and other books from which we used only smaller parts.
2.3.2 Meeting with experts

Several meetings with different experts were conducted. They were completed to clarify the not understood parts of the investigated topics and to get help with reading recommendations. Another important goal was to gain more insight in the subject innovation.

Innovation

We started by completing a two hour long interview with Warwick Schaffer, a person that has been working with innovations during many years and who was also one of the persons starting up The Incubator, an organization at the University of Canterbury for helping people carry out a product development from new ideas. This gave us an important insight in how innovations occur when involving persons not hired by companies and it was also very interesting to see how an innovator is thinking, which forces that drives him to find new innovations and how one should act when getting a new idea.

Grounded Theory

Concerning the Grounded Theory we had meeting with Dr. Brian Haig, professor in psychology at University of Canterbury and Dr. Ian Brooks, Senior Lecturer at University of Canterbury. They helped us with finding relevant literature and explaining how the method is supposed to be used.

Questionnaire Theory

For making a questionnaire we had a meeting with PhD Andrew Shawn. He told us what to think about when making a questionnaire, for example it is always good to have some background of the interviewed persons, and to think about how to quality secure the result. He also gave us insight in that different interview techniques are conducted for different purposes, for example using face to face, paper questionnaire, web site etc, and the importance of selecting the most appropriate technique.

Web tool

When designing a questionnaire used through a web tool John Ogier, Survey Administrator at University of Canterbury, helped us by giving advices in how to design the questions and in how to use the tool.

Product Specification

We also had a meeting with Dr Shayne Gooch, Lecturer at University of Canterbury about how to proceed while doing a product specification
3 Frame of Reference

In this chapter we will describe literature used in order to build a frame of references for our study. The qualitative methods of interest are described as well as the most important and recent existing processes for generating innovations and product improvement. The study was done in purpose to compare the, in the thesis, developed process with what is already available on market. This chapter is a part of the basis for the analysis and discussion.

3.1 Qualitative Methods

The studied qualitative methods are The Grounded Theory, Discourse Analysis, Protocol Analysis and Laddering.

3.1.1 The Grounded Theory

The Grounded theory is an inductive methodology used to generate a theory through the systematic and simultaneous process of collecting and analysing data. The basic idea is to find categories from which a theory can be generated. To narrow the area of research the found categories can be investigated further by using the Grounded Theory as an iterative tool until the theoretical framework being sufficiently worked out for an analyst to find substantive results. So instead of starting with a hypothesis or theory in mind the starting point is the collected data and the theory will emerge from them. The advantage of using grounded theory is that the research from data can discover new questions at issue that has not been thought of before. One problem in many companies today is that engineers and inventors tend to improve already existing products instead of finding new, and better, solutions. Another problem is that many new inventions made by inventors and engineers fail at the market since they do not respond to the customers wants and needs. To attack the problem of finding new innovations that will be a success the Grounded Theory can be a useful tool.

The grounded theory study is done through different steps (see figure 3).

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**Figure 3.** Schematic overview of the steps in Grounded Theory
The researcher must be careful not to identify the core category too early in the coding phase and the researcher should be wary not to enter the analysis with presumptions but instead let the data generate the themes through an iterative process.

**Data collection:**
The most common way to gather data is by using interviews but any another collection method can be used (for example focus groups or questionnaires). When doing interviews the researcher can either use a tape-recorder or write down key words. One advantage with doing face to face interviews is that the face expression and the voice of a person can give a lot of extra information which would be missed using for example questionnaires.

**Naming:**
From the data collected the researcher try to conceptualize and develop abstract meaning from incidents or observations by writing down what they observe is happening in those incidents. The researcher analyse every sentence from the interview to find incidents that occur and he should try to be very open minded and find as many as possible. This helps the researcher to sort different incidents from data into a few categories and it also helps the researcher to compare data from the different interviews to find certain conceptual categories.

**Coding:**
When coding the researcher must always have the other interviews in mind and collect the data in different categories. First thing done is a comparison between different incidents in the data and after that a comparison between incidents and the conceptual categories that have been found. After some time one category can be seen more frequently than the others and this is the core category. It should be well connected to the other conceptual categories. When the incidents have been collected in categories the researcher starts to look for the differences within each category to find sub categories.

By using the coding a set of categories and related properties will be gathered that forms the conceptual elements in the research. Since the Grounded Theory is an iterative method another set of data can now be collected but with a slightly different approach to narrow the investigated area to follow the core category. This time the researcher further concentrate his work on comparing new data to the conceptual categories than to make comparisons between data.

After some time new interviews don’t give any more information about the properties of the core category or connected categories and then the coding process has reached a saturation point where it is time to stop the data collection.

**Memoing:**
Memoing is a process that is going on simultaneously with the data collection, naming and coding. The researcher takes notes on what he thinks is expressed during the collection of data and on new ideas and indications of theories that might be seen at an early stag. When the coding starts the researcher writes down every new idea that emerges in his head and connections he can see within different categories. This helps the researcher to articulate and conserve his sense-making of what is going on in the
data. When the coding is over the researcher will have a lot of memos that can give different aspects to the theory which has emerged from the data.

**Sorting:**
In this step the researcher arranges all the conceptual categories in relation to each other to a conceptual “whole”; this is done with the memoing notes in mind. Since there is always possible to go further with an investigation the researcher must at some point consider the theoretical framework being sufficiently work out for an analyst to find substantive results and at this point the sorting process is started.

**Writing the theory:**
When data collection, note-taking, coding, memoing and sorting are done the writing is left where the sorted structure from steps above is written in a report. The final theory is now evaluated and this step should just follow the structure from the sorting step.

The data-collection, note-taking, coding and memoing occur simultaneously from the beginning and when the collection of data don’t give any new information the sorting process begins and after that the last step of writing.

### 3.1.2 Discourse Analysis

Discourse analysis is neither a quantitative nor a qualitative method and it will not give precise answers but instead an understanding of the conditions behind a specific problem. The discourse analysis is meant to provide a higher awareness of the hidden motivations in others and ourselves and because of that enable us to solve concrete problems. The problems addressed in discourse research aim to answer two general kinds of questions, number 1: what information is contained in extended sequences of statements that go beyond the meaning of the individual utterances themselves? And number 2: How does the context in which an expression is used affect the meaning of the individual utterance, or parts of them? This way of extending data can be used for written as well as spoken texts.

- Do interview with broad questions, make person speak freely. Record the interview.
- Write it down and analyze every sentence. Find codes and categories.

Discourse Analysis does not provide definite answers; it is not a "hard" science, but an insight/knowledge based on continuous debate and argumentation. Discourse or Critical Analysis always remains a matter of interpretation. As there is no hard data provided through discourse analysis, the reliability and the validity of

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14 Goulding, Christina (2002)
15 Locke, Karen (2001)
16 Richardson, John T. E. (1996)
17 [http://www.iupui.edu/~adulted/mwr2p/prior/gradpr96.html](http://www.iupui.edu/~adulted/mwr2p/prior/gradpr96.html)
18 [http://www.ed.uiuc.edu/eps/PES-yearbook/95_docs/haig.html](http://www.ed.uiuc.edu/eps/PES-yearbook/95_docs/haig.html)
one's research/findings depends on the force and logic of one's arguments. Even the best constructed arguments are subject to their own deconstructive reading and counter-interpretations. The validity of critical analysis is, therefore, dependent on the quality of the rhetoric. Despite this fact, well-founded arguments remain authoritative over time and have concrete applications.\textsuperscript{20}

3.1.3 Protocol Analysis

Protocol analysis is based on that a person is speaking continuously while doing a task. He speaks in everyday words and says everything he comes to think about during his job. A researcher is following the person taking notes or is using a tape recorder. This gives the researcher knowledge about how different tasks are normally carried out when thinking aloud is not required.

Practical implementation (through different steps):

1. Available resources? Plan which to use and how to use them.
2. What is required? Use specialist advice on theoretical and practical issues if you are not very familiar with the subject. Should be done through the whole process!
3. Feasible to think loud in domain? (For example a doctor can not think loud while investigating a patient)
4. Self recording ok for the person investigated or must a researcher be there to supervise?
5. How many protocols required? How long time should it take to record them? 1 hour of speaking => 10 hours of analyze
6. Plan for how to do data analysing: segmenting and coding
7. Equipment that need to be used, tape recorder
8. Motivate participants
9. Important to do a pilot study in the beginning

If participant silent, ask leading questions when he has been silent for too long. (A bit of laddering method)

Ask some warming up questions and make some trails to make the participants familiar with the method.

Good instruction how to do the thinking aloud and why the participant is doing them should be given.

Researcher has to write down every protocol and then do segmenting and coding as an iterative process. Identify coding categories and make a scheme with them.

Supplementary methods of eliciting knowledge while using protocol analysis:

- Repertory grids
- Sorting
- Laddering

\textsuperscript{20} Richardson, John T. E. (1996)
3.1.4 Laddering

Laddering is positioning research that enables the researcher to strategically understand the desires, needs, attitudes, and values that underlie the behaviour of consumers. Laddering is a method used to find a deeper source to a need a person has. By start on the surface asking a question that is easy to answer and then continue by asking the respondent why that is important the researcher can finally reach the real root of the need. An example of how this method can be used is:

R: -Why do you prefer product A before product B?  (R=Researcher)
Re: - Because……. (Re=Respondent)
R: - And why is that important for you?
Re: - Because……
R: - And why is that important for you?
Etc

In the end the real cause of the need is found, it could for example be that the respondent doesn’t want to make other people in his surrounding disappointed. Today it is common for companies and researchers to use laddering when investigating why customers prefers a specific brand. The customer then starts to tell which brand they prefer and when the researcher is using laddering they will get answers of what benefits the customer thinks they are receiving and then go further deeper to find the emotions the brand provoke (see figure 4 ).

![Figure 4. Schematic figure over the laddering attributes](http://www.populus.com/services/ladder.php)

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22 Fanning & McKay (1992)
23 http://www.populus.com/services/ladder.php
3.2 Market Research

To be able to reach goals and undertakings the researcher need information and data
to study. To find this information and collect data it is often necessary to do a market
research. The information that the researcher needs can be divided in three different
categories:

Intern Information
This is the information that is gathered from sources within a company and it is used
to evaluate how good the marketing is and to find problems within the marketing
process and to identify new opportunities.

Marketing intelligence
“Everyday information” that shows the development in the market environment and
that helps the management to prepare and adjust their market plans. A big part of this
information can be found among the company’s own employees and among retailers,
suppliers and customers.

Market research
The management can not always wait for the information to come to them but must
sometimes do their own research to find data. Some of the most common ways of
gather information is to investigate the market potential, to do market analysis, sales
analysing and to see trends in the business.24 25

3.2.1 The Market Research Process

The market research process consists of four different steps:

Step 1: Definition of the problem and goal of the market research
To identify the problem is often the most difficult step in the market research process.
The management often knows that something is wrong but can not pin point exactly
what. When the problem is identified the next stage is to decide goals for the
investigation and there is three possible ways to identify these:

- Investigating – Collecting information to be able to better identify the problem
and to propose possible hypotheses.
- Describing – Collecting of information to get a description of for example the
potential of a specific product, the customer’s attitude or demography.
- Cause/Effect- Market research to test hypothesis of the relationship between
cause and effect. For example if the price is raised by 10 % what happens with
the amount products sold.

Step 2: Development of investigation plan
The next step is to develop a plan to make the collection of secondary and primary
data happen in an efficient way. The plan should describe the existing data, research
method, contact method, selection method and the selection of research tools.

Secondary data: Information that already exists but has been gathered for another
purpose is called secondary data and is less time demanding and is cheaper to collect

25 McQuarrie, Edward F. (1996)
than new information (primary data). Disadvantages with using secondary data is that the data has been collected for someone else’s purpose and because of that it might not fit the new investigation perfectly and not be complete enough.

There are three ways of collecting primary data:

**Observational research**
Observational research is collecting of primary data by observing relevant people, acting and situations. A food manufacturer can for example send people to a super market to find the competitors price level at products and to see how much shelf space the retailer gives the competing brands. The advantage with observational research is that it gives information that people are unwilling or unable to speak about, sometimes this is the only way of gathering this kind of information. The disadvantage on the other hand is that feelings, attitude, motive and personal behaviors are not observed. When using this method it is common to use it as a compliment to other methods.

**Survey research**
This method is used when collecting data about people’s attitude, knowledge, preferences or consuming habits. There are two different ways in which the questions can be asked: in a structured way, which means that the questions are asked in exactly the same way to everyone, or in an unstructured way which means that the person interviewing lets the answers build up the interview. The investigation can also be direct, the person interviewing asks direct questions about a person’s opinions or behavior, or indirect which means that the researcher is looking for another answer than the direct answer the questions gives. Survey research gives a lot of information in many market situations and is cheaper and more time effective than the two others. The disadvantage is that sometimes people don’t want or can’t answer the questions and the researcher should also be aware of that some people gives answers that are not true, the reason can be that they want to be taken for smarter than they actually are or to help the person interviewing. It is also difficult to receive a statistically reliable selection of answers.

**Experimental survey**
The method is to collect people and give them different treatment and then look for differences in the answers from the investigated group. This can give a connection between cause and effect.

Now it is time to decide how to approach people with the market research questions (by phone, face to face, by mail, by e-mail, to use focus groups etc) and to design a sampling plan (how many interviews that is necessary, what kind of people etc) and then to find the right tools for the market research.

**Step 3: Implementing of research plan**
In the third step data is collected and analyzed. This is the most expensive step and also the stage where mistakes are most likely to occur. The researcher must make sure that the investigation is implemented according to the plan and that the persons interviewed really give true answers.
Step 4: Interpret and write a rapport
The researchers interpret and draw conclusions from collected data. Sometimes expert help is needed in this area, especially if it is a bigger investigation that demand complicated mathematical models.²⁶ ²⁷

3.3 Existing Processes for Generating Innovations
Existing processes for generating innovations that were found are Voice-of-Customer Research, Two Ways of Generating New Ideas, Ulwick’s Ideas about Innovation, The Sources of Innovation, Ten Tools for Customer-driven Product Development, Quality Function Deployment, Mastering the Dynamics of Innovation and The Art of Innovation.

3.3.1 Use Voice-of-Customer Research
To use Voice-of-Customer research normally means working closely with the customer, listening to their problems and understanding their situation. One way of doing this is through “camping-out” method which means that a researcher is actually spending a longer time in the environment were people investigated are to get to know them and to be able to understand and see how different tasks are done. This takes a long time, often 2 weeks or more, why it is an expensive and time inefficient method but it can at the same time give a very good result. The researcher observes the customer as well as speaks to the customer during this time.

Another voice of the customer method is Product Value analysis when customers face your product and then express opinions, concerns and difficulties. A guide is following the customer when she investigates the product and takes notes. By interfacing with the product the customer can respond in a much more creative way than if they just would have been asked what they would like to have in a new product.

A third way of detecting the voice of customers is to identify market trends or needs by conducting customer surveys and after that, when the problem is discovered, gather a focus group with experts to discuss the problem and possible breakthrough solutions. The researcher then do a large sample surveys to quantify the customers problems.

If a researcher works with average customers he will get average ideas. A way to avoid this is to work with a selected group of innovative or lead users which would probably generate much more innovative new products; this is called the “lead user method”. (Eric von Hippel). ²⁸ ²⁹

²⁷ McQuarrie, Edward F. (1996)
²⁸ Robert G. Cooper (2001)
²⁹ Luthje C. In Technovation 24 (2004) page 683-695
3.3.2 Two Ways of Generating New Ideas

Idea generation can be both bottoms-up or top-down. The bottom-up idea is for example when a scientist during her free time uncovers a technical possibility from which she realize that a new product can be the outcome. Another example is when a salesperson working in a shop realizes that the customers have a problem at which she can see a possible solution. The top-down generation of ideas is more directed and by using strategic thinking a particular market segment is chosen as a key area focus. By market research a significant customer problem is found that can generate new ideas for products. A disadvantage with the top-down method is that there is little room for creativity or originality since every new innovation and product is planned in advance and the products are often predictable. On the other side the bottom-up normally don’t bring new products that follow the strategy or vision of the company as a whole and the new products are often quite short term. The best way in doing idea generation in a company is therefore to have a mixture of the two methods.\(^\text{30}\)

3.3.3 Ulwick’s Ideas about Innovations

It is well known that despite the investments companies make in searching of customer knowledge and listening for customers’ opinion while developing new products the product failure rates still remain high and success is random and unpredictable. Anthony Ulwick, the CEO at Lantana, Fla.-based software and consulting firm Strategyn Inc. has come up with a new methodology for capturing customer input that focuses on outcomes, not on solutions.

