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Reference tool for perceived quality

- within the Sony Ericsson
Product Business Unit Accessories Organization

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Abstract

- Title** Reference tool for perceived quality – within the Sony Ericsson Product Business Unit Accessories Organization.
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- Problem Setting**
- What perceived quality requirements do the consumers using Sony Ericsson Bluetooth™ accessories have on the equipment?
 - How can these requirements be implemented and validated in an easy way so that a common understanding for user needs and perceived quality can be achieved?
- Objective**
- To find and define the perceived quality requirements expressed by consumers using Sony Ericsson’s Bluetooth™ headset accessories.
- To define a tool and supportive methods for a common understanding of the perceived quality requirements expressed by consumers using Sony Ericsson’s Bluetooth™ accessories.
- Method**
- This master thesis was based on a descriptive case study together with focus groups and in-depth interviews. The focus groups and in-depth interview formed the qualitative base for the master thesis.
- Conclusions**
- Perceived quality can be defined as the consumer’s judgment about a product’s overall excellence, and perceived quality has been found to have a dominant role on consumer satisfaction. The focus groups and in-depth interviews showed that the following nine factors were suitable for describing the perceived quality of PBU accessories Bluetooth™ headsets used in this study:
- Design
 - Sound
 - Wearability
 - Chargeability
 - Functionality
 - Usability
 - Compatibility
 - Comfort and Ergonomics
 - Convenience

The quality factor “Price” was defined in this study but was found to be more of a trigger for the expectation of overall quality of a product. A high price indicated expectations of high quality and vice versa. In that sense it is not a perceived quality factor in itself but rather an expectation of what quality level the product has.

This master thesis has also presented a methodology for how perceived quality factors can be elicited and implemented in a tool called Quality Reference Matrix. The Quality Reference Matrix is based on the perceived quality factors found in the qualitative study conducted in this master thesis. The Quality Reference Matrix has been developed by combining a concept screening matrix with the Kano theory of attractive quality. An open metric methodology has been used in the tool in order to be able to measure the target levels for the different perceived quality factors. The recommended methodology for eliciting perceived quality requirements and implement them in the Quality Reference Matrix, is built up of three steps:

Step1: Identify Quality Attributes.

Step2: Identify the quality attributes Kano characteristics

Step 3: Put together the different elements in the QRM and set the perceived quality target levels

Key words Attractive quality, concept development, focus group, in-depth interview, Kano, open metric, perceived quality, product development, product quality, quality requirements, Sony Ericsson, user needs, Voice Of the Customer.

Preface

This master thesis was conducted at the Product Business Unit Accessories organization at Sony Ericsson in Lund, from the beginning of September 2006 to the end of January 2007, as a part of my Master of Science in Information- and Communications technologies at the Faculty of Engineering LTH at Lund University.

During my time at Sony Ericsson many different persons both within the organization as well as outside of it contributed to the outcome of this master thesis. You know who you are and I would like to thank all of you.

I would especially like to thank my supervisors Gunilla Wejfeldt and Annika Olsson for their guidance and advices on different paths to take when things felt unclear or diffuse. I would also like to thank Torbjörn Dehlen, Andreas M. Paulsson and Johanna Åkesson for providing me with invaluable information regarding their work process within the PBU Accessories organization. Furthermore, I would like to thank Lotta Crona for her tips and guidance with my focus groups and in-depth interviews. And finally I would like to thank the participants in my focus groups and in-depth interviews who shared their views and opinions about their experiences.

March 2nd 2007, Lund, Sweden

Jakob Frey-Skött

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1 Introduction

The introductory chapter gives a picture of the incitements for this project. It describes the objectives for this master thesis together with its limitations. Finally a general overview of this reports lineup is given together with the time frame for the master thesis.

1.1 Background

The ability to identify consumer needs is a critical success factor for any company today. Without a broad knowledge of what it is that adds value to products in the market of fast-moving-consumer-goods (FMCG), a company is doomed to fall behind one's competitors.

Companies must be clear about their expectations for a new product and FMCG companies are notorious for demanding instant success to justify their research investment. If the idea is sound, the product justifies its claims and if the communications do their job, it is more likely to succeed. The focus for FMCG marketers is on the consumer, how they behave and their needs.¹

The principal criterion when deciding whether to take an idea forward is whether the consumer will like it. It is a simplistic measure, but it remains a good sign of how it will do.² If the consumer doesn't like the product he or she will probably not purchase it. Purchase intentions are widely studied in marketing and factors like involvement, satisfaction, values and perceived quality influence consumers' behaviors.

Research shows that perceived quality has a dominant role on consumer satisfaction and purchase intentions. When the perceived quality of a product is high, consumers are satisfied and more likely to purchase it again.³

Companies must therefore also be clear about what it is that creates quality and what it is that makes consumers buy a product. With a solid and basic understanding for these questions together with a thought through development process companies can thrive and prosper in an ever changing market.

1.2 Problem setting

In 2001, the joint venture of the two companies Sony Corporation and Ericsson lead to a new global provider of innovative mobile multimedia devices, including both phones and accessories. The company has continuously launched new products taking advantage of the latest technology and mobile communications and with the large number of new phones and accessories entering the market during 2005-2006 the company has seen a

¹ Tiltman, D. (2006) *In with the new*. Marketing, London: Feb 1, 2006. pg 37.

² Ibid. pg 37.

³ Tsiotsou, R. *The role of perceived product quality and overall satisfaction on purchase intentions*, International Journal of Consumer Studies 30, 2, March 2006, p214.

new stimulating growth. The new product portfolio has received a great response from both operators as well as end-users.⁴

Despite the great response from the market the Sony Ericsson Product Business Unit (PBU) Accessories Organization feels that there is a gap between the production and the end-consumers, and that there is a need to improve the understanding of perceived quality.

Today, product requirements are gathered in a Product Requirement Specification (PRS), with guidelines for perceived quality but there is little alignment between departments and no common language when speaking of “good enough” quality. Recently there has been a desire to close the gap and get a common understanding of what the consumer wants and what the consumer in detail think adds value to new accessories entering the market.

The two questions this project and master thesis will try to answer are:

What perceived quality requirements do the consumers using Sony Ericsson Bluetooth™ headset accessories have on the equipment?

How can these requirements be implemented and validated in an easy way so that a common understanding for user needs and perceived quality can be achieved?

1.3 Goals and objectives

The goal with this master thesis is two folded: Firstly the goal is to find and define the perceived quality requirements expressed by consumers using Sony Ericsson’s Bluetooth™ accessories.

Secondly the goal is to define a tool and supportive methods for a common understanding of the quality requirements expressed by consumers using Sony Ericsson’s Bluetooth™ accessories.

The tool is going to be a Quality Reference Matrix (QRM) that can be used to present consumer quality requirements compared to some reference products. The aim is to align the understanding of different perceived quality requirements within the organization, which in it turn will result in products with good enough quality from a consumer’s point of view.

1.4 Focus and limitations

The Product Business Unit Accessories Organization develops different types of accessories ranging from hands free devices, desk stands, chargers, to multimedia and car accessories. The defined tool covers one accessories category: Bluetooth headsets. Within the category there are a number of different products. During the project further

⁴ www.sonyericsson.com – About us. 060917

limitations were set regarding which specific products within the category that were used during the elicitation process.