Ulwick is in his book speaking about how important it is for a company to have an outcome driven approach to innovations instead of a customer driven approach. He writes that the biggest problem with companies today is that they all believe themselves to be customer-driven while they are in reality customer-led. Being customer-led is offering customers functions and solutions that they ask for while being customer-driven requires a company to understand what the customer is trying to achieve to offer customers products that may be outside their knowledge but will satisfy their needs better than existing solutions.

Customers should not be trusted to come up with solutions since they are no experts in product development or engineers. When customer-led companies ask their customers what they want they are asking for solutions but since customers are no engineers or experts they often come up with already existing and experienced solution. Instead they should be asked about what they want too achieve with a new product and what the outcome of the new product should do for them. Customer can only know what they have experienced while an expert knows about the latest technology, new materials etc. Customer-driven companies are concentrating on processes and outcomes instead, meaning unveiling what customers want and letting engineers come up with the exact solutions.

Ulwick’s methodology for capturing customer input that focuses on outcomes consists of five steps.

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\(^{30}\) Cooper, Robert G (2001)
**Step 1: Plan outcome based customer interviews**
The first step is to define each aspect of the process investigated and too carefully choose which people that should be a part of the investigation. It is important to interview only the people that are directly involved with the product otherwise enormous amounts of information that are irrelevant and can complicate the research will be gathered. It is also essential to choose the most varied set of individuals, since it will give a more complete set of distinctive outcomes. The customers should be users in different occupations, assignments, locations or positions, or customers that use the product for different purposes or in different environments.

**Step 2: Capture desired outcomes**
The next step is to develop a new style of customer interview. To capture outcomes a customer desire can be difficult since you have to sort the relevant facts the respondent are saying from solutions they are suggesting, vague statements, anecdotes and other beside the point facts. It is important that the customer is considering every step of the investigated process of using a specific product. The interviewer also has to redirect the question and force the customer to think about the underlying process whenever the costumer comes up with something that sounds like a solution.

Most interviews start with the respondent mentioning different ideas or solutions, for example that he want a handle to be bigger when holding a machine. The interviewer should then ask following-up questions about why the customer find this necessary, for example he don’t want to slide with his hands and the interviewer then notice this statement since that is the real problem the customer need a solution for. A well formatted outcome contains both the type of improvement required (minimize, increase) and a unit of measure (time, number, frequency) so that it can be used when comparing with other product and to evaluate new concepts.

**Step 3: Organize the outcomes**
The third step is about organizing data. All the outcomes gathered during the interviews are collected and the outcomes are then categorized into groups that correspond to each step in the process.

**Step 4: Rate outcomes for importance and satisfaction**
In the fourth step it is time for a quantitative survey where different outcomes are rated by different customers in terms of how important they are and to which point they are currently satisfied. The best opportunities spring from those desired outcomes that are important to customers but are not satisfied by existing products and services.

**Step 5: Use the outcomes to jump-start innovation**
In the fifth and last step data is used to uncover opportunity areas for product development, market segmentation and better competitive analyses. The outcomes are also used to formulate concepts and to evaluate the potential of alternative concepts. The new concepts are compared to already existing solutions and evaluated to find the most promising one to develop a new product from.

Finally to quote Ulwick:
“Coming to an understanding of what customers’ value is a far more fruitful exercise than merely asking them to submit their own solutions. The process of innovation begins with identifying the outcomes customers want to achieve; it ends in the creation of the items they will buy. When desired outcomes become the focus of customer research, innovation is no longer a matter of wish fulfillment or serendipity; it is instead a manageable, predictable discipline.”  

### 3.3.4 The Sources of Innovations

The sources of innovation vary greatly. The term functional source of innovation implies categorizing firms and individuals in terms of the functional relationship depending on how they benefit from a certain product, process, or service innovation. There are three different functional sources of innovation and they are: manufacturers as innovator, users as innovators and suppliers as innovators. Manufacturers as innovators benefit from a given product innovation by manufacturing it and in same way do users benefit from a given product or service or process innovation by using it and finally suppliers benefit from supplying components or materials necessary to build or use the innovation.

Regardless if the functional source of innovation comes from manufacturers, users or suppliers there is a special group called lead users that has more knowledge about the products of tomorrow than anyone else. Lead users are one of the most important sources of future needs and they have today an idea of the needs that will be common in the future. Lead user method identifies lead user in a given area and takes their help for developing new product or service concepts together with manufacturer personnel.

Lead users of a novel or enhanced product, process, or service are defined as those who display two characteristics with respect to it (quotation, Eric von Hippel, *The Sources of Innovation*, Oxford University Press 1988):

1. Lead users face needs that will be general in a marketplace, but they face them months or years before the bulk of the marketplace encounters them, and

2. Lead users are positioned to benefit significantly by obtaining a solution to those needs.

The first characteristic is important because of that users who have real-world experience with a need can provide the most accurate data regarding it. In today’s high technology world the needs are evolving rapidly and only users at the front of the trend will have experience with “tomorrow’s needs today”. The second lead user characteristic is important since a user who expects high benefit from a new solution to a need should have been driven by these expectations to attempt to solve the need.

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33 http://www.roundtable.com  
34 Melymuka, Kathleen (2001), “CEO: Help Your Customers Figure Out What They Need”, *Computerworld*, January 2, page 34
In addition they tend to experiment with solutions on their own and can provide the richest need and solution data to inquiring market researchers.

A Lead User market research study involves four major steps:

1. Identify an important market or technical trend
2. Identify lead users with respect to that trend
3. Analyze lead user data
4. Test lead user data on ordinary users

Step 1: Identify an important market or technical trend
To identify an important market or technical trend in a given area of investigation a survey to find the experts or expert users has to be done. To seek out the experts questions like “Whom do you regard as the engineer most expert in (the chosen field of investigation) in your firm?” and “Whom in your company do group members turn to when they face difficult (the chosen field of investigation) problems?”. Then the people working in the firm will give the name of the person in the company with the biggest knowledge within the investigated area. The discussion with the expert users should give the important trends.

Step 2: Identify lead users with respect to that trend
To identify lead users it is necessary to identify users who fulfill requirements of by themselves building and designing a product of investigation and who have high benefits from the product of investigation.

Step 3: Analyze lead user data
Once the lead users are identified the next step is to bring them together in a concept generation workshop. The goal of the product concept generation workshop is to develop the conceptual basis for a product with characteristics identified in the technical trend analyses. Several different subgroups can by establish and shifts in membership can be made from time to time to avoid the possible danger of premature fixation on individual problem-solving ideas. Working with problems can be mixed with general problem-solving and creativity exercises such as role-playing and team-building exercises. The purpose of these is to make participants more comfortable with each other and to lessen the pressure on them. Finally the different ideas are presented and evaluated on three criteria: originality, feasibility and comprehensiveness of solution. Originality means how revolutionary and novel is the solution from a technical point of view. With feasibility is evaluated how quickly the solution can be realized by employing currently available technology. Comprehensiveness of solution evaluates if the idea represent a single solution or does it resolve several user problems simultaneously.

Step 4: Test lead user data on ordinary users
The last step test in Lead User market research method involves testing whether routine users in a market place find the product or service concept developed by Lead Users to be attractive.  

35 Von Hippel, Erik (1988)
3.3.5 Ten Tools for Customer-driven Product Development

To be successful in product developing and to be able to retain existing customers and gain new ones a company has to listen to their customers needs and to try to reveal the hidden needs. Hannu Karkkainen, a professor in knowledge management at Lappeenranta University of Technology has together with Petteri Piippo, Development Manager at Valtra Inc. Jyvaskyla Finland and Markku Tuominen, professor in management of technology at Lappeenranta University of Technology come up with ten tools for customer-driven product and business development for companies producing industrial products.

Today is need assessment most of the times implemented in an unsystematic and unorganized way in companies producing industrial products. In spite of the importance of need assessment for product development there is a lack of proper tools and information about how to use them. The most common way for performing need assessment and discovering customer needs is through every day contact and free-form discussions.

The process that they have come up with is divided into six phases (see figure 5), the first one being defining the starting situation of a company and the goals of the need assessment so that the right tools can be chosen. Next step is to gather customers’ needs data from different sources. Then the gathered data is illustratively structured and analyzed. Also the data about the competitive situation must be gathered. With all the information gathered development targets for the product can be sat. In the last step the development has to be managed in order to achieve the targets.

There are some requirements that the tools must fulfill. They must support the gathering, organizing, and prioritizing of need information. The tools are also
supposed to help set practical targets for product concept development based on the information from customer need analyses and they should also support in achieving these targets. Because of that group work is a good way to promote mutual understanding, communication and commitment the tools have to be easy to use in groups. Most of the information about customer needs is collected with qualitative methods and the tools should be able to handle this in a good way.

The different tools can be seen in table 1. As seen from the table is the first tool aimed for planning the need assessment, tools two and three are for gathering the data, tools four and five aim to organize and analyze the collected data, tool six and seven are used for prioritizing the data and finally tools eight, nine and ten ensure that customer needs really direct the product development.

<table>
<thead>
<tr>
<th>Number</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need assessment outline</td>
</tr>
<tr>
<td>2</td>
<td>Creative group interview</td>
</tr>
<tr>
<td>3</td>
<td>Frame work for 1-on-1 interview</td>
</tr>
<tr>
<td>4</td>
<td>Trace matrix for business chains</td>
</tr>
<tr>
<td>5</td>
<td>Voice of customer interpretation table</td>
</tr>
<tr>
<td>6</td>
<td>Competitive position analysis</td>
</tr>
<tr>
<td>7</td>
<td>House of quality (QFD)</td>
</tr>
<tr>
<td>8</td>
<td>Pugh concept selection table</td>
</tr>
<tr>
<td>9</td>
<td>Problem source assessment</td>
</tr>
<tr>
<td>10</td>
<td>Assessment of future competitiveness</td>
</tr>
</tbody>
</table>

1. Need assessment outline
The first tool called “Need Assessment Outline” includes planning of customer need assessment. The goal is to ensure that the planned customer need assessment activities are as useful as possible for both R&D and the whole company. To be able to proceed through this first step it is important that the starting points of product development and the strategies of the company are clearly understood. The received output information is presentation of markets and important customer segments and the available customer information in the company.

2. Creative group interviews
Second tool is called “Creative Group Interviews” and it includes a group of company’s and customer’s representatives that work together to revile customers needs and demands. It is important that the group consists of people from different departments as marketing, production, purchasing and corporate planning so that all voices come up to surface. The goal with this tool is to use customer’s own words for forming a structured picture of customer’s needs and demands. To be able to implement this step the most important customers for the company have to be known. After the step is implemented customer’s needs, demands and objectives are known for the company.

3. Frame work for 1-on-1 interview
The goal of the third tool, “Frame Work for 1-on-1 Interviews” is to give a framework or future-oriented questions for learning to know customers’ business environment and needs. To be able to carry out the third step company has to know
customers’ whole business chain. Outputs from third tool are a broad picture of customers’ business environment, requirements and needs for the company.

4. **Trace matrix for business chains**
With the fourth tool, “Trace matrix for business chains”, the complex business chain network of customers’ stakeholders are analyzed and their requirements for the company are traced back. The needed input information is knowledge about company’s customers and important stakeholders and their links with the company. After the fourth step there is a clear picture of business chain and potential future needs and requirements from even remote stakeholders.

5. **Voice of customer interpretation table**
“Voice of customer interpretation table” is the fifth tool and it aims to analyze customer’s demands, opinions, attitudes, values and strategies in order to represent them in a structured way. This step can be carried out only if there is gathered data (voice of the customer) about customers’ requirements, opinions and reclamations. The output information of this tool consists of structured picture of customer’s real needs, background information for technical requirements and comparison criteria for suppliers.

6. **Competitive position analysis**
The sixth tool is called “Competitive position analysis” and its goal is to find out the customers’ opinion about its and competitors’ competitive position concerning the most important needs. The needed input information for this tool is a structured picture of customer’s needs and the output is information of needs that should be given special attention and target levels for their fulfillment.

7. **House of quality (QFD)**
The goal with the seventh tool, “House of Quality (QDF)”, is to seek out by the customer most valued product attributes. The input has to consist of a structured picture of customer needs, their importance and the competitive situation and the output is common, prioritized view of most important customer needs, competitive situation and product attributes.

8. **Pugh concept selection table**
“Pugh Concept Table”, the eighth tool, helps to illustratively combine, develop and choose the best concepts based on the most important customer needs. For being able to set up a Pugh Concept Table most important customer needs and product characteristic are need to be known. Result of the eighth tool ends up in the most vital product concepts and their weaknesses and strengths.

9. **Problem source assessment**
“Problem Source Assessment” gives a creative way to find out possible defects, problem sources and other negative images an early stadium of product development. The needed input information is customer’s needs requirements, values and product concepts. The output contains the most probable problem sources and customer’s possible negative views or the product and rough estimate of the probability.
10. Assessment of Future Competitiveness

“Assessment of Future Competitiveness” provides a way of estimating the competitiveness of the concepts in the planning stages and be better prepared for the future situations. The information needed to be known is customer needs, product concepts and their competitors and the output is estimate of product’s competitiveness in the market and position by most important criteria compared to the competing products.36

3.3.6 Quality Function Deployment

QFD meaning short for Quality Function Deployment was developed in the early 1960s by two Japanese professors, Yoji Akao and Shigeru Mizuno but found its ways to western world for the latest twenty years. It is a method or rather a structured approach to defining customer needs and requirements and translating the same into specific plans to meet those needs. QFD takes in consideration both the stated and unstated or in other words hidden customer needs, what you call “voice of the customer” and seeks to maximize positive quality (as ease of use, fun) instead of focusing on minimize negative quality (as defects, poor service). The root of QFD is a previously well done market research that captures customers’ needs. The problem is that customers are that they rather tell “how” a need can be satisfied than “what” the need is. To find the origin of the need it is important to ask “why” all of the time.

Once the data is gathered with an amount of interviews a process of sorting the data starts. QFD can offer several different tools for doing that:

- **Affinity Diagrams.** To surface the “deep structure” of voiced customer requirements
- **Relations Diagrams.** To discover priorities and root causes of problems and unspoken customer needs.
- **Hierarchy Trees.** To check for missing data and other purposes.
- **Various Matrixes.** For documenting relationships, prioritization and responsibility.
- **Process Decision Program Diagrams.** To analyze potential failures of new processes and services.
- **Analytic Hierarchy Process.** To prioritize a set of requirements, and to select from alternatives.
- **Blueprinting.** To depict and analyze all the processes which are involved in a product or service

When customer needs are discovered, sorted and organized QFD methodology flow consisting of four basic phases that occur over the course of the product development process begins. The different phases that end up in a “House of Quality” are “Product Planning”, “Assembly/Part Deployment”, “Process Planning” and “Process/Quality Control” (see figure 6). It’s called the House of Quality because of the correlation

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matrix that is roof shaped and sits on top of the main body of the matrix. The correlation matrix evaluates how the defined product specifications optimize or sub-optimize each other.

Figure 6. Four-Phase QFD Approach

Already in the first phase, the “Product Planning” phase (see figure 6), drawing of the “House of Quality” is made (see figure 7). The most important outcome of “Product Planning” is a matrix with customer needs or requirements stated on the left side and product design requirements on the top. Customer needs are organized by category based on affinity diagrams. Each one of the needs is then rated by a number between 1 and 5 founded on customer priorities. An evaluation of the competitive products is made based on customer needs. This survey results in identifying competitors’ strengths and weaknesses compared to customer priorities and in same time identifying new opportunities meaning areas for improvement to equal or exceed competitors’ capabilities. Development efforts will be focused were they have greatest payoff. Next step in “Product Planning” is to establish product requirements responding to customer needs and to organize those into related categories. The technical characteristics should be meaningful, measurable and global. Once that has been done relationships between customer and product requirements has to be developed. For that purpose different symbols for strong, medium and weak relationships are used. After that a technical benchmarking is done using competitive products. Based on the made survey preliminarily target values for product requirements are developed. Then potential positive and negative interactions between product requirements are determined. Symbols for strong or medium, positive or negative relationship are used. Next stage is to calculate importance ratings by assigning a weighting factor to relationship symbols and then multiplying the customer importance rating by the weighting factor in each box of the matrix and adding the resulting products in each column. A difficulty rating is done for each product requirement. Finally the last step of “Product Planning” consists of analyzing
the matrix finalizing the product development strategy and product plans. Required actions and areas of focus are determined and target values settled.