The focus of the project has been to elicit perceived quality requirements regarding Bluetooth™ headsets. This means that the presentation of the tool has been limited to a more descriptive study. I will not present model theory, because this would take focus from the overall purpose of this project. However the theories surrounding the upbringing of different elements in the tool will be described.

The in-house interviews done during this project have been limited to only include the people involved in the part of the process where the tool is meant to be used. The tool will focus on the interface between the two departments Product Planning (PP) and Customer Related Testing (CRT).

1.5 Outline

Chapter 1 Introduction

Gives a background to the project. Explains the problem setting and sets the focus and limitation for the master thesis.

Chapter 2 Methodology

Introduces the methodology used in this master thesis. Gives an overview of scientific methodology and how it has been applied in this project.

Chapter 3 Frame of reference

Gives the frame of reference for this master thesis. Includes methods for eliciting user needs and specifying quality attributes.

Chapter 4 Empirical studies and Analysis

Presents how research was conducted during the project together with the information found from interviews and focus groups. Also presents the quality view at Sony Ericsson together with different departments' perspective on the quality work within the PBU Accessories organization. The chapter concludes with presenting and explaining the suggested work process and work tool.

Chapter 5 Conclusions

Gives an overview of the results and different conclusions drawn from the work done during the master thesis.

Chapter 6 Discussion and future recommendations

Discusses different aspects of the project that could have affected the outcome. Finally recommendations for the future are presented.

The target groups of this master thesis are

- Quality Assurance, PBU Accessories, Sony Ericsson Mobile Communications
- Other departments within the PBU Accessories organization
- Other companies working with consumer needs and perceived quality
- Other master students

1.6 Definitions

BT – Bluetooth™: a wireless communication technology used for short range communication between devices with the Bluetooth™- protocol and hardware installed

CRT – Consumer Related Testing

DSP- Digital Signal Processing

Elicitation – the process of finding and specifying user needs and requirements

NPD – New Product Development

PBU – Product Business Unit

PC – Product Council

PP – Product Planning

PRS – Product Requirement Specification

R&D – Research & Development

Receiving end – The person hearing speech through a handset, handsfree or other mobile device

SEMC - Sony Ericsson Mobile Communication

QA – Quality Assurance

1.7 Time frame

The master thesis has spun over 20 weeks. To get an overview of the different activities that has taken place during this project see the schedule in Appendix A – Time Frame.

2 Methodology

Every scholarly dissertation must be impartial, objective and balanced.⁵ By knowing what methodology to follow when carrying out a scientific project, the correct level of impartialness, objectiveness and balance can be reached. In the following chapter research methodology will be presented together with explanations of how the methodology has been applied to this project.

2.1 Scientific methods and techniques

Methods are scientific ways to approach a research subject and the methods you choose will permeate the whole project and in the end the report.⁶ There are several methods and techniques that can be applied to a scientific project. The difficulty lies in choosing the right methods and applying them correctly on your project. If the methods are chosen blindfolded, the results will be the same.⁷ It is important to always clearly describe which methods that have been used and in what way they have been implemented.⁸

A method can be seen as a way to approach a research subject. One can for example choose to do a descriptive or comparative study, formulate hypotheses or make predictions. Techniques are the tools to collect data in order to be able to use the methods. Interviews and surveys are common tools for collecting data.⁹

Below follows a short description of the different methods and techniques that have been used in this project and approaches that have been taken during the process.

2.1.1 Case studies

A Case study is a way to describe the reality by taking a small part of it and using that part to describe the reality as a whole. The gain in this approach is that you don't have to take on the whole universe of information regarding a certain phenomenon, but instead limit the research to a specific case that can give the insight needed to satisfy the purpose of the research. It is especially suitable for a researcher who works alone. The method makes it possible for the researcher to concentrate on a special event or phenomenon and find the factors that influence the phenomenon in question.¹⁰

The disadvantage is that a single case can never fully represent the reality it is meant to describe. This means that the results must be carefully evaluated, and can only be confirmed when other results from other research methods points in the same direction.¹¹

⁵ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 15

⁶ Ibid. p 29

⁷ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 31

⁸ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 29

⁹ Ibid. p 29

¹⁰ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 16

¹¹ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 31

This projects approach

This project can be seen as a case study including interviews and focus groups. The study has been limited to look at the perceived quality factors when speaking of Bluetooth™ headsets at the Sony Ericsson PBU Accessories Organization. Interviews have been used both to give a picture of work processes as well as quality requirements. The focus groups have been used together with interviews to give the voice of the customer.

2.1.2 Description

The purpose of a describing investigation is to describe a phenomenon considering its spread, scope, and context among other factors. It is of great importance how you approach the method. Some believe that descriptions are more neutral and unbiased than other research methods. But descriptions are built upon a representation of a part of the reality with the help of symbols. They are social constructs and therefore characterized by the social context in which they've come up and evolved in.¹²

When using the method you must use a systematic approach or the result might end up being incoherent. The collected information must be categorized and sorted and then put together to show a situation or state.¹³

This projects approach

Parts of this project can be seen as a descriptive study since I am going to present results based on empirical data that will be categorized, sorted and finally shown in a Quality Reference Matrix. I will also describe different methods for eliciting user needs and requirements. This project will also describe the current interface between two departments within the PBU Accessories Organization.

2.1.3 Classification

Classification is a method for analyzing data and can be applied in many ways. Each research subject demands its classification. It is of importance that the classification follows some logic otherwise the classification can't be used for research and won't produce any usable results. The classes must be reliable, valid, exhaustive and mutually exclusive. If there are empty classes after the classification process is completed it could be a sign that the original classification is unsuitable.¹⁴

This projects approach

Classification has been made during the project regarding the different requirements. The classes have been chosen depending on their ability to describe a certain group of needs and requirements.

¹² Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 43

¹³ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 30

¹⁴ Ibid. p 33

2.1.4 Model

A model is almost the same thing as a theory but has some further concepts. The model does not only consist of different hypotheses. It also tries to give a fixed picture of the reality. The more complicated model, the more accurate is the picture of the reality it describes. The level of detail is based on its purpose e.g. a map is a good example of a model. Depending on what type of activity the map is going to be used for, the details in the map are varied.¹⁵

Many models are explanatory since they often describe the interchange between the parts it consists of. Models of a more mathematical kind are very well suited for simulations. Different variables and parameters can be changed in order to see the effect on other variables within it. On models of a more non-mathematical character scenarios can be used to reason about a certain subject.¹⁶

This projects approach

The Quality Reference Matrix can be seen as an explanatory model since it is trying to explain and give a picture of the quality factors that consumers look at when purchasing Bluetooth™ headsets. It will also include a description of how it can be used to add value to the production development process within the organization.

2.1.5 Comparative

A comparative study is one of the more common methods used in research. The purpose of the comparative study is to explain some event or phenomenon in e.g. a country by comparing it to some other country. The method is somewhat difficult to adopt because you have to be sure that you compare two units that are of the same kind. As with classification there are some rules that must be followed when conducting a comparative study:¹⁷

- The phenomena in the study must be comparable.
- The phenomena in the study must be generalized before being compared.
- If one phenomenon utilizes a different set of units of measurement than the other phenomenon, they must be translated into using the same units of measurement.
- Similarities as well as differences must be presented in the study.

This projects approach

In the beginning of the project there has been a comparative study between different methods used for both eliciting and classifying quality requirements and quality factors. The methods have been studied in order to find the most suitable approach for this project. Different parts from the methods have been selected and combined depending on how well they fit the purpose of this project.