Figure 7. “Product Planning”

“Assembly/Part Deployment” starts with concept selection. On basis of product requirements benchmarking, brainstorming and research and development is used for generating new product concepts. The generated concepts are then analyzed with help of a concept selection matrix where product requirements are on the left in the matrix and the different concepts on the top. The different concepts are evaluated on how well they satisfy the different product requirements and then the different requirements are multiplied by importance rating. The preferred concept will have the highest total and that is the product that will be selected. Now, a second “house” or what is called the deployment matrix can be built with product requirements from “Product Planning” on left and product requirements translated into critical subsystem, assembly or part characteristics on top (see figure 8).

Figure 8. “Product planning” and “Part deployment”
In the way as for “Product planning” relationships between product requirements and critical part characteristics are established, importance ratings calculated and target values settled.

Once again becomes the top of the previous matrix, meaning the top of the deployment matrix, the left of a new matrix, in this case process planning matrix. Process planning matrix is used to select between different manufacturing processes and as already mentioned has critical part characteristics on the left side and different processes on the top. Given that the different critical part characteristics has different priorities and there are different relationships between critical process steps and critical part characteristics there will probably be only one best process for manufacturing.

At last the different process steps developed in the process planning matrix can be used as basis for planning and defining specific process and quality control steps in a process/quality control matrix.37 38

3.3.7 The Art of Innovation

IDEO is a design and development firm that has come up with a lot of successful products; some examples are the Apple mouse, Polaroid’s I-zone instant camera and the Palm. Their general manager, Tom Kelley, is in the book “The Art of Innovation” explaining their methodology used when generating new products.

The methodology has 5 basic steps:

1. **Understand** the market, the client, the technology and the perceived constraints on the problem. It is important to understand current perception even though it quite often happens that the constraints are changed later on in the project.

2. **Observe** real-life situation where people are acting to find out what is actually happening: What confuses them, what makes them happy, what makes them irritated, where their needs are not satisfied by current products and services etc.

3. **Visualize** new-to-the-world-concepts and the customers who will use them. This is a very brainstorming intensive step and some people see it as predicting the future. The visualization of the products can take form through a computer-based simulation but also by building physical models and prototypes. For new product lines it also happen that scenarios are used or video recording to display life with the future product before it even exists.

4. **Evaluate and refine** the product happen through a series of quick improvements and it is important not to become to attached to the very first prototypes since they often change quite a lot. Input to improvements come from their internal team, from the client team, from knowledgeable people not directly involved in the project, and for the target customers.

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37 www.npd-solutions.com/qrd.html
38 Akao, Yoji (1990)
5. **Implement** the new concept for commercialization. This is often the most time consuming part in the process and also the one that is hardest to succeed with.

A demonstration of the process is when IDEO did a 5 days project showed at ABC’s *Nightline* were a big television audience got the opportunity to “see innovation happen”. They IDEO team’s task was to do redesign the shopping cart used in almost every grocery store. The team consisting of engineers, designers, psychologists, architects, administrators and linguistics started at 9 am a Monday morning by splitting to smaller groups to emerge themselves in grocery shopping, shopping carts and relevant technologies. The team members were observing people shop with a fresh perspective and could therefore find some major problems and difficulties when using the carts, they interviewed experts in carts and material, investigated design possibilities going for example to bike firms near by and also spoke to professional buyers who purchase carts from large store chains. By the end of the day three goals had emerged: make the cart more child friendly, figure out a more efficient shopping system, and increase safety.

The next step was to do a brainstorming using post it notes where every idea was considered and after choosing the most promising ones among hundreds of ideas, the coolest ones that could still be built in a few days; it was time to do prototypes of them. All of this done within hours since there was tight time restraints. The best feature of each prototype was chosen and each part of the prototypes was investigated and designed further by different members of the team. On the fifth day the totally new designed cart was finally ready. The old boxy cart we all know and hate had been replaced by a sleek, gleaming creation, much more functional than the older ones and also much easier to drive and turn around. After the show a lot of people contacted IDEO, not to ask about the shopping cart, but to ask about the process used to develop it. The IDEO was amazed by the huge response but maybe they shouldn’t have been. The fact is, everybody talks about innovation and creativity, but not many people perform the feats in a successful way or without a safety net.  

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4 Tools

This chapter describes different tools that can be used as building blocks in the process to generate customer driven innovations. The different tools used are stimuli for coming up with ideas, selector for selecting a group to survey, collector to collect the data and analyser for analysing gathered data. There is also a spotter over viewing the whole investigation.

4.1 Tools in General

When designing a new method for generating innovation some trial and error experience complemented with literature search give the result that the necessary tools for the process are: stimuli, selector, collector, analyzer and spotter (see figure 12). Each of the tools has its own specific task to do when the process is implemented and the tools can be performed in many different ways depending on what is most suitable for the situation investigated. The important thing is to find a combination of techniques that are as effective as possible for filling the purposes the process should achieve. A survey to give a perspicuous list of techniques has been done in order to know the most important alternatives for each tool to choose between.

![Diagram of tools necessary for the process](image)

**Figure 9.** Figure of the tools necessary for the process

The first step includes using a stimuli tool which brings new ideas to life. This is an important step because without an idea there is no starting point for the process. When the first idea has been born a selection of population to investigate is done to get information and data connected to the new idea. When the population is chosen the data collection phase starts and during the collection the information is analyzed progressively to give the researcher opportunity to see which and when new direction for the investigation should be taken. During the whole process a spotter tool is used which means that an expert is looking at and evaluates every step. It is then easier to faster find the right track the investigation should follow but also to faster see when good results are found and when it is time to change direction.
4.2 Stimuli

A stimulus is the tool that trigs our thinking and makes us come up with new ideas. Using the stimuli tool is the very first step in the process of tracking a need and the tool is used from the first beginning but would also be possible to use in the refining step. The refining step mainly mean that the process start all over again but this time a more narrow area is investigated, the area found when doing the first analysis.

Figure 10. Figure of the different stimuli

The stimuli can include any kind of application as long as it makes the person come up with new ideas. Methods used to bring out stimuli are for example questions, “Guessing Technique” with objects, “bugs” or irritations, brainstorming and interviews (see figure 13).

4.2.1 Objects

“Guessing Technique” is a type of triggering and brainstorming technique that involves giving a person an object that is hard to identify and then make the person come up with ideas of what the object might be used for. In that way new areas of usage can be discovered and new ideas can be generated. This could be a good idea if there is a specific technical tool to investigate. It is very important how to design the “object” to really find the information you are looking for.

Advantages with this method are that many mistakes can be avoided when designing a new product if the customer opinion is given at an early stage. If a person is really holding an object and tries to imaging what it would be like to use it, it is easier to understand what is practical realistic and what is not.

Disadvantages are that a more narrow area must be chosen immediately with the guessing technique method which is not appropriate for this investigation. Beside this, there would probably be a lot of research just to decide how to design the object to receive “right answers” and that is both time consuming and expert demanding research.

Another interesting idea could be to give a person an already existing object which usage is very hard to identify. By letting the person using the imagination to decide the purpose of using the object new interesting ideas for products could be generated.
4.2.2 Observation

To do observations is another stimulus. By following a person for one day and take notes of how the person perform the job and deal with problems that occur can give new ideas for innovations that are needed. Often a person has a daily routine while working and might not notice problems or see new solutions that could make the job easier to handle but if persons from the “outside” do the observation they see everything with new eyes and have not reached the sensory adaptation. This kind of study assumes a smaller area that is investigated since it is a very time inefficient method and for the researcher to be able to compare different situations and see common themes of problems occurring during the observation. Observation can be a stimuli tool if the researcher is choosing an area to observe and then let a problem found lead to a more narrow and specific investigation.

Disadvantages are that the methods give a better result if more narrow area is investigated. It is not suitable to use if there is a limitation concerning the time since doing an observation is very time consuming method.

Advantages are that since people often reach sensory adaptation when experiencing something every day it could be difficult, if not impossible, for them to see problems. There would also be a possibility to discover things that are not even problems but just a bit ineffective compared to a better way of doing it. By asking people they would never see this and definitely not pronounce them as problems so the only way of catching the idea of a new innovation is by doing observations.

4.2.3 Irritations

Sometimes one can use irritations or “bugs” as stimuli. An irritation is obviously something that annoys one and something that one wants to get rid of. In that way it is a good start point for the innovation process. This could give a hunch about problems that can be solved with technical solutions. One way in which this kind of approach can be used is by choosing a quantity of people and to ask them to, during for example one week, take notes of every irritation element that occur in their every day life. How to decide the selections of respondent depend on what kind of survey that is done but it is important to do the selection in a way that is relevant for the investigation. Another way of finding irritations is to select a group of people and ask them about things that have been irritating for them recently.

Disadvantages can be that if gathering people and ask them about irritating incidents that have happened recently they probably can’t remember them all. It might also be difficult to chose the right population if a specific kind of innovation is search for and to get people that are trustful.

Advantages are that this kind of investigation can full fill the goal of finding hidden needs among a more general population. For example before the Sony walkman came a person could have noted at the list of irritating incidents that he had to switch off his favorite music every time he went out. It is important that the people in the study are trustful and responsible to get a good result in the end. It is a method rather to find new break through innovations than product developments.
4.2.4 Brainstorming

Brainstorming is often used to generate new ideas and to solve difficult problems. It can without any difficulties be used in a general process. Brainstorming works by focusing on a problem to come up with many radical solutions to it. Brainstorming can be used either by an individual or in groups where participants are discussing different ideas.

Individual brainstorming will probably make the individual doing the brainstorming generates more ideas than if the person was in a group. One does not have to think of other peoples opinions and can create more freely. On the other hand ideas do not get developed as effectively as in a group when there is no access of the group’s experience. 40

With group brainstorming participants should have as different background as possible. That brings a wide range of experience to the group and makes it more creative. No ideas should be criticised during the session since what at first seems to be a silly thought might be the next thing everybody wants to have. Criticising the ideas during the generation would stop the idea generation process. Once one participant has come up with an idea somebody else can continue building and so on. 41

Tom Kelly, general manager of the Silicon Valley-based design firm IDEO, is writing in his book “The Art of Innovation” about seven secrets for better brainstorming.

1. Sharpen the focus
One should always start with a well defined problem. It can be a question or a statement of a problem. Without a good problem statement it is difficult to guide the right direction of the discussion and it will take a lot of luck and extra talent to succeed. The question or problem statement should not be to narrow, it is better if it is too broad then to narrow.

2. Playful rules
The ideas should not be criticised or debated during the session. There should be well exposed brainstorming rules in the session room. The rules are supposed to be for example, “Go for quantity,” “Encourage wild ideas,” or “Be visual.”

3. Number your ideas
Numbering the ideas helps in to ways. One of it is that it motivates the participants before and during the session, for example the facilitator (person holding the session) could say “Let’s try to get hundred ideas during one hour”. The other way in which numbering the ideas helps is that it is a good technique for jumping back and forth idea to idea without losing track of where you are. One hundred ideas per hour is a good measurement and one hundred and fifty ideas per hour are pushing the limit.

4. Build and jump

40 http://www.mindtools.com/brainstm.html

41 http://www.mindtools.com/brainstm.html
Brainstorming usually follows a certain path. It starts with a series of steep “power” curves where momentum builds slowly, then intensely, then starts to plateau. Building on an idea means encouraging another push or introducing a small variation. When an idea gets emptied it is good considering jumping either back to an earlier path that was discussed to quickly or forward to a completely new idea.

5. The space remembers
There should be large white boards, post it notes and large pieces of paper on the table so that the facilitator can write down the generated ideas. All ideas should be disposable and nothing should be erased to make space for new ideas. When everything is visible there is opportunity of going back to the ideas that was just mentioned earlier and not discussed enough.

6. Stretch your mental muscles
Even thou people are busy and don’t have time it good to have a warming-up in certain circumstances. This is the case especially for when the group has not worked together before or when most of the group doesn’t brainstorm frequently. It holds also for the circumstance when the group seems distracted by pressing but unrelated issues.

7. Get physical
Performing good brainstorming includes getting visual. Tools like sketching, mind mapping, diagrams and stick figures are all used. Not only two dimensional tools are used, there are also three different tree dimensional tools. The first one is bringing in competitors solutions to the problem and also elegant solutions from other fields as well as promising technologies that could be applied to the problem. The second way is using: blocks, foam core, tubing and duct tape to build models. The third and last way is “body storming,” which means that we act out current behaviour/usage patterns and see how those might be altered.

If the above described was seven secrets for better brainstorming what will now come is a few ways to kill a brainstorming.

8. The boss gets to speak first
When the boss is the one that gets to speak first he will start with setting the agenda and boundaries. He might say that he wants every new idea to be able to be manufactured and that he wants only great ideas. In that way nobody will dare to say anything and the result will be no ideas. If possible the boss should not attend the session.

9. Everybody gets a turn
A meeting where a group of people sit around a table and everybody gets their two minutes to speak and it goes around the table like that is not brainstorming.

10. Experts only please
Sessions with lots of different expert for example an engineer, a martial expert and a software guru are not a good way of performing brainstorming. People from manufacturing, customers and other kind of people that don’t have the “right” kind of degrees might have the insight that is needed for the problem.
11. Write down everything
One should not concentrate on writing down every single thing that is said. What happens then is that focus on brainstorming and coming up with new ideas is lost.\textsuperscript{42}

4.2.5 Interviews
Interviews with different kind of experts are another method that can be used to come up with new ideas. One could use parts from von Hippel’s “Lead User Method” (see 3.3.4 The Sources of Innovation) to find trends and interesting areas of investigation.

4.3 Selector
Selector is the tool used to limit and choose the right population for examination. When choosing the population to exam there are several things to be considered. In a by us proposed procedure consists the first step of identifying all individuals that have interest in the studied area that is previously chosen with the stimuli. Persons of interest to be considered are users, manufacturers, customers and producers. After identification the different groups have to be ranked by importance. Finally the groups that influence most are the one chosen to study.

A more precise procedure that includes a 6-step process that researcher can follow when drawing a sample of population is described:

1. Define the target population: The researcher must decide weather the target population consists of individuals, households, business firms or some other unit. In making this specification the researcher at the same time must specify what units are to be excluded, for example geographic boundaries, time limitations etc. When identifying the target population it is important that the researcher is precise and specifies exactly what elements that is of interest and what elements are to be excluded.

2. Identifying the sampling frame: This step involves listing of the elements from which the actual sample is drawn, for example the telephone book. One of the tricky tasks a researcher has is to identify an appropriate sampling frame when the list of population elements is not readily available.

3. Selecting a sample procedure: This is depending on the sample frame. Even a simple random sample requires that a complete, accurate list of population elements to be available.

4. Determine the sample size: How big should the sample size be to make the investigation trustable?

5. Select the sampling elements: How does the researcher want to collect the data, which method is he going to use?

6. Collect data from the designated elements: Using method decided in the step above the researcher starts to collect data.\textsuperscript{43}

\textsuperscript{42} Kelly, Tom (2001)
4.4 Collector

Collector is a tool consisting of different methods for data gathering. Different types of collectors are used in first and fourth steps of the process (see figure 14) when making a market research. Collectors could be focus groups, depth interviews, phone interviews, mail surveys and observations.

![COLLECTOR Diagram]

**Figure 11.** Figure over different collectors

Parts of methods such as discourse analyses and grounded theory (see chapter 3.1.1 Grounded Theory and 3.1.2 Discourse Analyses) are also used to collect data. With those methods one should do interviews with broad questions and make the respondents talk freely. Parts of another method called protocol analysis are also used for collecting the data (see 3.1.3 Protocol Analyses).

4.4.1 Depth Interview

A depth interview is a conversation with one respondent and one interviewer that collects specific information about the respondent. When performing depth interviews there is usually a smaller sample and participants are not selected with random methods. Depth interviews are always arranged in advance via a letter, phone call, fax or e-mail. They usually last for one or two hours. Depth interviews are conducted in a location convenient to the person being interviewed and away from distractions.

When conducting the market research the role of the depth interview is:

- Exploring the boundaries of a problem
- Obtaining evidence for a problem or issue
- Evaluating potential solutions
- Managing the research process

In general depth interviews start with a written set of questions, but respondent’s answer determine the direction the interview takes next. The interviewer does not have to follow a specific order when asking the questions and should allow the respondent to bring up topics not on the list of questions and be prepared to follow his or her train of thought. Unstructured interviews are more like a conversation.

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43 McQuarrie, Edward F. (1996)
It is important that the interviewer makes clear before the start of the interview that the information will remain confidential. In that way respondent feels much easier to talk freely. The interviewer should start the conversation with telling what will happen during the interview and how the information will be used. He should also tell the purpose of the interview. It is important to be polite and thank participants for their time and help. The interviewer has to be interested by the topic and by the respondents to be able to get good answers and ask the right follow up questions. It is useful to ask same question but asked slightly differently several times through the interview in order encourage respondents to reveal additional facets of the key of issue.

When conducting a depth interview:

- Keep the questions simple and ask only one thing at a time
- Avoid yes/no questions by asking “how” or “what” rather then “do you”
- Avoid asking leading questions
- Help people come up with ideas

Interviewers in depth interviews use often follow up questions, for example “Please tell me more about”, to get more information or to clarify statements already made by the participants. If there are pauses in the interview the interviewer should not feel uncomfortable and feel that all pauses must be filled. Sometimes the respondent is just trying to formulate an answer and if disturbed that information can get lost. Interviewer’s body language should show that he or she is interested in what the respondent has to say. That is achieved by making sounds (such as “Yes I see”) indicating that you are interested.

Depth interviews can be preformed either with open or structured questions (see 3.1.5 Market research).

Advantages with using in depth interviews are many. Compared to focus groups it is often easier to speak to one person and keep her attention than address a group. It is also easier to make appointment with only one person than to try to schedule different persons for same time. The respondents are not influenced by each other. Compared to closed questions and questionnaires are depth interviews more detailed and there is a chance to follow-up on questions and probe for meaning. Advantages are also that the respondent’s reaction can be noted while performing the interview.

Disadvantage is that it takes more time if the different respondents are in different places and the person performing the survey has to go to the different places.

4.4.2 Surveys

A survey is a structured series of questions that is administrated to a large number of persons. Surveys usually require data analysis using some statistical methods. Surveys and questionnaires are some of the most used methods for doing market research.

They give information that is current and in certain situations, data may be collected and analyzed during a short time period (two to four weeks).

When conducting a survey one usually begin with a written questionnaire and proceed in a systematic manner. One and same questionnaire is given to many different persons. The opening questions should capture the respondent’s interest and motivate him or her to continue to answer the remaining questions. In the beginning of the questionnaire the questions are most of the time close-ended which means that they need a simple answer such as yes or no. The questions at the end of the survey are often open-ended meaning that there is free space for the respondent to write whatever she or he wants.

One should always begin with small-scale, well-focused surveys. After trying the questionnaire on a certain chosen test group feedback can be received and questionnaire if so necessary improved. The questionnaire should be kept as small and simple as possible.

Mail surveys are the most time effective, lots of people can be reached with little time effort. They are also the one that are most impersonal. The reaction of the respondents can not be noticed in any way, neither by the voice or their appearance. It is easy to reject participate in the survey when all one have to do is not answering the mail.

Phone interviews are best performed with structured questions. It can be difficult to carry out phone interviews with open questions when it is not possible to see people’s reaction to different questions and notice if they understand the questions. It is also difficult to make people speak freely over the phone. An advantage with phone interviews is that it is more time effective than face to face interviews. A disadvantage is that it is easier for respondents to reject participating in the survey over the phone.

4.4.3 Focus Groups

Focus groups are one of the most frequently used qualitative techniques and one of the most popular tools for conducting market research. When using focus groups for market research a small number of individuals are brought together to discuss a topic chosen by the focus group sponsor. Focus group attendants are usually individuals that in some way have interest and are familiar with the subject of discussion. A moderator directs the discussion and makes sure that the voices of all attendants are included in the groups’ discussion. The group discussion should be dynamic, like a conversation.

Focus groups are used for a variety of purposes (Quotation; “Marketing Research: Methodological Foundations”, 9th edition, Gilbert A. Churchill, Jr. and Dawn Iacobucci, Bokforlag Thomson South-Western 2005):

- Generate hypotheses that can be further tasted quantitatively
- Generate information helpful in structuring consumer questionnaires
- Provide background information on a product category
- Obtain customer impressions on new product concepts or ad copy
The number of participants in each focus group should be between eight and twelve. In groups smaller than that there is a large risk that they get dominated by one or to attendants. In larger groups members have to wait their turn to respond or get involved why frustration and boredom can arise as a result. Members of each focus group are chosen carefully to make each group homogeneous; minimizing differences in experience and so the conflicts among group members as well as irrelevant attributes. Not considering above mentioned characteristics can frighten some of the attendants and stifle discussion.

People that already have attended focus groups before should not be chosen to participate. Reason is that those people tend to behave as “experts” and cause the group to behave in dysfunctional ways. Also people that know each other since before or that are relatives should be left out because they tent to only talk to each other.

Number of groups varies between four and twelve, but a typical project consists of four groups and a typical focus group session lasts from one and a half to two hours.

The person that directs discussion is called moderator and has a key role. Moderators work starts long before the actual focus group. Prior to the session moderator has to plan the session, learn about the topic of the discussion and prepare moderators guide with points to cover. There are several different qualities that a moderator is desired to have:

- **Personable:** A moderator should have ability to easily make people talk and feel comfortable. He or she should not pretend to know all and be domineering, sometimes are the group members the one that have most knowledge about the topic.

- **Superior Listening Ability:** A moderator should pay attention to what the group members are saying and may not miss any comments. He or she should not speak a lot and instead let the participants talk. The moderator is not supposed to express his own thoughts about a certain question.

- **A quick learner:** A moderator should have the ability to learn quickly about a new subject in order to be able to easily re guide the conversation if necessary.

- **High energy level:** A moderator should have ability to bring some energy and life in the group if the group gets laidback. When the group gets lifeless it lowers the quality of the discussion.

A session often starts with a warm-up period. This includes a quick introduction of the moderator, the topic of discussion and participants presenting themselves in few words. Purpose of the warm-up period is to make everybody feel comfortable and to start the conversation. After asking some general questions moderator try to make participants talk to each other about the topic of discussion rather then to him. Finally he fades into the background focusing on what is said in the conversation and taking notes. An impotent task for moderator is to know when to let the discussion follow some unanticipated path or when to redirect the members back in and move on to the next point on the moderator’s guide. The moderator must encourage all of the group members to participate in the discussion and be neutral and objective.

After the session there remains a lot of work for the moderator. Moderator’s task now is to supervise the preparation of a transcript of the conducted focus group interviews.
and use the transcript to a report for the client detailing the key insights that group generated.

Advantages with focus groups are that they are especially suited for feedback on new product concepts, advertising copy or proposed marketing promotions, product and service positioning, and product usability tests. They are also an excellent tool for generating ideas and insights.

Disadvantages can be that groups should not be used for answers to numerical questions and when one can not afford a survey. A problem is that group-think which prevents new individual ideas can occur. Another difficulty with focus groups is that individuals have little time to speak individually and participants may hide or be passive. In that case it is important with a good moderator that is able to engage all participants.45

4.4.4 Observations

Observational data can be gathered by using either structured or unstructured methods that can be disguised or undisguised. The unstructured method is used when the problem is specific and is well-suited for exploratory research. Structured observations on the other hand are done when the problem is very specific. Disguised or undisguised means if the person knows that he is observed or not.

It is important to develop a written procedure for observation before going out in the field. The procedure may consist of a checklist or things to look for, specific questions to answer, and space for writing in independent notes. The procedure makes sure that the data is collected in a systematic way and makes the data more useful.

So, what should do an observer want to observe? The researcher should specify the following things:

- Who should be observed?
- What aspect of the purchase should be reported?
- When should the observation be made?
- Where the observation should be made?

These questions must be made in the selecting the research design. The why and how are also important questions that must be considered were the why is decided by the research problem and the how involves choosing the observation device or form to use46.

Advantage is that it gives information that people are unwilling or unable to speak about, sometimes this is the only way of gathering this kind of information.

Disadvantages can be that feelings, attitude, motive and personal behaviors not observed. When using this method it is common to use it as a compliment to other methods.

46 McQuarrie, Edward F. (1996)
4.4.5 Camping-out

One way of doing this is through the “camping-out” method which means that a researcher is spending a longer time in the environment were people investigated are working. The researcher will then get to know the environment and the people to be able to understand and see how different tasks are done but also to see which tasks that are done in an inefficient or unnecessary complicated way. This takes a long time, often two weeks or more, why it is an expensive and time ineffective method but it can at the same time give a very good result. The researcher observes the customer as well as speaks to the customer during this time.\(^{47}\)

4.5 Analyzer

To analyze the data there are several different tools available (see figure 15). There is grounded theory (see 3.1.1 The Grounded Theory), discourse analysis (see 3.1.2 Discourse Analysis) and protocol analysis (see 3.1.3 Protocol Analysis). In order to those analysing methods we have come up with two new tools one of them called “Spotter model” and the other one the Grounded Theory and Protocol Analyses inspired “Theme Model”.

![Diagram of analyzers](image)

Figure 12. Figure over different analyzers

When analysing surveys the data needs to be cleaned as a first step. This means that someone needs to go through the responses and make sure that they are reliable and that they make sense. Afterwards statistical methods are used to present the data.

When analysing observation or depth interviews one should look for answers to some different questions, some of them are:

\(^{47}\) Cooper, Robert G (2001)
- Are there any striking or surprising findings?
- What questions do they give rise to? What questions do they answer?
- Do they tell about any new needs?
4.5.1 The Spotter Model

The nature of collected data
The base in the “Spotter Model” is that the collected data will generate all different kind of needs. There will be needs not possible to solve (for example if a person don’t want to die, there is no solution to give a person eternal life), needs with a non technical solution (for example needs concerning emotions), needs with a technical solution but without any business opportunity and finally the little layer of needs that are of importance and that are needs with a technical solution and a business opportunity (see figure 16). This is a spotter dependent way when doing analyse and the spotter should have both the technological and business knowledge in order to spot the opportunities or “where the money is”.

The analyse process:

1. The first step when analysing the data is to find any kind of need expressed by the respondent and to collect them in a category. Some needs are impossible to work out, like making world peace, and there is no idea to put effort in trying to solve them so further sorting must be done before starting inventing.
2. When all needs are found the needs that can be solved must be selected and put into a sub category. This includes needs with or without a technical solution while it is still necessary to do further limitations to get only the needs that can be fulfilled by technical tools.

3. The third step is to find a second sub category containing all the needs that possibly can be solved by a technical solution. Here the spotter has an important roll since a need that at the first look seems to be a need without technical solution actually can be solve in a technical way if an engineer or product developer starts to think in a new way. The spotter is the expert who can think of technical solutions and if he is not a skilled person many breakthrough ideas can in this step be wasted.

4. The second step is the last one and here the most promising technical solution is chosen. Some of the needs from sub category two might already have solutions or are not important enough to waste money for further investigation. The spotter is also in this step very important and he must have business knowledge to be able to distinguish the good opportunities that can become a success from the bad ones. Then an idea for a product is borne and a more developed product specification can be done.

**Defining opportunities**
Following issues should be considered by the spotter when defining opportunities. These criteria are based on good business sense so the person judging must be familiar with and have experience of the innovation process. A specific product is still not chosen, only a need that can possibly be satisfied by a new product. But to know if there is any idea to continue doing further investments and to create a real prototype these criteria can be considered:

**Market:**
1. What does the market look like today?
2. Are there similar products at the market already?
3. Which are the customers?
4. What value will a product add to the customers?
5. How big is the market size?
6. What is the market capacity?
7. Are there any barriers to entry the market?

**Investment:**
1. How big is the risk when doing the investment?
2. How big can the reward become?
3. Is the timing the best to make the product now?
4. Do we have the right technology?
5. What pricing level is suitable?
6. How is the sales growth?
4.5.2 The Theme Model

The nature of data
This model is suitable when the data is consisting of many kinds of problems and needs. It can only be used when data have been collected through in-depth-interviews and the analyze method is grounded on the analysis method used in the grounded theory and protocol analysis. The data collection phase should continue until a saturation phase is reached and until no more, or almost no more, new data can be added to the collection.

The analyse process
Once the depth interviews are conducted the next question is how to analyse the collected data? When doing the interviews the researcher takes key word notes that are, as soon as possible after the interview, written down in a document. The text is then analysed sentence by sentence and the analyser should look for themes that are occurring. If one finds many different themes one might see if there are ways to categorise them and to cluster them in a meaningful way, such as by type or participant. For example it might emerge that young and old participants feel different or that woman and men have different opinions.

The analyser should try to be open minded to find as many incidents as possible. The analysis should be done from the beginning of the data collection phase and continue progressively during the whole investigation. When the themes occurs the interview questions should be asked with a slightly different approach to narrow the investigated area to follow the most important categories found from the analysis.

When analyzing depth interviews it is important to have some questions in mind and see which answers emerges. The questions to bee asked are:

1. Are there any striking or surprising findings?
2. What questions do they give rise to? What questions do they answer?
3. Do they tell you about any new needs?
4. Do they tell you about anything that raises frustration?
5. Do they tell you about any problems?

When each interview is analysed the next step is to look at them all as a whole and to compare the answers to find similarities and differences. This is done to be able to make connections between reasons and needs and to get a complete map over the situation. Following questions can then be useful:

1. Which common themes can you find in the answers from different respondents?
2. Which differences can you find?
3. Can you categories the needs and problems that are common?
4. Do different respondents find the same issues important or is there a difference?

In the analysis the themes is divided to different categories of needs among which one of the biggest categories can be considered being the most important opportunity for a new invention. Here there is a complicated part when the researcher must decide weather one category of needs can be solved by a technical solution or not and it can
be useful to ask a spotter for help to get advice from an expert. Another difficult problem is how to decide which category that is the most important and promising one, also here a spotter can be helpful if not necessary to consult.

### 4.6 Spotter

Through the whole process a tool named spotter is used. The spotter is an experienced person that has worked with innovation before and that has the ability to see opportunities as they occur along the whole process. The spotter is the person who makes all the qualified decisions and is support. He or she is also the person saying stop if they can in an early stage see that the investigation is not leading to any opportunities. The spotter should have both the technological and business knowledge so that she or he will be able to spot the opportunities or “where the money is”.

Another though is that the spotter is a software tool where some data should be taped in. Based on several previously worked out questions the tool should be able to calculate if the data can provide an opportunity or not.

The spotter should not interfere in the rest of the process like collecting the data or conducting the interviews because he or she can be affected by the respondents. There is an advantage in having several spotters when what one person sees as a business opportunity is not sure that the other will too.
5 Empirics and Analysis of Case Study I and II

In this chapter are described the two trials and case studies that lead to the final process.

5.1 Trial Procedure

This project is different from the most master theses where the students start with a hypothesis decided in advance or a specific goal to aim for from the beginning. In this project one important thing was instead to start at one point and then to wait and see the result and to take this in consideration when deciding a new choice of direction, without any preconceived thoughts.

One of the targets was to find a simple process why every step in the process was judged after three criteria:

- Simplicity to understand
- Simplicity to use/perform investigation
- Simplicity to analyse and understand results

Another important goal was to consider whether the result searched for was really the one captured in the end, if the process generated needs a person is not aware of but that can be solved with a technical solution.

The project consists of two parts, the first trial and the second trial, containing four different steps:

- To collect data
- To analyze and describe the information
- To interpret the results
- To evaluate the interpretations

5.2 First Trial

The first trial started with a “playing around” phase to learn more about and get deeper understanding for the purpose with the project. A very wide and open question was asked to the respondents and progressively during the investigation the question was extended to a few questions and were refined to finally lead directly to ideas for technical solution. The original idea was to use the Grounded Theory as the research method. When starting investigating how to use the Grounded Theory it was discovered that it is not possible to use it in the way intended (this became clear through reading about it and speaking to experts within the subject) but still many of the ideas from the method seemed to be suitable. Therefore the decision was taken to still use the data collection method where analysing and the gathering of data are done progressively at the same time. It is also important to continuously categorize the data and look for common themes.

The first step in the playing phase was to do a data collection using the very broad question: “Can you tell us about a problem you have had recently?” The idea came from Ulwick’s research since he is advocating that it is important to use an outcome-
driven innovation process and to investigate what job a customer need to have done instead of ask the customer of the solutions immediately. Different from Ulwick’s ideas was the goal of finding a process that started at an earlier point than his, to start from scratch and then during the gathering of data let the data lead the investigation in a specific direction.