¹⁵ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 37-39

¹⁶ Ibid. p 37-39

¹⁷ Ibid. p 39

2.2 Qualitative vs. Quantitative methods

Within the field of methodology a difference can be made between two groups of methods; quantitative and qualitative methods. In the first group the relationship between the researcher and its subject plays an important part. The second group of methods focuses on the ways the collected material has been worked up, and on how the material has been interpreted and presented.¹⁸

The starting point for the quantitative methods is that the subject of study is made measurable and that the results are presented numerically.¹⁹ Because of the nature of this project the qualitative methods were more suitable.

Researchers with a more qualitative perspective seeks to find answers to how humans percept the world around them. Their goal is rather insight than statistic analysis. They doubt the existence of social facts and question the scientific approach when dealing with humans.²⁰

In their meaning it is impossible to make everything measurable. They recognize that there is a difficulty in delimiting the qualitative methods in an exact way. But the thing that distinguishes the qualitative methods from the quantitative methods is that they treat every phenomenon as a unique combination of qualities or characteristics that cannot be measured. The research process is seen as a two-way communication between the researcher and the research subject.²¹

This projects approach

In the problem setting for this project I mentioned that there was a need for improving the understanding of consumer needs through a clearer picture of perceived quality when it comes to Bluetooth™ headsets. Interviews and focus groups have been used to produce qualitative data which has been interpreted by the author in order to get insights about the different underlying consumer needs.

2.3 Techniques for gathering data

No scientific approach rests on one method solely or excludes a method because it's called quantitative or qualitative. What you need to ask yourself is "What do I need to know, and why do I need to know it?" When you know the answer to these questions you can start to focus on how to get the information you seek and how to manage the collected material.²²

The techniques used for gathering information can be classified into three groups:²³

1. Document studies which mean an indirect observation of social phenomena
2. Observations which means a direct study of human behavior

¹⁸ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 70

¹⁹ Ibid. p 70

²⁰ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 13

²¹ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 71

²² Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 61

²³ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 73

3. Surveys and Interviews where you ask direct questions to persons within the field of study

Before you start looking for information it is suitable to get a picture of what type of source you are going to be using. Sources can be divided into primary and secondary sources. Primary sources comes to life during the project e.g. notes and records of interviews and meetings. When dealing with secondary sources you have to interpret events and phenomena that have occurred earlier based on information found in other primary sources.²⁴

2.3.1 Document studies

When looking for literature, which comprises all printed material, it is recommended to use different databases. By using keywords related to the research you can find suitable sources of information.²⁵

The information you find must be relevant for the project. If you start with the latest relevant literature and then move backwards to older sources you will get the best possible coverage of your field of study.²⁶

A well know fact and somewhat a disadvantage when it comes to literature, is that the material is set from the beginning. But sometimes this method is the only one available. When it comes to historical research the possibilities are limited since primary sources don't exist anymore. Sometimes document studies are chosen because of a limited budget. Time and money can be saved when choosing a document study instead of collecting similar data on your own.²⁷

This projects approach

The literature for this project has focused on the areas of fast-moving-consumer-goods, consumer needs analysis, requirement engineering, and perceived quality. The electronic database ELIN has been used to find relating articles. The key words have been “fast-moving-consumer-goods”, “consumer needs”, “elicitation”, “perceived quality” and “product development”.

A study of Sony Ericsson market research material was conducted with the purpose of finding important issues regarding the consumer needs. Two surveys were used in the study of market material. The first survey is from December 2005²⁸ and worked as a starting point for the market research study. The survey in it self was quantitative but included some parts where more qualitative data could be found. This qualitative data have been used as a secondary source of information in this project. The second survey is

²⁴ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 65-66

²⁵ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 42

²⁶ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 75

²⁷ Ibid. p 74

²⁸ Langford, L & Ha, T (2005) *Bluetooth Headset Research – Qualitative and Quantitative Findings*, Synovate for Sony Ericsson.

from 2006²⁹ and has a more qualitative nature. It describes the consumer attitudes towards different Sony Ericsson product categories.

2.3.2 Observations

Observation is a direct study of social behavior. The researcher is in direct contact with the phenomenon which is included in the study. Observations are good for getting an initial picture of a social phenomenon or event. They are also great when you are in need of new ideas.³⁰

The method requires careful preparations and well thought through pilot studies. It also requires a great deal of experience to get as much out of the observations as possible. When mastered correctly the method can give insights about the experiences of individuals and groups, which otherwise would be hard to elicit.³¹

There are two types of observations:³²

1. Participating observations; the researcher participates in the interplay within the group that is being observed at the same time as data is collected.
2. Non-participating observations; the researcher observes the life within the group without participating in it. An example is laboratory studies where the group is studied through a one-way mirror.

The problem with observations where the observer is present is the risk of bias. The observer might influence the group or vice versa. It is sometimes difficult to take on the role of observer if you know the members in the group. Strengths and weaknesses of different members are known to the observer and that can result in unawareness of important aspects of the behavior within the group.³³

There are different ways to register the interplay within the group. The most common solution is audio or video recordings, but there are other methods like schemes and different types of forms. The method you use depends on what it is that you want to observe.³⁴

This projects approach

Participating observations was used to capture consumer perceived quality regarding the Bluetooth™ headsets. Two focus group interviews and two in-depth interviews were conducted at Ingvar Kamprad Design Center (IKDC). The focus groups and in-depth interviews were conducted on the 23rd, 24th and 25th of October and audio and video taped for reporting purposes. All participants received the HBH-GV435 Bluetooth™ headset as a gift for participating in the study.

²⁹ (2006) *Consumer Insight Summary- what we know about the consumers behaviour and attitudes for different product categories* Sony Ericsson

³⁰ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 76

³¹ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 108

³² Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 77

³³ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 110

³⁴ Ibid. p 111

Participants were chosen according to target groups set by the Sony Ericsson PBU Accessories Organization project leader for this project. Two target groups were identified. The first group consisted of students taking the role of the inexperienced user. The second group consisted of experienced users, using BT headsets either in their professional life or personal life. The experienced users consisted of working professionals at Tetra Pak, together with a student who had used BT headsets for over 2 years. The sample groups for the focus groups can be found in table 1.

Group	Age	Device owners	Accessories used
1 – Young users	20-25	Mobile phone users + BT Headset users	Have little or no experience using BT Headsets.
2 – Professional users	26-35	Mobile phone users + BT headset users	Have a long experience of using BT Headsets

Table 1: Sample groups

To get both a depth and width in the output from the observations one person from each target group were chosen for a deep interview. The participants in each session can be found in table 2.

Deep interview 1	Student –inexperienced user	1 participant
Deep interview 2	Student – experienced user	1 participant
Focus group 1	Students – inexperienced users	3 participants
Focus group 2	Professionals – experienced users	2 participants

Table 2: Sessions

The inexperienced students were given a BT headset two weeks prior to the interview and focus group in order to build their own opinions and thoughts about the headsets. The participants were encouraged to use their Bluetooth™ headsets for all their mobile communication during the test week, and to think about their usage from a quality perspective.

A plan for the focus groups and in-depth interviews were worked out prior to the meetings at IKDC. The plan included an objective and background for the research together with a discussion guide. Two different discussion guides were used during the meeting; one for the experienced users and one for the inexperienced users. The discussion guides can be found in Appendix B - Discussion Guides.

A visualization of the amount of participants in each group can be found in exhibit 1: participants in the elicitation process.

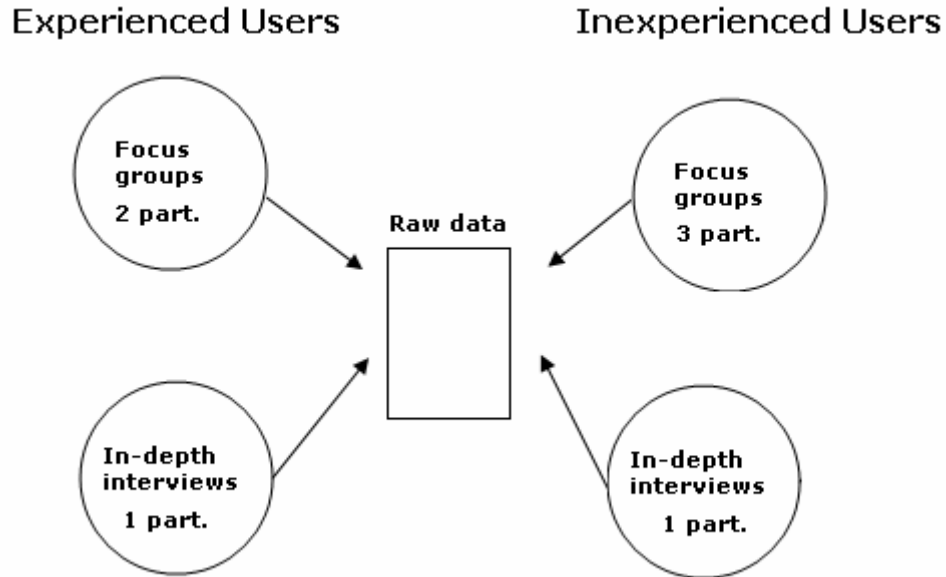


Exhibit 1: Conceptual view of the number of participants (part.) in each session used in the elicitation process.

2.3.3 Interviews

Opinions, feelings, views, knowledge etc. in a population are usually captured through interviews or surveys. In the interview the communication is verbal while the communication in the survey is written.³⁵ Surveys were not used in this study since they are not suitable for the qualitative approach of this project.

In the interview the interviewer controls the conversation between the respondent and himself. The interview is a two-way communication form where two persons unavoidably influence each other, thus it requires that the interviewer is aware of this and can avoid too much influence.³⁶

Interviews can be divided into standardized vs. non-standardized and structured vs. unstructured interviews. In a very standardized interview the questions content, shape, and order are decided in advance. No re-ordering is allowed while in non-standardized interviews the interviewer can change questions and order to fit the situation at hand.³⁷

When speaking of structured and un-structured, one talks about the level of openness in the answers. Closed questions have limited answering possibilities, while opened questions gives the respondent a possibility to answer depending on experience, attitudes etc.³⁸

This project approach

³⁵ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 50

³⁶ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 80

³⁷ Ibid. p 84

³⁸ Ibid. p 84

Both formal and informal interviews took place during the time span for this project. The interviews had a low level of standardization. Because of the qualitative approach unstructured interviews were used. The interviews had different purposes but could in general be divided into two types:

1. Interviews related to the tool and work process conducted with Sony Ericsson employees.
2. Interviews related to requirements and user needs conducted with both Sony Ericsson employees as well as consumers.

The tool and work process related interviews focused on getting a general picture of the problems and opportunities with Bluetooth™ headsets within the PBU accessories organization. They were rather aimed at defining the work process surrounding the QRM, than the requirements within it.

Themes like warranty, production costs, work process and the quality aspects surrounding the development of the product were discussed and illustrated through interviews with the product planner for Bluetooth™ headsets.

Within the PBU Accessories, consumer related testing gave insights about the current quality assurance work and suggestions on how to improve the process surrounding testing and verification. They also gave input on what requirements that were important to them when testing accessories.

With the purpose of getting detailed insights to the perceived quality of Sony Ericsson’s Bluetooth™ headsets two deep-interviews with consumers were conducted. Further information about these interviews and the participants in them can be found in the previous section – Observations.

All together 10 interviews were conducted with Product Planning, Consumer Related Testing and Quality Assurance at the PBU Accessories Organization. Table 3 gives an overview of the distribution of interviews and the interview dates.

Department	Date
Product Planning	2006-09-14
Consumer Related Testing	2006-09-19
Quality Assurance	2006-09-20
Consumer Related Testing	2006-09-27
Product Planning	2006-10-03
Consumer Related Testing	2006-12-06
Consumer Related Testing	2006-12-07
Product Planning	2006-12-11
Consumer Related Testing	2006-12-15
Quality Assurance	2006-12-20

Table 3: Overview of interviews conducted at PBU Accessories.

2.4 Reliability and validity

Regardless of what type of method that is used for gathering data, the information must be critically reviewed for reliability and validity.³⁹ Measures, parameters, measure instruments, tests and research methods must all be checked to assure that they can be useful and are suitable for the project.⁴⁰

Reliability is a measurement of in what extent an instrument or line of action gives the same data when redone under the same circumstances.⁴¹ It is a measure of the accuracy and usability of the instrument or measurement unit.⁴² One can make a difference between two types of reliability: inter-subjective and intra-subjective reliability. Inter-subjective reliability is the level of conformity between different researchers' measures of the same phenomenon. Intra-subjective reliability is the level of conformity between the same researcher's measures of the same phenomenon.⁴³

There are different ways of measuring reliability. The four most common methods for measuring reliability are presented below⁴⁴;

- The test-retest method; the same individuals are given the same test after a certain period of time. If there's a big difference between the test results it can be said that the test has a low level of reliability.
- Alternative formulations of questions; Ask questions with the same meaning but with a different set of words, and then compare the results. With a high level of reliability the results are almost identical.
- The split-half-method; the questions or answers in e.g. a test are divided into two different matching parts and then the points or results between them are compared.
- The parallel-method; the starting point is two different surveys with the same purpose. If the results are the same the reliability is said to be high.

To validate data or instruments is a more difficult issue than measuring reliability. Validity is a measurement of a certain question's ability to measure or describe what it is intended to measure or describe. If a question isn't reliable it lacks validity. But it doesn't automatically mean that if a question has high reliability it has high validity. A question can give the same answers over time, but it doesn't guarantee that the question answer the right things.⁴⁵

This projects approach

By using both focus groups and interviews in this project, the validity and reliability of the results has hopefully been established.

³⁹ Bell' J.,(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 62

⁴⁰ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 67

⁴¹ Bell',(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 62

⁴² Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 67

⁴³ Andersen H., (2003) *Vetenskapsteori och metodlära*, Lund: Studentlitteratur, p 91

⁴⁴ Ejvegård R., (2000) *Vetenskaplig metod*, Lund: Studentlitteratur, p 68

⁴⁵ Bell',(1999) *Introduktion till forskningsmetodik*, Lund: Studentlitteratur, p 62

Reliability in this type of study is hard to measure because it's not guaranteed that the same questions will generate the same answers over time due to the level of transience in the usage. A user who hasn't used a BT headset before might find it very inconvenient and difficult to use in the beginning. But over time he will get used to the product, and if you ask the same user about his perceptions about quality after a long time of usage he won't have the same preferences anymore. This will probably lead to a different attitude and therefore different answers than earlier.