The population investigated was randomly chosen people since the goal were to find every day problems that was bothering a big range of different people. Things that was so common that people had just accepted them as a fact and not ever though of that a technical solution could help them avoid or eliminate the problems. By using a very broad question a big range of different answers was expected that could be categorized after the character of the problem.

The chosen method consists of several steps (see figure 17):

1. Market research with wide questions
2. Analyse the answers and categorise them
3. Choose one category
4. Do another deeper market research within the chosen category
5. Analysing the answers to find customer needs
6. Do a product specification that suits the needs

**Step 1**
In this step a market research is done by asking a very open question to find a wide range of problems that occur in people’s everyday life. The investigated population is a group of random selected people since the purpose is to survey the customer’s opinion, not the inventors or the product developers. The question should, at least at the start, be asked face to face to see how the people react and should only require a quick answer. This gives the researcher the possibility to interview a large group of people which is necessary since a wide range of different answers will be gathered and to be able to find themes within the data. The really wide question: “Tell us about
any problem that you have had recently” will be asked in the start and people will be allowed to give any kind of answer, personal problems as well as technical. It is important that the researcher doesn’t give leading hints about any kind of problem since the answer than can then be influenced. Sometimes problems that seem to be non technical can anyway be solved with a technical solution if someone looks at the problem from a different point of vie. That is why the goal is to survey any kind of problem.

The innovativeness with this approach is that the interviewed people will give the subjects to be studied themselves. People’s real problems and needs will be in focus. In the first step parallels can be drawn with Ulwick’s ideas about innovation were his says “What is the job to be done” (see 3.3.3 Ulwicks’s Ideas about Innovations)

**Step 2**
The second step is to look for themes in the collection of data and to sort the answer in different categories. Analyse every answer sentence by sentence and find as many themes as possible. While reading the answers all the other answers should be kept in mind at the same time. Each category includes problems that relates to each other and that are fundamentally caused by the same problem. The whole second step is done according to Grounded theory (see 3.1.1 The Grounded Theory).

**Step 3**
The category including most answers, which is obviously the category that causes most problems, is then chosen to proceed with for further investigation. A very open question will probably give a big range of problems and since some of them are mentioned by only a few respondents they is not problems that can generate a big market sale. Therefore they are not of importance enough to investigate further. There will also be problems that can not be solved at all or not with technical solutions and they too have to be excluded before the next trial.

**Step 4**
Now when one category has been chosen a new questionnaire is designed for a deeper and narrower study within this specific area. The investigated population is still random people but the questionnaire is more extent and the interviews should take around 10 minutes each. The questionnaire should consist of open questions, but concern the chosen category, since we do not want to lead the interview in a specific direction. When starting interviewing a face to face approach will be done in the beginning, this to be able to see if people understand the questions in the right way and to see if further sub questions are necessary. When the questionnaire is approved a web tool will be used to give a more time effective method.

**Step 5**
From the new data another analyse is taking place where the customers needs are surveyed. This is done by using the same methods as above, analyzing every sentence and different needs are collected in categories.

## 5.3 Case Study I

In the first trial a process starting at the earliest point in the innovation process was tested. The goal was to generate product ideas without doing any kind of narrowing of
investigation area before starting. In the first trial and case study several different collector tools were tried out. As a stimulus the question “Can you tell us about any problem you have had recently?” was used and it resulted in a wide range of problems existing among people for which there evidentially not exists a solution that is good enough (for example of the first phase interviews see appendix B). By looking at the different problems categories with problems of the same type could be identified and the one that was most occurring, time management was chosen to go further with.

It was quite easy to categories the answers and the method used was based on readings of the grounded theory where the researcher was looking for themes in the collected data and then arranged the problems in different categories.

The next step was to refine the questions within a more narrow area and naturally the decision was to proceed within the most occurring category, time management. This market research phase started by doing interviews with questions about how respondents managed their time and problems they had with doing it. After some face to face interviews when testing a first draft of questionnaire it became clear that the questions had to be more technical oriented questions to generate answers that could lead to a technical solution. When the questionnaire had been tested and rewritten a web tool was used to collect more data during a shorter time.

Next step was to create a product specification (see Table 2.) from the data collected in the refined questionnaire. The web tool was forcing the researchers to ask more specific questions about especially technical solutions which was not really in line with the process search for. Even though it was not really a satisfying method of collecting data a product specification was carried out to go through the whole process once to be able to refine every step next trial. When doing the specification the data from the time management investigation was analyzed to find indications of properties that the product should have. The result can be seen in table 2 below:

<table>
<thead>
<tr>
<th>Invention</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizer or electrical calendar</td>
<td>- Easy to carry</td>
</tr>
<tr>
<td></td>
<td>- Easy to use</td>
</tr>
<tr>
<td></td>
<td>- Help to structure time</td>
</tr>
<tr>
<td></td>
<td>- Help to make a good planning</td>
</tr>
<tr>
<td></td>
<td>- Priority to more important</td>
</tr>
<tr>
<td></td>
<td>things/sorted by priority</td>
</tr>
<tr>
<td></td>
<td>- Personal planning tool</td>
</tr>
<tr>
<td></td>
<td>- Reminder function</td>
</tr>
<tr>
<td>Electrical Personal assistant or robot</td>
<td>- Take away boring work</td>
</tr>
<tr>
<td></td>
<td>- That can push you to do things</td>
</tr>
</tbody>
</table>

**Table 2. Product specification from the first trial**

5.4 Conclusion for the First Trial

**Step 1: Market research with a wide question**

After and during case study I it became clear that it was difficult to gather trustful data by choosing random people at the street. The start question was too wide since respondents became confused and seemed to feel stressed when trying to find an answer. Stopping people in the street doesn’t give the respondent time to think of a
problem that really had been bothering them and some immediately thought that their personal problems was search for and didn’t want to answer. When we, in a few cases, tried to give leading hints about technical solutions we immediately saw that the respondents directly locked themselves and started to think only within the narrow area of the example we just gave. If using a wide question it is very important not to give any direction about what kind of reply search for since this affect the answer from the respondent. It was though a successful way of finding new ideas since we achieved some categories were people in general seemed to have problems; the most occurring category was time management. The advantage with this stimuli tool is that every day problems can be found that occur among a wide range of people. The disadvantage is that it might exist other problems that people don’t come to think of immediately but that are more important. Another disadvantage is that some respondents thought about personal problems which would be easier to tell about if the method was confidential.

**Step 2: Analyze the answers and categories them**
An analysis for the first trial was made with the Grounded Theory inspired The Theme Model. The model worked and gave some different categories that seemed to be problematic for many people. It was a good way of choosing a more narrow area to investigate and it was quite easy to immediately see different categories occur and to find the most important ones.

**Step 3: Choose one category**
It was though a successful way of finding new ideas since we achieved some categories were people in general seemed to have problems; one of the categories was time management. A second part in the first trial was therefore made and the area of investigation was limited to comprise only time management but to investigate this area deeper.

**Step 4: Do a deeper market research within the area chosen**
In the second part of the first trial we used direct short questionnaires with only few questions. When studying time management this kind of questionnaire did bring out some problems and needs, but it was still hard for people to give us some good answers when they were stopped on the street. They felt stressed when we approached them since they were unprepared and found it hard to give any answer at all. Web tool was also used as a kind of questionnaire, we thought this might give respondents the opportunity to think and reflect over the questions and their answers. Another advantage with the web tool was that it could fast reach many people but when trying it we found that the replay rate was low and the opportunity of making follow up questions was missed out.

Using a web tool help us collect many answers but one disadvantage is that the opportunity of asking follow up questions is missed out and you can not observe any spoken signs in a respondent opinion. To make the questionnaire clear enough to send via mail we had to ask about specific technical solutions which were not our intention.

**Step 5: Analysing the answers to find customer needs**
The analysis for the first trial was made with the Grounded Theory inspired The Theme Model. The model worked and gave two product specifications in the end. After the first trial we realized that deeper questions would probably give much more
information from respondents but also that a small narrower of the investigation area would probably be necessary. We also decided to continue doing face to face questions since we in the first trial saw that body language and expression in the face gives a lot of information in addition to the only words. We also found that it was too vague to just pick random people and decided to use a more methodically way of selecting population of respondent in the next trial.

**Step 6: Do a product specification that suits the needs**
The product specification was made very briefly and if a product development would really have been on the carpet it should have been done much more carefully.

**Reflection**
This was our first trial where we were playing around and even though we learnt a lot we did not get a result that was good enough. It was mainly the first step when choosing investigation area that felt very insecure and uncertain. Based on this we now continued doing a refined version of the whole process to find a more accurate method in how to survey needs for innovations.

**5.5 Second Trial**
From the first trial the conclusion was made that the question “Can you tell us about any problem that you have had recently?” was too broad and unspecific. Because of that the decision was made to as a first step of the second trial choose a subject to study. It was now that the idea of a stimuli tool (see 4.2 Stimuli) was born. Brainstorming was used to choose the studied subject and in same time new types of stimuli were generated.

The second process (see figure 18) consists of six different steps. In addition to those six steps there is a function called “Spotter” that is used thought-out the whole process. The different steps are as followed;

![Figure 15. Figure over the process used in the second trial](image)

1. An idea is born
2. Select a group or category to study
3. Collect data about the chosen category or group
4. Analyse the collected data
5. If necessary do another collection of data
6. Do a product specification that suits the needs

Step 1: An idea is born
Everything starts with an idea. To generate that idea the tool called stimuli (see 4.2 Stimuli) is used. The idea can be generated in several different ways. One is to go out in the public and ask broad questions like “Tell me about any of your problems”. Other are to brainstorm and to hand out an unidentifiable object and ask people to describe what it might be used for.

Step 2: Select a group or category to study
Once the idea has been born and a subject of study is decided a group of people to study have to be chosen. When selecting a group to study all persons that might have any interest in the chosen subject have to bee identified. For selecting the group there is a tool called selector (see 4.3 Selector).

Step 3: Collect data about the chosen category or group
Next step in the process is gathering the data within the chosen subject and selected group. Data gathering is done with the tool named collector (see 4.4 Collector). The collector consists of several different techniques for obtaining information. Some of them are more preferred then others depending on factors such as cost and time.

Step 4: Analyze the collected data
When a certain amount of data has been gathered the analysing of the data takes place. The collected data is analyzed with the tool called analyser (see 4.5 Analyser). When analysing the data is divided into different categories and subcategories. Answers to questions like “Are there any new problems or ideas?” are screened for. If the data doesn’t give much information or if there is lack of information another trial of collecting data has to be done until the data is saturated.

Step 5: If necessary do another collection of data
In the refining step the questions asked in the collection step are refined, meaning some questions that seem to be unnecessary are taken away while new question that provides deeper information about the studied subject are added. The refining of the asked questions also is also conducted progressively during collecting information.

Step 6: Do a product specification that suits the needs
In the final step the investigation is supposed to end up in a product specification that is handed over to engineers for further investigating specific attributes and design for the product.

Through the whole process a certain tool and likewise a step in the process called “Spotter” (see 4.6 Spotter) is used. The spotter has a decisive roll when he or she is the one making all the important decisions. Another possibility is that that the spotter is a team of people with knowledge within the areas business, market and product development.
5.6 Case Study II

Using a brainstorming the area of heat exchangers was chosen as investigation area for the second trial. This because of previous knowledge in the subject and a connection of heat exchangers with chemistry studies (we have studied chemistry our first three years at university). After some research in the subject it appeared that there wasn’t any big heat exchanger industry in New Zealand why the investigation would be difficult to put through. The subject was therefore considered again and a decision of choosing another area was made.

After a new trial with brainstorming the idea of examining elderly care came up. This was thought to be a good idea when there are lots of elderly homes in the area around the University of Canterbury but also since old people often have plenty of time. It was also considered that there are a lot of problems and needs in the field of elderly care which give space for many improvements. When speaking to the managers of the elderly care homes it appeared that it was not suitable to do the survey there when a huge part off information was confidential and since they felt that they would have to speak to relatives connected to the people. The fact that our English is not perfect might also have been a factor that affected the result.

Once again the brainstorming was applied and finally the idea to examine university libraries emerged. They were all easy accessible and staff had understanding for students doing different kind of surveys, exactly what was needed when time was a question of matter (for explanation about the proceeded library interviews see Appendix D).

In the previous trial a web tool and questionnaires were used to collect the data. The problem with web tool was that it was too easy for the people that received the mail not to answer. Beside this it was also impossible to make follow up questions. Questionnaires were on the other hand found to short and not exploring the answers in the depth. For this second trial depth interviews were chosen as collecting tool. They explore the subject on the depth and allow following up questions. The part of asking the follow up questions is recognized from laddering method and it was used for depth interviews. The nature of depth interviews also allows taking new paths and making new questions. Because of the loose questionnaire the interviewed person is talking freely about subject and even suggesting the problems and solutions that the interviewer has not thought off. It was chosen not to do focus groups when it is difficult to schedule different persons and make them all come at same time. Another problem with focus groups is that the different participants influence each other and it is not certain that all voices are to be heard. Observations on the other hand can be giving, but is very time consuming and time was a limiting factor. A disadvantage with both focus groups and observations for the first data collection is also that the problem to investigate is not yet found. The purpose with asking wider question is to, from a very wide area, find specific problems.

A trial with using laddering

A smaller trial was done using the laddering technique to see how it would work. This is probably a useful method when the purpose is to find the deepest roots for a need but is that really necessary if a technical solution is searched for? The test experiments showed that if one kept going long enough it almost always became apparent that the reason for the need was that the respondent valued friends or family opinions. This
need would not create the base of a new technical product so therefore a test was done using the laddering partly but to stop before reaching the respondents deepest needs. This gave more satisfying results.

**Designing the first version of the questionnaire**
For the first trial there was a test questionnaire consisting of following questions:

1. Do you have any difficulties in your job?
2. Can you think of any problems that occur?
3. Can you imagine something that would make your job easier?

Each interview lasted between 20-40 minutes, since it became apparent during some test interviews that this was sufficient to get hold of all the important thoughts the respondent had. Beside this time was a limiting factor. It is always better to do several shorter interviews then a smaller number of longer interviews, because it is better to get different peoples opinions and views of the point. The interviewed persons were allowed to talk freely about the subject and as they spoke it appeared new follow up questions.

**Designing the second version of the questionnaire**
After that first part of library interviews, which consisted of four interviews, a procedure for the next interviews was made. Some things came apparent during this first set of interviews: the interviewer must always start with presenting themselves and explaining what the interview will be about and the purpose with the investigation. After the introduction and before starting the interview they must always say that what is said during the interview will remain confidential if that is the case. Saying that interview is performed under confidential circumstances make the participants more relaxed and open then they would have been otherwise. In the first set of interviews it also became apparent that it was important to from the beginning fully understand which task the respondent had in the library. This to be able to draw the right conclusions from the answers and to see the true connections between different respondents answers. The questionnaire was changed so that after the presentation of the interviewer the interviewer should ask the participants to tell about their job tasks and how an ordinary they day is like. It’s then possible to naturally make follow up questions and ask them to explain more as the respondents are speaking.

**Designing the third version of the questionnaire**
For the next set of interviews, also consisting of 4-5 respondents, the questionnaire was extended a bit further with new questions since some issues that were not asked about in the first trial reappeared very often. The third version of the set of questions was therefore consisting of following questions ((I) mean new added questions after the first refining, (II) new questions after second refining etc):

1. Present our selves:
   - Master students from Sweden
   - Thesis about finding a process for generating new innovations
   - Having the process and trying to test if working on libraries
   - Everything that is said confidential(II)
2. Can you tell us about your job and your tasks? (II)
3. Do you have any difficulties in your job? (I)
4. Can you think of any problems that occur? (I)
5. Do users seem to have any problems? (II)
6. Can you imagine something that would make your job easier? (I)

The refining process with the questionnaire continued after the second trial too. As the participants were interviewed new subjects and questions came up. The final questionnaire was consisting of following questions:

1. Present our selves:
   - Master students from Sweden
   - Thesis about finding a process for generating new innovations
   - Having a process and trying to test if working on libraries
   - Everything that is said confidential (II)
2. Can you tell us about your job and your tasks? (II)
3. Do books get stolen? (III)
4. Do books get miss shelved? (III)
5. Do you check if returned book are damaged or dirty? (III)
6. Do you have any difficulties in your job? (I)
7. Can you think of any problems that occur? (I)
8. Do users seem to have any problems? (II)
9. Can you imagine something that would make your job easier? (I)

The final set of questions was tried on two different libraries and at a total of seven participants. After these interviews it became apparent that there were no new subjects or questions emerging and the answers that were received were only repetition of previous answers. Parts of the grounded theory were used throughout the whole process and according to grounded theory (see 3.1.1 The Grounded Theory) one should stop doing interviews when the data is saturated so therefore the data collection phase for the second trial was here put to an end.

To see if it made any difference and if it was more effective the last three interviews were performed with just one interviewer. The interviewers ware no experts and it appeared that it was much better to be two interviewers, because two persons interpret words and body language different and come to think of different follow up questions. Also when the one of the interviewer is asking questions the other one can concentrate on listening, writing down what is said, take notes and observe the respondent to see if the body language is telling something more than what is spoken.

For the second trial the direction had changed and the focus were sat to discover problems instead of making a product specification. This was done because there is already much knowledge in how to make product specifications while there is little knowledge in how to discover needs in society.

**Analysis**
When analyzing interviews the interviewers were reading data and interpreting and categorising each and every sentence. All problems and needs were categorised according to the nature of the problem with the help of grounded theory inspired technique. Several different categories emerged and amongst them were work
environment, book ordering, communication and technical problems the ones that were most often repeated.

The discourse analysis is not used for analysing the data when it is a very subjective method. This process is supposed to be used by non professional people as well as professionals. Even professionals would have problems with analysing with discourse analyses if they have not done it before.

Once all problems and needs were identified and categorised it was time to use “The Spotter model” (see 4.5.1 The Spotter Model) to sort them. A lot of the identified problems and needs belonged to the second layer in the model meaning “Problems and needs that we can solve”. Doing open interviews means that a lot of needs will be gathered and when categorising it became clear that most of the problems were cause of communication difficulties (see appendix D-F with interviews). Never the less some of the problems and needs appearing in categories work environment, book ordering and technical problems could be spotted as belonging to the third layer, of “Problems and needs with technical solutions”. For example is one of the spotted problems too low and too high shelves. There certainly is a technical solution to that problem once it is handed over to engineers and designers.

The most difficult part in “The Spotter Model” is to identify the problems belonging to the most inner layer, the core of the whole model, “Problems and needs with business opportunity”. As already mentioned there is a need of expertise knowledge for this part. The results worthy a further investigation, data that seems to be needs that could be solved by technical solutions, are the following:

1. A big problem mention by almost every person interviewed was that books are missing and they can then either be misplaced, hidden or stolen. Some way of tracking books in the library would save time for people working there as well as for customers that don’t need to waste time looking and waiting for books.

2. A big problem mention by almost every person interviewed was that books are missing and they can then either be misplaced, hidden or stolen. Some way of tracking books in the library would save time for people working there as well as for customers that don’t need to waste time looking and waiting for books.

3. Business opportunities can be seen in developing a system were a customer is able to see were in the process a book they have ordered is just by logging in on her or his library account. Since many people are working under a restrained amount of time this could be a helpful way for them to plan their time, especially if they need the ordered book for their work or for research.

4. Another business opportunity would be a system for storing information of a person’s all borrowed books and by that sending reminders to the person when a new book in the category that the person has already borrowed comes to the library.
5. A system for checking if the returned books are damaged would also be very useful. Today it is difficult to identify the person that destroyed the book if it is not discovered immediately after the returning of the book.

5.7 Conclusion for the Second Trial
For the second trial a more thought through and methodical procedure was designed. More tools were developed and tried out. This time we started with narrowing the area of investigation in the first step of the process.

Step 1: Idea generation
Brainstorming can be used just by one person alone but is preferably used in groups. When deciding the area of investigation for this trial two non-experienced persons was a part of the team as well as two persons with bigger knowledge about product development and innovation. After some trial and error a suitable area of investigation was found why this is considered to work better than the unstructured way of asking randomly people questions used in trial one.

Step 2: Selection
In the selection step a start with investigating the libraries structure was done where different task was surveyed. This was a good way to be sure that respondents came from every different undertaking in the libraries that was of importance for this market research. One thing that could have been done, but that was excluded since time was a limiting factor, was to do a selection among users of the library services which means people borrowing books, using the library premises, getting help from information librarians etc.

Step 3: Collection and Refine
The conclusion from trial two is that the depth interviews proved to be a good tool for gathering data. They can be done quite easily and using a smaller amount of time and money. It can be difficult in the beginning to know how to do the interview, especially if it is the researchers first time to do depth interviews, so it is necessary to do some test meetings with respondents before starting with the respondents selected in step 2. Then the researcher can practise and improve his interviewing skills. If the interviewer is an amateur it is a good idea to be two interviewers present at every session. Then one person can ask questions while the other is writing and vice versa and also two persons always see and understand the same words in different ways which can be important to take advantage of. The researcher should also use the laddering technique to get the deeper reasons to why something is a problem, it was during the interviews in trial 2 discovered that using the laddering technique gave more information.

From trial II we realized that the following questions are a good start and then it is up to the researcher to find the follow up questions that are most suitable.

1. The researcher present himself:
   - Tell the respondent about your occupation
   - Explain what will happen during the interview
– Explain to the respondent the purpose with this investigation
– Make sure that the respondent understands that every answer will be treated confidentially

2. Can you tell us about your job and your tasks?
3. Do you have any difficulties in your job?
4. Can you think of any problem that occurs?
5. Can you imagine something that could make you job easier?
6. Why would that help you?

Questions should be focused on problems and really make the interviewed person talk freely. The participants may not be asked what kind of product they want and solutions. It is also important to ask laddering inspired follow up questions since the reasons for the problems is to be found.

The interviews should take about 20-40 minutes and a fact found was that it was better to always make an appointment in advance. When the time for the interviews was decided in advance the interviewed persons were not stressed and were prepared for answering our questions. It was also found to be very important to pin point that the answers will be treated confidential since it made the respondents much more open hearted and honest.

Even though the questions above are very open the experience from trial 2 shows that after a few interviews it is already possible to see common themes in the answers from different people. It is then time to start leading the investigation in a specific direction.

Since the analysis is started during the data collection phase it was discovered that 5-10 interviews was enough before starting analysing using the theme model. The result from the analysis gave rise to a slightly change of direction of the questions and added sub questions that was suitable. The data collection phase was then continued by analysing and categorise the answers until the point when the researcher realises that no new information is added.

One thing that was a bit surprising was how fast the data became saturated. Even though the investigation area was quite big, the whole library environment including a range of people working with different tasks, it was already after 4-5 interviews possible to see common themes between the respondents. This was good news since it means that not a big amount of interviews needs to be done for this kind of investigation, 14-20 interviews are enough.

Step 4: Analyse
Now all the data is gathered and categorised according to the theme model. A spotter analyse is also necessary since an expert can see problems that at the first sight don’t seem to be of a technical nature but still can be solved by it if a totally new solution is thought of. The spotter will here help the researcher to choose the most promising category/categories to use when continuing with the investigation. In the next episode of the investigation a more narrow area will be investigated.
In trial 2 Dr Keith Alexander was used as a spotter since he is an experienced product developer. He could easily find the interesting ideas.

A combination of “The Theme Model” and “The Spotter Model” seemed to work as a good combination for analysing. It was easy to apply “The Spotter Model” once all needs and problems were identified and categorised. In this small study no new break through ideas were expected but anyway many problems were found and also few potential future products.

**Reflection:**
After in depth interviews it would have been interesting to conducting focus groups with the in depth interview participants. They might have given some new insights to the discovered problems and needs and ideas for possible solutions. For this thesis there was no time for doing that.
6 Innovating the idea generation phase in the Innovation process

In this chapter both the proposed process as well as the existing innovation processes will be discussed. The discussion consists of four parts (see figure 19). The chapter begins with our main contribution, the proposed process. It then goes into greater detail. The next section compares our ideas with existing processes followed by a debate about whether they are similar enough to actually make similarities and if it is possible, to use the proposed process in symbiosis with existing examples. In the very last part of the chapter the reader finds a critical evaluation of the process.

Figure 16. Breakdown of the discussion

6.1 The Proposed Process

We propose a process that uses seven steps that will lead to a result that can generate a product specification (see figure 20). The purpose of this process is to allow the researcher to be able to choose any kind of area, apply the process and finally get a result consisting of a group of ideas for new technical solutions. The way of finding the ideas is by speaking to customers being careful not to ask about solutions, but to identify their problems. Another important item is to understand the reasons for the problems.
6.1.1 Implementation

Phase 1: Idea generation
The idea generation is conducted using a brainstorming process. It is recommended that more than one person is used for this part of the process and it is preferable that some members have previous knowledge about innovation and product development.

Phase 2: Selection I
The selection procedure is used to find the right population of respondents. It is completed using the following steps:

1. Define the target population: This is done by surveying the field of investigation and identifying every part whose influence is deemed important.
2. Identifying the sampling frame: This step involves listing the elements from which the actual sample is drawn.
3. Select a start number of respondents: Make an even selection from the elements listed. For example, every important task in a work environment should be equally represented in the first selected group.
4. Select a new number of respondents in the same way as above. This procedure is repeated until the data collection is saturated. (There is no point to decide in advance the number of respondents in the investigation.)

Phase 3: Collection I
Gathering data is to be completed through in-depth interviews. If it is the researchers first time it is strongly recommended to do some test meetings with respondents before starting with the respondents selected in Phase 2. Then the researcher can practise and improve his interviewing skills. The researcher should also use the laddering technique to fully understand why something is a problem.

We propose to start with the following interview procedure and questions:

1. The researcher introduces himself:
   - Tell the respondent about your occupation
   - Explain what will happen during the interview
   - Explain to the respondent the purpose of this investigation
   - Make sure that the respondent understands that every answer will be treated confidentially

2. Can you tell us about your job and your tasks? Why?
3. Do you have any difficulties in your job? Why?
4. Can you think of any problem that occurs? Why?
5. Can you imagine something that could make you job easier? Why?
6. Why would that help you?

Questions should focus on problems and the interviewer should allow the interviewed person to talk freely. The participants MAY NOT be asked what kind of product they want or about solutions to the problem. It is also important to ask laddering inspired follow up questions as soon as something important shows up.

The interviews should take about 20-40 minutes and the researcher should always make an appointment in advance. We found it was very important to explain that the answers will be treated confidentially since it made the respondents much more open hearted and honest.

After 5-10 Interviews: start analysing using the Theme Model. Even though the questions are very open, our experience shows that after a few interviews it is already possible to see common themes in answers from different people. Change the direction of questions, take away unnecessary questions or add sub questions that are suitable. Continue hereafter to categorise the answers until the point when the researcher realises that no new information is being added.

Phase 4: Analyse I
Now all the data is gathered and categorised into problems according to The Theme Model. A spotter analysis is necessary since an expert can see problems that at first sight do not seem to be of a technical nature but still can be solved using a totally new
solution. The spotter will help the researcher to choose the most promising category/categories to use when continuing with the investigation.

In the next episode of the investigation a **narrower area** will be investigated, selected from phase 4.

**Phase 5: Selection II**

In this step the researcher conducts the selection process again, from phase 2 and now the population chosen should be suitable for the area chosen in phase 4 above. One or a few of the most promising ideas is selected to continue working with.

**Phase 6: Collection II**

This step consists of another data collection completed using in depth interviews. The same procedure as in step 3 is used but this time the questions are from the beginning focusing on the category/categories selected in phase 4. It is important that the customer is considers every step of the investigation process of using a specific product.

**Phase 7: Analyse II**

The last analysis should give the researcher a foundation for concepts to investigate further when completing a product specification. Here the spotter is important for judging which attributes are concerning usability and cost. A list of attributes is gathered which are used when completing a real product specification for the new product.

### 6.1.2 Mainstay of the Proposed Process

![Diagram of Mainstay of the Proposed Process](image)

**Figure 18.** Mainstay of the proposed process

The proposed process was evaluated with 4 different criteria in mind, the four mainstays for the process (see figure 21).

**Customer driven**
The most important criteria with the process were it should be customer driven and generate products that the customer really wants. A goal was also to find ideas for products that were required but not yet wished for by customers since they still did not realize they had problems that could be solved. The proposed process starts at a point where there is no specified task or product purpose investigated but only a wider area where changes could possibly be needed. Going through the process, problems are found and the most occurring ones are investigated further leading to a product specification.

It is important that the interviewer does not ask participants for the solutions when the participants are not innovators or engineers and can only come up with already existing or experienced solutions that might be a part of the problem. The expression “customer driven” means discovering a customer’s needs and problems and does not mean asking them for solutions. That is why our process is concentrating on discovering problems with broad questions such as “Do you have any difficulties in your job?” and not “How can I make this product better?”

**Target population**
Target group for the process is universities, small innovators and smaller firms. The reason why the proposed process is intended for the mentioned population is because there is no existing process currently available for these fields. It is a fact that small innovators and universities do a lot of research and come up with new innovations, but those are not always able to be made profitable. Another problem is that many ideas are born but since they are not anchored to customer needs they are not asked for or wanted by the customers. When designing the process the target population was always kept in mind.

**Resource demand**
The target group do not have the same amount of resources as big companies and it is important that the process does not require large resource demanding market surveys. Nevertheless, it is important that the surveys are effective and do fulfill their purpose, which is coming up with ideas for new products that are demanded by the customers. The process fulfills the requirement of being resource minimizing when not lots of people are involved. In depth interviews are a good way of gathering useful and informative data but are at the same time less demanding than many other information collecting tools.

The process can be carried out by just two people where one is the researcher doing the investigation and the other person the spotter. The choice of the spotter is a crucial step since he must have business knowledge and insight and expertise in economics and technology. During some phases of the process it is an advantage though to be a group of at least three people, for example during the brainstorming step.

**Communicability**
One of the targets was to find a process that was easy to communicate therefore every step in the process was judged against three criteria:

- Simplicity to understand
- Simplicity to use/perform the investigation
- Simplicity to analyze and understand the results
When the process is intended to be used by people that are not experts in innovation or market research all definitions are explained and the process is written in a language understood by people with a technical background. All steps in the process are well described and for further help there is a case study that gives an example of how to proceed when using the process. On the other hand some times simplicity to apply had to be balanced against getting meaningful results. In the case of collecting the information it would have been easier and less resource demanding using other methods but during testing it proved that in depth interviews gave much more meaningful and significant answers compared to the resources demanded.

Most of the existing analyse methods of a qualitative nature are complex, time consuming and need lots of understanding. According to Brian Haig, professor in psychology at University of Canterbury, it takes for example six to eight months for a person to learn how to perform and interpret analyses with Grounded Theory. Therefore we developed The Spotter Model and The Theme Model that are used conjointly to simplify the analysing. The technical and economical experts, which can be one and same person and are called the spotter, in The Spotter Model contribute to simplicity because thereby the persons performing the survey do not need to be experts themselves.

6.2 The Proposed Process versus Existing Processes

Our main goal was to generate a simple process suitable for people that work at the university, private persons, students and smaller companies and not bigger companies and industries. Today there are existing processes used for generating innovations and three of the recent and well-known are developed by Ulwick (see 3.3.3 Ulwick’s Ideas about Innovation), Eric von Hippel ( The sources of Innovation) and Hannu Karkkainen, Petteri Piippo and Markku Tuominen (see 3.3.5 Ten Tools for a Customer-driven Product Development in Industrial Companies).

When comparing the developed suggestion to a new innovations process to the already existing processes the following issues will be discussed:

- Where in the innovations process does the process start?
- Who is the target population for the process?
- How resource demanding is the process?
- How easy is it to apply the process?
- How communicable is the process?
- Is the innovation process most suitable for product improvements or for finding new products?

One point that is new with our process, not to be found anywhere else as far as we know, is the concept of using a spotter. The spotter is very important since the process can be performed also by amateurs who have no knowledge about business strategy. In the processes mentioned above there are probably teams of experts working on generating the innovation but with our process only one expert is needed and not for a long duration which makes it much simpler to carry out.
6.2.1 The Proposed Process versus Ulwick’s Ideas

When comparing the proposed process to Ulwick’s (see 3.3.3 Ulwick’s Ideas about Innovation) some major differences can be seen. First of all, Ulwick’s process starts at a later stage in the innovation process than the process we suggest (see figure 22). One of our goals was to go as far back as possible in the innovation process and instead of choosing a narrower area in the beginning, start a broader and through this find the smaller area that is to be investigated. In the first trial we realized that starting without any narrowing at all of the investigation area and to ask random people in the street was too wide. In the second trial we therefore made the start area narrower but we still did not choose a specific process in a specific environment which is the case with Ulwick’s ideas.