The same questions were in general given during the focus groups and interviews and one can see a pattern in the answers from respective group which indicates some level of validity, as well as some level of saturation.

3 Frame of reference

The frame of reference for this master thesis is presented in this chapter and is constituted of theories surrounding the subjects voice-of-the-customer, perceived quality, user needs, product development, attractive quality and requirements engineering.

3.1 User needs and quality requirements

3.1.1 Voice of the customer

In the article “In with the new” by author D. Tiltman it is argued that the principal criterion for FMCG companies when deciding whether to take an idea forward is whether the consumer will like it. Tiltman claims that the generation of product ideas can begin, once an understanding of the consumer and market has been gained.⁴⁶

Van Kleef et al. says that incorporating the ‘voice of the customer’ in early stages of the product development process has been identified as a critical success factor for new product development. So in order to develop successful new products, companies should gain a deep understanding of “the voice of the customer”. They emphasize that even the most technologically oriented companies use consumer research to verify that consumers will accept a new product when it will be launched at the market.⁴⁷

But care must be exercised when it comes to choosing consumers recruited to test an idea. Tiltman means that mainstream consumers have a tendency to reject innovative concepts simply because they are unfamiliar. The consumers must therefore include early adopters, as they are most likely to recognize the benefit of a new product.⁴⁸ Ulrich & Eppinger identifies these early adopters as lead users. Lead users are

“...customers who experience needs months or years ahead of the majority of the market and stand to benefit substantially from product innovations.”⁴⁹

By focusing on these lead users the development team may be able to identify latent needs and then produce products to meet these needs long before competitors.⁵⁰

Familiarity is also discussed by van Kleef et al. where the authors write that the result of a particular consumer research method depends to a large extent on the familiarity of provided stimuli. The more familiar the consumers are with the product, the more

⁴⁶ Tiltman, D. (2006) *In with the new*. Marketing, London: Feb 1, 2006. pg 37-39

⁴⁷ Van Kleef, E. van Trijp, H. Luning, P.(2005) *Consumer research in the early stages of new product development: a critical review of methods and techniques*, Food Quality and Preference 16 (2005) 181-201

⁴⁸ Tiltman, D. (2006) *In with the new*. Marketing, London: Feb 1, 2006. pg 37-39

⁴⁹ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 58.

⁵⁰ Ibid. p 58.

specific consumer needs can be inquired, because when participants are more familiar with a product the quantity of accessible information in memory is higher.⁵¹

Needs and wants

According to Van Kleef et al. underlying needs motivate consumer purchase behavior. It is the core of the marketing concept and therefore it is important to understand what consumer needs are, and how they can be distinguished from consumer wants:

“Needs are more general as they refer to basic human requirements like food, air, water, and clothing. Wants are much more specific and related to concrete objects that might satisfy the need. A consumer needs food, but wants a hamburger, apple, or sandwich...”⁵²

Perceived Quality

The role of perceived product quality is discussed in an article by Rodoula Tsiotsou where she investigates the effects of perceived product quality and overall satisfaction on purchase intentions. The author presents a conceptual framework where the four concepts value, involvement, satisfaction and perceived quality are explained and what role they play on purchase intentions.⁵³

In short she discusses that social values affect consumers' attitudes and motivates their involvement in products. This leads to the conclusion that products with which consumer are heavily involved in are more likely to reflect social values.⁵⁴

Product involvement can be seen as the perceived relevance of a product based on the consumers' needs and interests. So depending on the values a consumer holds the more or less he/she will get involved in a product.⁵⁵

The level of satisfaction can in its turn be said to be directly effected by the product involvement. Satisfaction can be defined as a limited feeling of varying intensity during a specific short time span directed towards a certain situation like a product acquisition and/or consumption.⁵⁶

The relation between perceived quality and purchase intentions has been debated and some scholars have found that there is a direct relationship between the two, whereas

⁵¹ Van Kleef, E. van Trijp, H. Luning, P.(2005) *Consumer research in the early stages of new product development: a critical review of methods and techniques*, Food Quality and Preference 16 (2005) 181-201

⁵² Ibid. pp181-201

⁵³ Tsiotsou, R. (2006) *The role of perceived product quality and overall satisfaction on purchase intentions*. International Journal of Consumer Studies, 30, 2, March 2006, pp207-217.

⁵⁴ Ibid.

⁵⁵ Ibid.

⁵⁶ Ibid.

others have reported that there is an indirect relation. The indirect relation is said to be mediated by the concept of satisfaction.⁵⁷

Tsiotsou writes the following about perceived quality:

*“Perceived quality has been defined as the consumer’s judgment about a product’s overall excellence or superiority... Perceived product quality is a global assessment characterized by a high abstraction level and refers to a specific consumption setting”*⁵⁸

The author concludes that perceived quality has a dominant role on consumer satisfaction and purchase intentions. Consumers are more likely to buy a product again and again when the perceived quality is high and they are satisfied. The higher satisfaction with a product the more involved is the consumer. Because of the important role that perceived quality plays it is essential that marketing communication strategies should be designed so that they emphasize product attributes and cues. Cues like price, brand name, and objective quality will enhance consumers’ perceived quality and have been found to be related to consumers’ product evaluations.⁵⁹

3.1.2 Identifying customer needs in the product development process

A commonly cited statistics in a mature market where constant innovation is recognized as the best way to retain share, is that within their first few years 90 % of new products will fail. This is said by Tiltman who continues with saying that even though there are no guarantees of success there are ways to remove some risk from the process. If followed carefully, product development processes that have a starting point in gaining insight about the customer should maximize results.⁶⁰

Van Kleef et al recognize that successful new product development strongly depends on the quality of the opportunity identification stage. The opportunity identification stage typically involves searching for new areas of opportunities with regards to unmet needs and wants from consumers.⁶¹ Because of the uncertainty of what to ask consumers at this point, consumer research at this stage is considered difficult.⁶² A problem is also that many users have difficulties explaining what tasks they perform and often they specify a solution instead of a demand.⁶³

⁵⁷ Tsiotsou, R. (2006) *The role of perceived product quality and overall satisfaction on purchase intentions*. International Journal of Consumer Studies, 30, 2, March 2006, pp207-217

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ Tiltman, D. (2006) *In with the new*. Marketing, London: Feb 1, 2006. pg 37-39

⁶¹ Van Kleef, E. van Trijp, H. Luning, P., (2005) *Consumer research in the early stages of new product development: a critical review of methods and techniques*, Food Quality and Preference 16 (2005) 181-201

⁶² Ibid. pp181-201

⁶³ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 334

Product development

A product development process is the sequence of steps or activities which an enterprise employs to conceive, design, and commercialize a product.⁶⁴ To exemplify a product development process a generic development process described by the authors Ulrich & Eppinger has been chosen.

Ulrich & Eppinger present a generic development process consisting of six phases.⁶⁵ The phases are presented in exhibit 2 below together with the key activities to describe them:

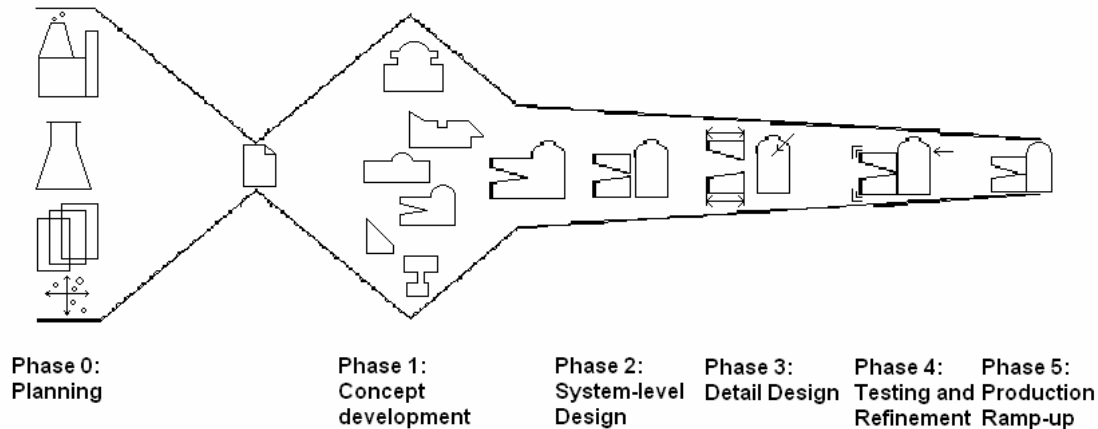


Exhibit 2: The generic product development process suggested by Ulrich & Eppinger.⁶⁶

0. **Planning:** Articulate market need and define market segments.
1. **Concept development:** Collect customer needs, identify lead users and identify competitive products.
2. **System-level design:** Develop plan for product options and extended product family.
3. **Detail design:** Develop marketing plan, define part geometry and choose materials.
4. **Testing and refinement:** Facilitate field testing, reliability testing and performance testing.
5. **Product ramp-up:** Begin operation of entire operation system.

This master thesis will focus on step 1, **Concept development** described by Ulrich & Eppinger. The **Concept development** phase is in itself divided into a number of activities. Exhibit 3 shows the activities in this phase.

⁶⁴ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 12.

⁶⁵ Ibid. p 14.

⁶⁶ Ibid. p 14.

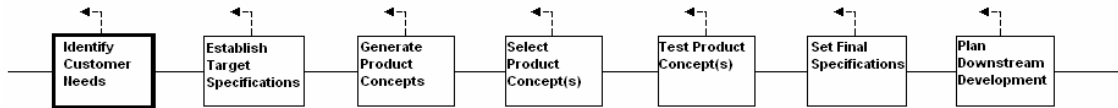


Exhibit 3: The concept development phase⁶⁷

The first one of these activities describes the process of identifying customer needs. The goal of the process is to ensure that the product is focused on customer needs. Other goals are to identify latent or hidden needs as well as develop a common understanding of customer needs among members of the development team.⁶⁸

Identifying customer needs

The identification process is divided into five steps out of which the three first steps have been given focus in the empirical research project:

1. Gather raw data from customers.
2. Interpret the raw data in terms of customer needs.
3. Organize the needs into a hierarchy of primary, secondary, and (if necessary) tertiary needs.
4. Establish the relative importance of the needs.
5. Reflect on the results and the process.

Step 1: Gather raw data from customers

Ulrich & Eppinger describes three different methods that can be used to gather raw data from the customers; in-depth interviews, focus groups and observing the product in use.

An in-depth interview can be defined as:

“...an unstructured personal interview which uses extensive probing to get a single respondent to talk freely and to express detailed beliefs and feelings on a topic”⁶⁹

Interviews can be conducted in many different ways with a single customer but the common way is to conduct the interview in the customer’s environment.⁷⁰ Interviews are good for identifying present problems and formulating requirements. They can point out goals and key issues and provide thoughts about future system ideas.⁷¹ Interviews have

⁶⁷ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 54

⁶⁸ Ibid. p 54

⁶⁹ Stokes, D. Bergin R. *Methodology or “methodolatry”? An evaluation of focus groups and depth interviews*. Qualitative Market Research: An International Journal, Vol 9 No.1 2006 p 28.

⁷⁰ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 56

⁷¹ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 338

the ability to provide the researcher with the possibility to get under the surface and expose important attitudinal data.⁷²

A focus group can be defined as:

“...a group of individuals selected and assembled by researchers to discuss and comment upon, from personal experience, the topic that is the subject of the research”⁷³

Focus groups can provide breadth and contextual information, and a consensus view that allows researchers to easier draw conclusions.⁷⁴ The focus group is typically facilitated by a moderator who leads a two-hour discussion about a certain topic.⁷⁵ The focus group is a form of group interview but it is important to distinguish between the two. While focus groups are based on topics supplied by the researcher, group interviews emphasize on questions and responses between the researcher and participants.⁷⁶

When observing the product in use, the researcher gets the opportunity to watch a consumer use an existing product or perform a task for which a product is intended. This can reveal important details about consumer needs. The observations can be conducted without any direct contact with the consumer, or may involve working side by side with the consumer in his or hers working environment.⁷⁷

Ulrich & Eppinger suggests four different methods for documenting interactions with consumers. One can either make audio recordings, take notes, video record the sessions or take still photographs. Regardless of which method used the final result is a set of raw data usually in the form of customer statements. The raw data can be presented in a spreadsheet as shown in Exhibit 4. In this example Ulrich & Eppinger have chosen a screwdriver (SD) to show how the raw data can be structured:

⁷² Stokes, D. Bergin R.(2006) *Methodology or “methodolatry”?* An evaluation of focus groups and depth interviews. Qualitative Market Research: An International Journal, Vol 9 No.1 2006 p 35

⁷³ Ibid. p 27.

⁷⁴ Ibid. p 34.

⁷⁵ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 56

⁷⁶ Gibbs, A (1997), *Focus groups*, Social Research Update, Vol 19, Departement of Sociology, University of Surrey, available at: www.soc.surrey.ac.uk/sru/SRU19.html

⁷⁷ Ulrich, Karl T. Eppinger, Steven D.(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 57

Customer:	Bill Esposito	Interviewer(s):	Jonathan and Lisa
Address:	100 Memorial Drive Cambridge, MA 02139	Date:	19-dec-02
Telephone:	617-864-1274	Currently uses:	Craftsman Model A3
Willing to do follow-up?	Yes	Type of user:	Building maintenance
Question/Prompt	Customer Statement	Interpreted Need	
Typical uses	I need to drive screws fast, faster than by hand	The SD drives screws faster than by hand	
	I sometimes do duct work; use sheet metal screws	The SD drives metal screws into metal duct work.	
	A lot of electrical ; switch covers, outlets, fans kitchens appliances	The SD can be used for screws on electrical devices.	
Likes -- current tool	I like the pistol grip; it feels the best.	The SD is comfortable to grip.	
	I like the magnetized grip	The SD retains the screw before it is driven.	
Dislikes -- current tool	I don't like it when the tip slips off the screw	The SD remains aligned with the screw head without slipping.	
	I would like to be able to lock it so I can use it with a dead battery.	The user can apply torque manually to the SD to drive	
	Can't drive screws into hard wood.		
	Sometimes I strip tou		

Exhibit 4: Customer Statement Spreadsheet.⁷⁸

The first column in the spreadsheet describes the topic discussed that elicited the customer data. The second column is a list of verbal statements the customer made or an observation of a customer reaction. The third column contains the need as interpreted by the development team.