Another difference between the two methods is that the suggested method is designed to suit universities and small innovators while Ulwick is more concentrated on helping bigger companies.

To perform Ulwick’s process a lot of expertise help is needed while the proposed process can be done by one person individually and by an amateur without too much effort or prior knowledge. The need for many experts and the concentration on bigger companies makes Ulwick’s process more resource demanding and not suitable for universities, innovators and smaller firms.

Similarities are that both of the two methods are focused on finding unsolved problems that causes needs among customers. Both of the processes are trying to reach beyond listening what customers say that they want. Instead they are trying to listen to the problems to be able to generate breakthrough products and solutions not thought of before.

It is difficult to judge how easy Ulwick’s process is to apply when there is no case study of exactly how the process is carried out. What can be said from the findings is that it requires good and experienced interviewers. The process is not easy to communicate when it is hard to learn how to perform it and since it requires a big knowledge pool from within many different areas.

Figure 19. Comparison where our process respective to Ulwick’s process begins in the innovation process
6.2.2 The Proposed Process versus Eric von Hippel’s Ideas

In order to be applied, it is necessary in “The Lead User Model” to have a problem formulated in advance and when the problem exists the model seems to successfully solve it with the method described (see 3.3.4 The Sources of Innovation). The consequence is that the model starts in a later phase of the innovation process than the process we propose.

“The Lead User Model” is best suited for big companies. The first step in “The Lead User Model” is to identify an important market or technical trend by finding and questioning experts in the field. It is not easy for ordinary people to find the experts and make them talk to an amateur.

It is not likely that the identified experts will take the time to be interviewed without any profit. In one of the steps in the process lead users are put together to develop new concept ideas. Here is a question once again of whether the identified lead users will spend perhaps one day to attend a workshop without any gain? The conclusion is that “The Lead user Process” is highly resource demanding and hard to carry out by people that are not well known. It is probably easier for bigger companies, since it would be an honour for the attended lead users to be associated with the company in question.

When applied by large well known companies, to find experts the big companies might have to talk to their competitors. Even if the big companies have resources in the form of money it is a question of whether the competitors would agree to attend their competitors’ workshops. The conclusion is that it can be hard for big companies to apply the lead user process when its success can depend on their competitors’ good will. It would be hard for an amateur and a professional too to find the time when all the lead users are available at the same time.

6.2.3 The Proposed Process versus Ten Tools for Customer Driven Product Development

Once again there is the issue that the ten tools are developed especially for industrial companies and are thereby leaving out non professionals. One of the requirements for the tools is that they must be easy to use in the group, which means that they are made for team work. This makes it difficult to use by one person. One of the steps in the ten tool model is that customers and companies own representatives should sit together in creative interviews implying on strong industrial company connections.

The tools consist also of many different models and it is impossible for only one individual, furthermore an amateur, to quickly and easy get hold of the different complicated models.

6.2.4 The Proposed Process versus IDEO’s Ideas

The proposed process has some similarities with IDEO’s ideas, since both attacks a problem that can be found in the ordinary daily life. The starting point is when a
The problem is seen which is later in the innovation process since the proposed process starts without even seeing the problem. The target group is companies acting in a pulsing business and the main goals with IDEO’s process is to make products in line with the company strategy and also to make the time to market as short as possible. It is mainly innovation within design that is at the carpet and not, as in the proposed process, any kind of innovation that is interesting. IDEO’s process is taking a short time but is very work demanding and performed by teams working full time requiring members within human factors experts, engineering, business strategists and designers. The process is suitable for product improvements but can also be used when new products are searched for while the proposed process is rather a tool for finding new products.

6.2.5 The Proposed Process versus QFD
QFD doesn’t really say how to proceed when discovering customer needs and collecting data. It only says that good market research has to be done before. It focuses on how to organise the gathered data and if you don’t have the right information it doesn’t matter how good you are in organizing the information, you will not get the right needs anyway. Then again QFD is easy to apply once market research is done. It is a really good tool for organizing the discovered needs and revealing which features in products are important for the customers. Quality Function Deployment is more suitable for making product specifications.

The conclusion is that it is not possible to compare the process that we propose to QFD when they direct to different parts of innovation process.

6.2.6 Business-Product Development Matrix
To be able to easier explain what we are trying to achieve with the proposed process we have developed a business-product development matrix. The purpose with the process is to help innovators; universities and smaller firms to move from the upper left corner in the matrix to the upper right (see figure 23). The existing processes (for example Ulwick) are transferring the companies from the lower left to the lower right.

All the existing models for innovation (see 3.3 Existing Processes for Generating Innovations) are used on an established business and are trying to change the businesses approach to innovation from technology push to market pull. The proposed model is instead rather designed for people that are not working in an established business but that still want to reach the lower right square (see figure 23). They might reach their goal by first passing the higher right square and then continue in a second step. It is in the established business where money can be made which is the obvious reason why all the existing methods we have found are focusing only at this part.
Figure 20. Business-Product development matrix

The upper left quadrant represents the innovation environment where universities, private persons, smaller innovators and SME are acting. They are all defined by having a limited amount of capital and knowledge available for doing market research to find new innovation ideas by listening to the voice of the customers. A lot of the people acting here have a superior knowledge in product development and the idea generating rate is high. It is often more difficult for a big and established company to experiment too much with testing new ideas since they have a reputation and company strategy to take into consideration. Therefore many new break-through ideas are born in the environment represented by this quadrant but it is still a big question mark when to predict in advance which product that is actually wanted by customers. Since they don’t have the opportunity to earn money on many of their innovations they do not have the capital to go further with the break through products and they are often bought by a bigger company. The invested resources are low but at the same time the failure rate for new innovations is high.

The lower left quadrant represents businesses with enough capital to do market research for listening to the voice of the customer but that haven’t succeeded with their management of technology innovation strategy. Their approach to innovation is like playing at a roulette table where money is thrown out to finance different innovation ideas but even though some of the new products actually succeed, most of them become a failure. The way to success is random and unpredictable, just as a roulette table chance of winning is much smaller than losing. So this quadrant is distinguished using high investments only to gain innovations with a high failure rate. One example is the story about New Coke (see 1.1 Background).

In the higher right quadrant the universities, private persons, smaller innovators and SME are acting and the proposed process is one way to get there from the higher left quadrant. There are still not a lot of investments opportunities which is why the process used here must be less resource demanding compared to the processes bigger companies can use. This is a rough diamond that, if polished in the right way, can become a glitzy jewel and a part of a gold mine. Here the adopted process when finding new innovation ideas are using listening-to-the-voice-of-the-customer
approach and the failure rate becomes much lower. What happens in the higher right quadrant is that a product wanted by the customers is developed but we are still not making any money from it because we don’t have a business.

So finally the lower right corner is the goldmine, where most of the earning-money-opportunities are to be found. This is the dream situation for a company where the innovation failure rate is low which means that they have succeeded to find out what customers actually are asking for. Processes for moving a business from the lower left to the lower right are for example Ulwick’s procedure and Von Hippels lead user model which are costly but still worth the investment for a bigger businesses if they become successful with their management of technological innovation strategy. The main goal would be for the university, private persons and smaller firms to move from the upper right to the lower right and as two examples, very well known, IKEA and Tetra Pak can be mentioned.

### 6.3 Synthesis or Incompatibility?

The question in the end is if the proposed process is able to be synthesised with the already existing innovations processes or is it even possible to compare the proposed process to the existing ones? The answer to the question is both yes and no.

The major difference between the process that we propose and the existing processes is that they direct to different target populations. All research done in the subject of innovation processes has been done with the focus on established big companies with lots of resources while we turn to small innovators and universities with limited amount of money. Limitation of resources in the chosen target group requires a simple process which is not complex and does not require lots of experts.

One idea would be to use the first half of the suggested process in combination with for example Ulwick’s ideas when the process we suggest starts further back in innovation process.

It would be a good idea to combine the process that we propose with QFD. QFD starts much later in the innovation process then the process developed by us does and it only comprises the later part of innovation process. In that way it is not suitable for innovation generation but combined with the process that we propose it gives a complete innovations process from idea generation to a product ready to be launched.

### 6.4 Critical Evaluation of the Proposed Process

A good process is distinguished by being both simple and easy to understand. But still it is important not to simplify too much since that would just give inadequate results. The proposed model could have been built up by more simple steps and less time consuming to perform but after testing some we realised that the result achieved wasn’t good enough.

The strength with the proposed process is that all phases building it up have been tested in the reality through the first and the second trial. The strength is also that people with rather big knowledge within innovation and product development gave
the judgment that the process is working well for the purpose of generating innovation ideas for technical products.

One weakness with the process is that the product ideas generated through trial one and trial two have not been developed or tested at the market. Doing an investigation taking the product that far would take years. Another weakness is that the limited amount of time prevented us from doing deeper and more extensive research. This restricted us from trying out more methods for the phases that constitute as building blocks for the proposed process and also to test the phases chosen more carefully.

One critical step where we found it important to act as quality thinking as possible was when choosing the spotter. The choice of the spotter is a crucial step since the spotter has an important role to play for the end result when using the process. The person we used in our trials was Dr Keith Alexander who has an engineering background. He has for a long time been working as a manager in a high tech company at the resource & development department which gave him knowledge within business strategy as well as product development. During the most recent years he went back working for the university where he has done several successful innovations that has gain their way to the market. In his opinion we succeeded to find many interesting and promising ideas.

Another factor that might have influenced our research work is the fact that English is not our mother tongue. This has probably affected our understanding when doing interviews as well as how we have been met by people. To get reliable results from the interviews we decided that both of us should attend during the interviews as often as possible so that we would not miss important issues.

Since our process is the result of a newly started research project it is difficult to make a good comparison to processes developed during years of research done by research teams. Another issue is the fact that the existing processes are often going through the whole innovation process while we are only investigating the idea generation phase. The hypothetical public to use our process is different from the goal public for the existing processes but since we haven’t found anything more similar to our process this was the best way to evaluate the theoretical relevance.

The case study where we were testing possible steps for our proposed process was done in New Zealand and is adapted to the life and culture there. We can therefore not be sure if the same results and reflections would have been found in other countries in the world. When carrying out our master thesis we realised that the way of living in New Zealand is different from the Swedish since the strategy and business thinking is much less evident in New Zealand. Most people are rather interested in the innovation phase and the generating and testing of new ideas than of making money. When they have found a successful product they sell the idea and start to innovate again. (One typical example of the New Zealander mentality can be seen in the film “The World’s Fastest Indian”.)

In the literature search, used as a base for our work, we have used mainly American and European sources cover most of relevant literature existing today.
7 Conclusion

One of the purposes with the thesis was to find and investigate existing processes for innovation. We started by investigating Ulwick’s ideas and along the way we found more and more existing processes and recent research within the area. The processes that we came across except Ulwick’s ideas were “Ten Tools for Customer Driven Product Development in Industrial Companies”, “Lead User Model” by von Hippel and “Qualitative Functional Deployment” which is a product development tool and Utterback’s Mastering the Dynamics of Innovation. One striking finding was that all those processes focus on industrial companies. Not a single one of the investigated processes is designed to be used by innovators, universities and SME and all of them require a team of experts. All of the above mentioned processes do not only require many experts but also a big amount of capital and time. Beside this, many of the existing models for generating innovations are in reality more efficient for product improvement processes and require an already existing product to be used on.

The most important conclusion from our project is that it is not necessary to use very complicated and costly methods when trying to find the true Voice-of-Customer. Only asking the right questions and listen carefully to the answers can give the researcher exactly what he is looking for.

The final process consists of seven steps. It starts with idea generation and for that first step brainstorming was found to be the most suitable tool. In the second step a group to interview is chosen with a selector and then in depth interviews in combination with laddering are used to collect the data. In the fourth step the gathered data is analysed according the “Theme Model” and “The Spotter Model”. We found that the ideas from Grounded Theory were analysis is carried out progressively during the data collection phase was good to use since it was then easy to see which directions the investigation should be taken and which new questions that should be added. After analysing the saturated data collected in the first data collection phase some new categories are chosen to continue with. It is necessary to once again select, collect and analyse a new set of people suitable for investigating the new categories. Then the whole procedure is repeated again.

Compared to existing processes this is the biggest advantage of our process, the simplicity of use. It is designed to be used by non professionals and doesn’t need costly experts. While the existing processes are often product improvement processes our process starts from scratch, one does not even have to have an idea. It also starts earlier in innovation process than any of the existing processes. Of course the existing processes are much more professional and a company having the resources to go through more costly processes to generate innovations have then the opportunity to take the company strategy and goals in consideration when developing new products. Our process is plain and simple and its goal is to generate new ideas of any kind, not following a specific line of attack or strategy.

7.1 Reflection

It could also be interesting to investigate other combinations of the different tools gathered in chapter four. We only had the time to go through a few of them in our project.
In the case of the focus groups those could be performed with the same participants as the people that took part of the depth interviews but might also include people with technical knowledge that have been working within product development. After the in depth interviews were done, the members could have been brought together to take part in a focus group session instead of, as in our final process, do this second phase with in depth interviews. This could be an interesting investigation for a future project or master thesis.

Another interesting idea that there was not the time to investigate is to perform observations in the first step of the proposed process. By doing observations even problems not thought of as problems could come up to surface. One example could be that a person from the outside sees how a nurse is lifting a patient and even though it is working satisfyingly enough, the observer could see a more efficient way of doing it.
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Appendix

Appendix A: An Interview with an Innovator, Warwick Schaffer

Interview Background
It was our first interview and was done in a relaxed environment over a cup of tea. The interviewed person was known from before and was encouraged to come with comments and suggestions during the interview. The interview lasted for an hour and a half which is longer than the intended time. The interviewed person got the questions in advance so that he could think about subject and prepare himself. In that way we could just ask a question and let the person talk without asking any further directly prepared questions. As the interview went on we were able to ask the respondent to explain more clearly parts that we did not understand.

Interview
Interview started with us asking the first question “How do you come up with new ideas for a product?”, The respondent suggested that we should instead start with asking the question “Can you give us a list of your innovations?” since it is hard to just come up with a general process of inventing. He said that every new innovation is unique and is created in its own way. He then gave us a list of his own innovations.

Innovation list:
- Visit or name cardholder
- Frame for art
- Electric blanket that gives electric shocks instead of alarm in the morning.
- Lap top holder

Warrick started telling about one of his ideas that was an electric blanket. He never tried to invent it though. The electric blanket was suppose to be like a normal electric blanket used to heat the bed but the new thing was that it in the morning when you were suppose to wake up would give you an electric shock. That could be good for mums for example when they wanted to wake up their sleepy children or for people that find it hard to wake up in the morning (a bit of a smile could be seen at Warwick’s face since he thought about him self). After a smaller market research to see if there was any interest in the market it was clear that the electric blanket was a bad idea.

“This is probably my worst idea ever”.

Quotation from Warwick: There are actually no failures for an inventor, or at least you should not think like that but instead think about some innovations as less successful.

A more successful idea was the cardholder. It did not existed cardholders before that in Japan or New Zealand. While being in New Zealand working in a company that had some business with a Japanese company he discovered that cardholders in wood were a good gift from the New Zealander company to the Japanese company. It did not existed cardholders before that in Japan or New Zealand. While he was a student
in Japan he discovered that Japanese were very fond of visiting cards and gave them to everybody as it in the same time was no good way for storing them. There was a need for cardholders from Japanese people and a need for a gift from the New Zealander company. He just managed to make the connection.

Quotation from Warwick: I saw a need and a market and then came up with this idea. I had already seen card holders but not really nice once and not that practical. It was quite an easy idea and since I already had a buyer (the company who needed a present) it was easy to earn some money.

A new invention, the Art frame, he assumes is a failure for the moment since the cost of producing it is too high.

He also has an idea that has not yet been put on the paper. That is an idea of “Lego furniture”, meaning furniture that you can easily assemble, put together and put apart creating different sizes and shapes. This could be good especially for younger people that are moving a lot.

When Warwick come to think of the innovation “the lap top holder” he got his idea from seeing somebody having his lap top on a paper box and he was thinking “I can do that in a better way”. His first thought was taking the patent but someone already had it in USA. He then made a wood prototype of his own version and took it to a company. The company seemed to be interested but while trying it a problem occurred, the larger lap tops overturned and fell. He has now made some further development on the holder. He said that the idea with the holder was to make it as simple as possible to cut down on production costs. For the same reason he don’t want to have several different sizes.