Step 2: Interpret the raw data in terms of customer needs

The needs found in the third column are expressed as written statements interpreted from the raw data. It is important to describe the needs in the right manner and Ulrich & Eppinger points out that there are some guidelines to how write needs statements:⁷⁹

- *Express the need in terms of what the product has to do, not in terms of how it might do it:* The need should be independent of a particular technical solution.
- *Express the need as specifically as the raw data:* To avoid loss of information, express the need at the same level of detail as the raw data.
- *Use positive, not negative phrasing:* For easier translation to a product requirement specification.
- *Express the need as an attribute of the product:* Ensures consistency and simplifies the translation of needs into product requirements.
- *Avoid the words must and should:* Implies a level of importance for the need which should be avoided at this early stage of the identification phase.

Step 3: Organize the Needs into a Hierarchy

⁷⁸ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 62.

⁷⁹ Ibid. p 61-63

The large number of needs interpreted from the customer statements must be organized in some way in order to be useful in the following development activities. The goal of step 3 is to organize the needs into a hierarchical list. The procedure for organizing the needs is optional but Ulrich & Eppinger presents a step-by-step procedure suitable for this master thesis that contains 6 steps:⁸⁰

1. Print or write each statement on a separate card or self-stick note
2. Eliminate redundant statements.
3. Group the cards according to the similarity of the needs they express.
4. For each group, choose a label.
5. Consider creating super groups consisting of two to five groups.
6. Review and edit the organized needs statements.

An example of the resulting hierarchical list can be found in exhibit 5:

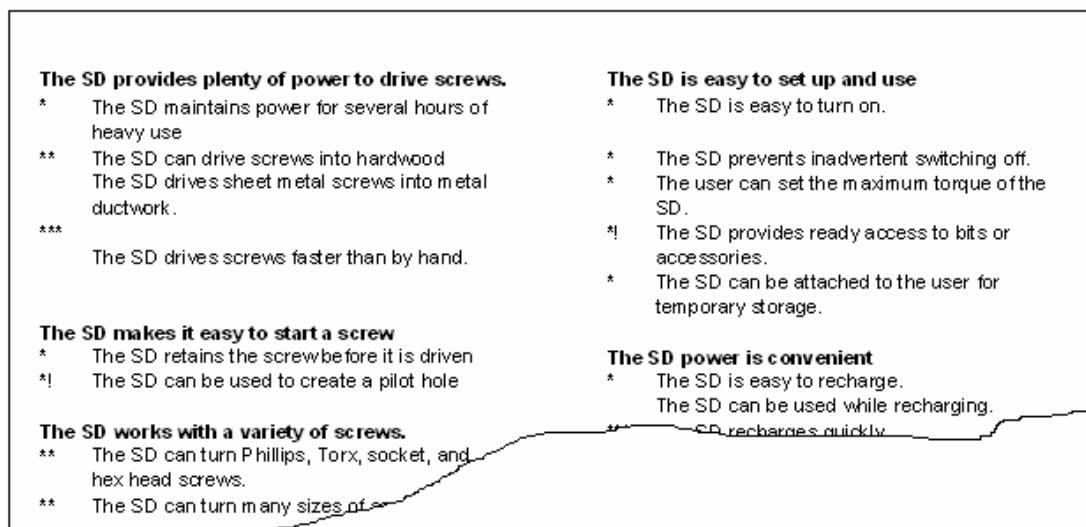


Exhibit 5: Hierarchical list of consumer needs.⁸¹

Step 4: Establish the Relative Importance of the Needs

The hierarchical list above cannot solely give all the information needed. Trade-offs has to be made between different needs, and these trade-offs has to be made based on qualified data. A relative importance rating can help the development team to take correct design decisions when being forced to choose between different technical solutions.

Ulrich & Eppinger presents two approaches to this activity.⁸²

1. In-house: Let the development team conduct the rating procedure based on the collective knowledge of customers and their purchase behaviors.

⁸⁰ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 65

⁸¹ Ibid. p 64

⁸² Ibid. p 66

2. Consumer-based: Base the ratings on further customer surveys.

Even though the customer based approach takes much more time in account than in-house importance assessment, it is argued that the customer surveys are important and worth the time required to complete them.⁸³

The survey should be limited to include queries about the needs that are likely to give rise to difficult technical trade-offs or costly features in the product design.⁸⁴ It is suggested that the customers used in the elicitation process should be the ones used in the relative importance rating. An example of a survey can be found in Exhibit 6.

Cordless Screwdriver Survey	
For each of the following cordless screwdriver features, please indicate on a scale of 1 to 5 how important the feature is to you. Please use the following scale:	
1. Feature is undesirable. I would not consider a product with this feature.	
2. Feature is not important, but I would not mind having it.	
3. Feature would be nice to have, but is not necessary.	
4. Feature is highly desirable, but I would consider a product without it.	
5. Feature is critical. I would not consider a product without this feature.	
Also indicate by checking the box to the right if you feel that the feature is unique, exciting, and/or unexpected.	
Importance of feature on scale of 1 to 5	Check box if feature is unique, exciting, and/or unexpected.
_____ The screwdriver maintains power for several hours of heavy use.	<input type="checkbox"/>
_____ The screwdriver can drive screws into hardwood.	<input type="checkbox"/>
_____ The screwdriver speed can be controlled by the user while turning a screw.	<input type="checkbox"/>
_____ The screwdriver _____	<input type="checkbox"/>

Exhibit 6: Survey example for the cordless screwdriver⁸⁵

The scale from 1 to 5 can be used to summarize the rating for the specific statement, and the rating can then be reflected in the hierarchical list (see exhibit 5 on previous page) by the number of ‘*’s next to the statement. The more ‘*’s the more important need, with three ‘*’s indicating a critical need.⁸⁶ The latent needs can be denoted with ‘!’, and gives indications of needs that aren’t obvious to the consumer.

Step 5: Reflect on the Results and the Process

In the final step of Ulrich & Eppinger’s user needs identification phase, one looks at the earlier stages in the process in order to find possible strengths and weaknesses in the analysis and results. Finding user needs isn’t an exact science and the team must challenge its results in order to verify them. The team must check for consistency and ask themselves questions like; have we interacted with all important types of consumers? It is important to make sure that all latent needs have been given enough attention, and ask themselves if they were surprised by any of the needs. It is also important to ask oneself if

⁸³ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 66

⁸⁴ Ibid. p 66

⁸⁵ Ibid. p 67

⁸⁶ Ibid. p 67

everyone within the organization who needs to deeply understand customer needs have been involved in the process.⁸⁷

In the following section product quality will be discussed together with a theory on how to prioritize and classify the needs elicited in the identification phase.

3.1.3 Product quality and Kano's theory of attractive quality

Product quality

Product quality has been said to be:

“...the extent to which a product successfully serves the purpose of the user...”⁸⁸

There are different perspectives of product quality and through history the view of product quality has changed from a two-factor model to a multidimensional model. The two-factor model presented quality from a subjective and objective perspective. The subjective perspective considers quality based on what one thinks, feels, and senses. The objective view considers quality as an objective reality independent of man. The subjective perspective is somewhat a result of the objective reality.⁸⁹

Löfgren et al discusses that the customer's view of quality is derived from two distinctively different dimensions: product performance and freedom from deficiencies.⁹⁰

Product performance in this context is to which degree the consumer needs are met by the products requirements. Freedom of deficiencies is the level of reliability the product has in the consumer's eyes.⁹¹

When quality is viewed from a multi-dimensional it is often recognized that when a product may be of high quality in one dimension, it is low in another.⁹² Löfgren et al describes a multidimensional view where eight different dimensions are identified: 1) performance; 2) features; 3) reliability; 4) conformance; 5) durability; 6) serviceability; 7) aesthetics; 8) perceived quality. Other quality factors mentioned are maintainability and attractability. The following description of high quality is presented by Löfgren et al:

⁸⁷ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 66

⁸⁸ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

⁸⁹ Ibid.