He has many different ideas at once. Some of them he leaves for some time to later come back to them.

He also said that you don’t want to spend too much money on prototypes. You need to take it to market before further development.

His thought of innovations and innovations process:

1. The inventor has a rough idea, just a need he has or he has discovered
2. Make a prototype as cheap as possible. Low cost is the key.
3. Take to the market and test prototype. Customer view is showed

Often it is really complicated to do even very small inventions that seem to be very easy. Bigger inventions always tend to flow out and grow really big and complicated.
The inventor takes an idea that pops up in his head and start to think about a design. He then makes a prototype with cheap material and show the prototype for people that can be customers. It is necessary for a customer to actually see the product (the made prototype) in front of him (not just a sketch at a paper) to know weather he or she needs it or not. Since this step may be done several times it is important that the cost is not too high. It becomes obvious if the invention is going to hit quite soon since you can watch peoples opinions about it and see if it is possible to make it cheap enough. The manufacturing cost must be one 5\textsuperscript{th} of the selling cost. If the cost is too high it is a dead end.

How Warwick rank the reasons why he does inventions? There are three reasons and the rank is:

1. Creating new things. This gives me satisfaction and makes me happy.
2. Having fun. I really like to invent things.
3. The thought of earning money.

*Quotation from Warwick: It is great to see people using my invention. I then feel proud and satisfied with my self. The inventions I prioritize the most is the one I find most exciting.*

*Memo:* He doesn’t believe in doing market research in advance. He really thinks that his way is the only right way.

The respondent finds the costs as the only problem for innovation and product development.

*Memo:* He seems to believe that people would buy anything just if the cost is low enough.

He says that steps between idea prototype and the actual product are huge.

Innovation is according to him a good idea that would be good for your self and other people. You develop the idea and make a prototype and then you go to people and hear what they have to say.

He thinks that you come up with an idea and then go out to customers and don’t start with market research. He can not imagine it working in other way.

*Quotation from Warwick: I think that the value of market research is over estimated. It is not a creative process since customers don’t know what they don’t already have. I think that innovation should be compared to science. You have a hypothesis (your idea that you think could be necessary) and then try it out (doing the market research and analyzing). You can not just ask people in the streets about problems but should instead take a problem you have your self and evolve a solution. Often I have seen one idea and then just try to do it better.*
He thinks that innovative people come up with the ideas by themselves. They don’t ask for others peoples opinions or problems that they later try to solve. They need to be in isolation to come up with ideas.

Innovators are “personally interested”, the most important and in that order for them is, according respondent:

- creating something new
- earning money
- having fun while doing it

It is in the beginning important that the new innovation is simple to produce since people must be able to buy it.

There is a huge difference with doing something for your self or for the market.

New companies buy ideas from start ups. They don’t want to spend money at development of products since they would just throw away money when the have a secure position selling things. Can not afford the risk so few innovations is made by big companies.

**Memo:** Warrick seemed to get many ideas from his own environment. Furniture made like Lego since he is moving a lot, electrical shocks in bed since he likes to sleep in the morning, frames for art since he is really interested in art etc. Since he seems to be a quite unusual person, and I can imagine that many innovators are like him and more like artists, it could be dangerous to only look at there innovation ideas.
### Appendix B: Example of Coding Case Study II Phase 1

<table>
<thead>
<tr>
<th>Notes</th>
<th>Coding categories</th>
</tr>
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| 1. There were no available computers at the university and this was a problem since I had a lot of assignments to hand in. | - Time management  
- To much work  
- Lack of working tools  
- Missing electricity |
| 2. When I woke up there was no electricity in my apartment. | - Hangover  
- Illness  
- Not feeling safe |
| 3. I drank too much and felt really bad next morning. | |
| 4. I have a feeling of not being safe when walking alone as a girl. | - Separation  
- Contact  
- Distance  
- Relation  
- Time management |
| 5. My friend is moving overseas. | - Time management |
| 6. I have problem with managing the time to be able to do everything in time. | - Relation problem  
- Contact  
- Personality problem |
| 7. I have problem with an unpleasant girl that I know. | - Public transportation (busses) |
| 8. I am too obsessed by myself. | - Time management  
- Public transportation  
- Economical situation  
- Organization |
| 9. I am new here in Christchurch and have problem with finding the right timetables and busses. | - Medical |
| 10. I missed the bus this morning. | - Theft  
- Security  
- Car issues |
| 11. I lost 5 dollars. | - Theft  
- Security  
- Medical  
- Organization |
| 12. I had an allergic reaction when eating medicine because of my diabetics. | - Theft  
- Security  
- Medical  
- Organization |
| 13. My van got stolen on Friday night. | - Theft  
- Security  
- Car issues  
- Safety  
- Police |
| 14. I have problem with shoplifting in the pharmacy shop were I am working. | - Theft  
- Security  
- Shoplifting |
| 15. I have a problem with my financiering of my master since I do not get any founding (which I thought I would get and therefore quitted my job). | - Economical situation  
- Work |
| 16. I caught flu last week when I had to do a lot of work. | - Work  
- Illness  
- Time management |
| 17. There was no university in my home town so I had to move to Christchurch. | - Separation  
- Distance |
| 18. I can not find a girlfriend. | - Relation  
- Communication |
| 19. I broke the thing that grind rests of food in my kitchen sink. | - Cleaning  
- Technology |
| 20. I do not like the university structure since they sold Ilam village to an Australian company without telling us who works in the Ilam village office. Instead we received | - Communication  
- Work |
information about it from the gardener.

I have problem with hearing, especially when women are speaking since their voices have a higher frequency. - Communication

I lost my return ticket. - Transport
- Organization

My daughter is in Melbourne and is not doing well. - Distance
- Separation

I do not have enough time. - Time management

I fell stressed and have a physical injury. - Time management
- Illness

I have work problems. - Work

I have an assignment to hand in that is a problem for me. - Work

I do not have enough of money. - Economical situation

I ran out of time for an assignment. - Time management
- Work

I have a problem when being in contact with people since it is difficult to text a whole conversation with a cell phone instead of speaking directly to the person. - Communication
- Technology

That my research experiments are not working (in the lab) - Work

To know how to solve a problem at my job. - Work

I do not have enough of time to do everything I want/need. - Time management

I could not be in two different places at the same time so I had to choose one. - Time management

I don’t know what I will work with in the future. - Work
- Personality

A big problem recently was lack of communication. I misunderstood what was expected of me. - Communication
- Work

I do not have enough of time do to everything I need. - Time management

We don’t have time to administrate our orders since people are away because of holiday, illness or education. - Time management
- Illness
- Work

I have a problem with my back since I have an injury. - Injury

I had a problem with booking my airplane tickets. - Travel issues

I had a growl with my friend. - Communication
- Relation

I have a problem with managing my time. - Time management

I had problems with the snow that fell recently. - Weather

My friend’s dog dies the other night and she is really sad. - Relation
- Animal
- Separation
45 I had a row with my friend recently but now we everything is fine again and we are friends. - Communication - Relation
46 My son is ill. - Illness
47 I could not buy the top I wanted since I do not have enough of money. - Economical situation
48 I missed the bus today. - Public transportation - Time management
49 Sky TV broke down because of the storm yesterday so I could not watch my favorite TV-program. - Weather - Technology
50 We don’t sell well today since there is less people than normal shopping. - Work - Economical situation
51 I lost my gloves today. - Organization
52 I don’t have enough of time to answer your question. - Time management
53 I have a problem at my work (computer problem since it broke down). - Work - Technology
54 I forgot where I parked my car. - Organization - Car issues
55 I was failing my English course. - Work
56 I have to much work to do. - Time management - Work
57 My garage door was closing when I was going through with my car. - Technology - Car issues
58 I have a really stressful situation at my work. - Time management - Work
59 I have a problem with lab work since I get bad results which will give the consequence that I will not finish my project in time. - Work - Time management
60 I have problem with installing a new operative system at my computer and the one I have now is not working. - Computer
61 I recently lost my job and can’t find a new one. - Work - Economical situation
62 I have too much job to do at work which give me a limited amount of spare time and that is a problem for me. - Work - Time management
Appendix C: Explanation about Library Interviews

This was the second trial to test an outlined method to generate new innovations. The decision was made to do interviews within libraries at the university areas to see if it is possible to find needs for new technical solutions by asking broad questions. The persons interviewed have three different kinds of tasks:

Library staff: People working in the library without having a specific librarian education. Librarian staffs are often working with a mixture of different tasks for example in the lending desk, at the returning desk, with restricted loans etc.

Information librarians: Work as a connection between academic staff and the students. They are specialist at a specific subject and help students finding material, data bases, restricted loans etc when they have assignments. The academic staff can tell the information librarian in advance about the subject and ask the librarian to have a presentation and teach the students about how to use the sources in a library.

Library assistants: People that have an education for working in libraries. The often have a mixture of different tasks, for example standing in the lending desk, taking care of returned books, working with restricted loans etc.

The University of Canterbury has five different libraries of which four agreed to help us in our investigation. The Central library is the main library and the biggest while the Engineering-, Physical-Science-, Law- and Mcmillan Brown-library are branch libraries. (The only library that was not a part of the investigation was the Law library.) In the branch libraries most people were working with a lot of different tasks while in the central library most of the staff have a more specific task.

Restricted loans: When a book can not be borrowed to be brought outside the library it is called a restricted loan. All the inter loans are treated as restricted loans and the books can therefore not be taken out from the library.

Inter loans: When books are ordered from other libraries that are called an inter loan. The university library is collaborating with other libraries to borrow books or articles that do not exist at the UC libraries for shorter time. Ordered books must be picked up in the Central library and they are treated as restricted loans why the person who ordered the book can not bring it outside the Central Library.
Appendix D: Interviews in the University Libraries: One example using the first set of questions

Questionnaire version 1

1. Do you have any difficulties in your job?
2. Can you think of any problems that occur?
3. Can you imagine something that would make your job easier?

Interview example: Library Assistant

The respondent found it limiting to develop any further in the job without having a library degree. She fills that she can the job but can not get any further to a higher position when she doesn’t have the degree.

It is hard to learn and to know everything about creating library catalogs.

Another problem is communication with the central library. They have all the books and it can be hard to get some of the books to the engineering library. Also all decisions are made by the staff from the central library and these decisions are not always best and applicable to small libraries.

Change machines and Canterbury cards are not always working as they are supposed to. People have problems with being able to but money on their cards with the tool machines. Color from the Canterbury cards is fading away quickly making them not work.

The first problem that he came to think of was people taking a book from a shelf and putting it somewhere else. In that way it is hard to find it when another person looks for the book and the book is registered being in the library but is not in its right position.

Risk management is a problem. When people for example are sick, away or on training there is a shortage of people but not any good plan for how to deal with it. This is a problem mainly since it is a smaller library, for example a rule is that there always must be two persons in the library at the same time and one must be at the lending desk.

Because there has been a change in the system few years ago it can be hard to find some of the older material while searching in the computer. Some people comes to the library for help while other give up and never get hold of the information they need and which is existing but which they don’t find.

When asked if there is anything that she can think of making her job easier the respondent said “solving the mentioned problems”.

One problem in the interviewed library is the space. Here is too little space.

When asking about if it is a problem with people not returning the books the answer was that people are generally good in retuning the books.
The respondent found it good that there were possibilities to get involved in different projects that were not only about lending books. One could go on different conferences to learn new things in the library world and there were by projects dealing with Maori culture.
Appendix E: Interviews in the University Libraries: One example using the second set of questions

Questionnaire version 2

1. Present our selves:
   - Tell respondent that we are master students from Sweden
   - Thesis about finding a process for generating new innovations
   - We have outlined a process and will now test it
   - Everything that is said is confidential

2. Can you tell us about your job and your tasks? (II)
3. Do you have any difficulties in your job? (I)
4. Can you think of any problems that occur? (I)
5. Do users seem to have any problems? (II)
6. Can you imagine something that would make your job easier? (I)

Interview example: Information Librarian

He works as an information librarian, same duties as information librarian in Engineering Library. The main task is to help people how to find information.

Generally there are to types of people in libraries, professionals and others. Professionals are mainly information librarians and other librarians with a degree while the other is for example library assistants which don’t have a degree.

The interviewed person has worked in both libraries and the private sector. The resemblance that he finds is a difficulty is that they are much more open for new ideas in the private sector and that changes are carried out much slower in libraries.

Another problem is that books are not always were they are supposed to be. There are few different explanations for that. Sometimes borrowers take a book and read in it for a wile in the library and then leave it at some other shelve than were they took it from.

A confusing thing for borrowers is that people from different university library branches are telling different things to borrowers.

There are a lot of process things that could be made better and make job easier. People are too much using papers which they are later misplacing and loosing instead of using a computer.

Science library is a good environment that is relaxed and not much stressful.

The interviewed person has classes when explaining to students how to use library and computers to find information, but also one and one help. In classes students are much quieter in classes than when helped one and one.
Problems for visitors that borrow books are mainly that they are fined if they don’t return books in time. Or that they can not find the information they are looking for and anyway are not asking for help.

A technical problem is that now missing books are noticed on a paper form that are sometimes lost or displaced. It would be easier to have it at the computer.

The work is not so challenging. It does not change much over the years. There are always same tasks and doing the same thing year after year.

Main problem is that new ideas are held back by people higher up in the hierarchy. Worked in the industry before and everything is much slower in the library. Nothing happens. Ideas are being held back. They get stock on desks of the leaders. Not an innovating environment. There is also frustration when trying to get somebody to give guidance, help and acknowledgement.
Appendix F: Interviews in the University Libraries: One example using the third set of questions

Questionnaire version 3

1. Present our selves:
   - Tell respondent that we are master students from Sweden
   - Thesis about finding a process for generating new innovations
   - We have outlined a process and will now test it
   - Everything that is said is confidential

2. Can you tell us about your job and your tasks? (II)
3. Do books get stolen? (III)
4. Do books get miss shelved? (III)
5. Do you have any difficulties in your job? (I)
6. Can you think of any problems that occur? (I)
7. Do users seem to have any problems? (II)
8. Can you imagine something that would make your job easier? (I)

Interview example: Library Assistant

Works with inter loans in a small group of four people. The main task is to provide source material from other libraries to borrowers.

There are lots of things that are done manually that could be done better done better:
   - For example there could be a system for reading other libraries book numbers.
   - Lots of things are requested manually that could be done electronically.

She sees it as a vision that al departments are working efficiently together. It would be better if there were more collaboration with inter loan departments in other companies.

There is no option of working in other teams. The only possibility today is a six months swap with somebody else and it is vary formalized. She would like to swap for shorter time, for example a week, which is impossible.

Now during the summer it is less work for staff working at lending desk because there are no students here. On contrary there is more work for inter loans staff in summer when several students start with research. It would be good if lending desk staff could help with inter loans.

A problem is that there are many different rules and regulations which mean that books can be caught in custom which delays books.

Borrowers find it a problem that because inter loans have just been centralized to the central library they can not longer pick items at branch libraries.
Also all reference only books and journals have to be in the central library and can not be lend to branch libraries which borrowers finds a problem.

Central library is a good working environment.

Another problem since we are a small team is that we sometimes are short of people, if one or two people are away it makes a very big difference. It would be good if everyone in the library can try another person’s job for a shorter time (less than 6 month, maybe only one week) since they then can jump in and help smaller departments when shortage occurs. It would also be a help if people in different teams and departments where working more together since we then can get help from each other. Also some periods of the year are busier in some departments and then it could be good to get help from a department that for the moment have less work to be done.

It is online ordering of books and sometimes the books are delayed because of customs rules. Documents are sent electronically and geographic boundaries are then not a problem. Often people ordering books are in a stressed situation and the think that they can always get the book really soon, for example the next day. But normally it takes longer if the book is sent by post and the person that requested the book can not see by himself where the book is in the sending progress. He must come to the library and ask which a frustration is sometimes for them.

More interaction with other teams and more back up would make the job easier. Also more technology would make the job easier. For example doing things more electronically would do process more streamlined.

The only barrier in advancing is that there are lots of older people working in central library because it is better paid comparing to other libraries in the country.

There is almost no contact between central library and branch libraries, not even between people that have the same tasks.

A more stream lined process would be able to get by make people use the electronic way of request material. To do everything electronically saves time.

Lots of books get miss-helved and hidden by the students.

Eating in the library is an ongoing problem.

There are not any good ways to check that returned books are not dirty and damaged.