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Ibid.

“High quality is the composite of quality attributes that provides the intended functions with the greatest overall economy”⁹³

Lauesen presents a number of quality attributes that are mainly focused on software systems but that can be seen as a multi-dimensional view of quality of a system. Many quality requirements are dependent on both the software system as well as the hardware system of a product.⁹⁴ This is especially relevant for a product like Bluetooth headsets and therefore the requirements described by Lausen are interesting to mention in this master thesis.

Lauesen makes a difference between hard and soft requirements. Hard requirements are critical for a system. As an example he brings up a bank vault. A requirement might be that the vault door must close within a certain time span because of other security systems in the bank. If the vault door doesn't close within e.g. 0.13 seconds it might lead to critical consequences. Therefore this requirement is critical, otherwise the system is useless. But other requirements are not critical in the same sense. A soft requirement might be a response time from the banking system of 2 seconds, but if it takes 4 seconds to update a display or screen the user might still use the system. The point Lausen is trying to make is that the physical world doesn't have time for delays whilst the user might accept them - although at a higher cost.⁹⁵

Lauesen presents many lists of quality factors and gives the recommendation that all types of lists should be used as checklists for what to consider. He also emphasizes that the requirement engineer adds new quality requirements in the light of newly found experience.⁹⁶ The ISO 9126 standard is mentioned as a standard that was well received when presented in 1991. He describes that the standard has six overall quality factors: 1) functionality; 2) Reliability; 3) Usability; 4) Efficiency; 5) Maintainability; 6) Portability.

According to Löfgren et al, a common criticism concerning quality is that people consider all quality attributes to be equally important. This leads to the creation of mediocre products and loss of innovative competitive advantage. The theory of attractive quality presented by professor Kano et al can help companies understand the different aspects of how consumers evaluate a product or offering.⁹⁷ This understanding can then help the companies in their prioritization process.

Kano's theory of attractive quality

In 1984 Professor Noriaki Kano presented a model for quality evaluation, based on customer satisfaction with specific quality attributes and their degree of achievement. Through this model invisible ideas about quality can be made visible. After making a list

⁹³ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

⁹⁴ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 217

⁹⁵ Ibid.

⁹⁶ Ibid.

⁹⁷ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

of potential customer needs in the method presented by Kleef et al, the theories and methods presented by Kano are applicable.

The methods are a way to identify the different characteristics of the needs and requirements found in the identification phase. The Kano diagram can help the development team get a clear picture of the customer's idea of quality.⁹⁸ Exhibit 7 gives an overview of Kano's theory of attractive quality.

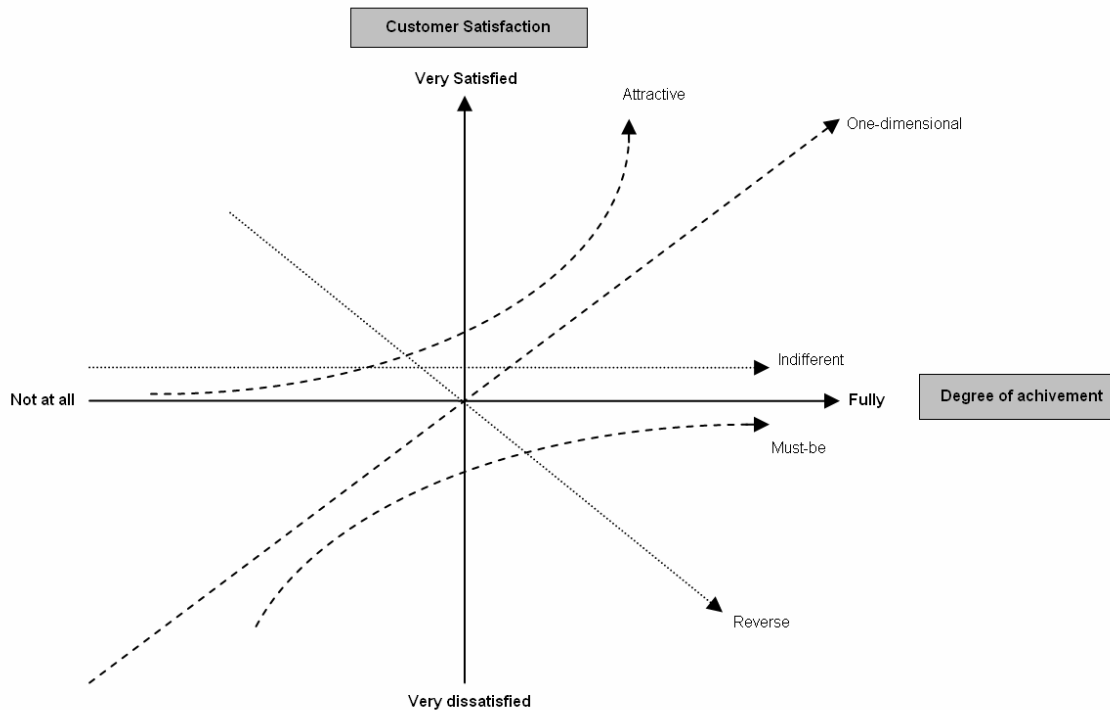


Exhibit 7: The Kano diagram.⁹⁹

The horizontal axis of the Kano diagram indicates how functional the product is regarding to a specific requirement. The vertical axis indicates how satisfied the customer is in relation to the degree of achieved functionality.¹⁰⁰

The 45 degrees line going through the origin indicates a situation where the customer satisfaction is proportional to the level of achieved product functionality. This type of requirement is called a One-dimensional requirement and is often the type of attribute

⁹⁸ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2 number 4.

⁹⁹ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹⁰⁰ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

with which consumers compare different products. Löfgren et al gives the following description of one-dimensional quality attributes:

“One-dimensional quality attributes result in satisfaction when fulfilled and dissatisfaction when not fulfilled”¹⁰¹

An example of a one-dimensional attribute can be the gas vs. mileage on a car. The more miles you can drive the more satisfied customer, and on the opposite end the fewer miles you can drive the less satisfied customer.¹⁰²

A must-be requirement indicates that the customer is very dissatisfied if the need isn't met but is neutral if the requirement is fulfilled. These requirements are typically functionality required for the product to even consider competing on the market. An example can be the breaks on a car. The less implemented breaks on a car the more dissatisfied customer. But if the breaks work as intended it is something that is expected and doesn't create anything else but a neutral satisfaction.¹⁰³ Must-be quality attributes are described the following way by Löfgren et al.:

“Must-be quality attributes are taken for granted when fulfilled but result in dissatisfaction when not fulfilled”¹⁰⁴

Another example of must-be quality attributes is the requirement that you should be able to talk and hear the voice of the person you are using a Bluetooth headset. If these requirements aren't implemented the customer will be very dissatisfied. But if the requirements are fully functional it will not create increased satisfaction.

The attractive curve points out areas where the customer gets very satisfied if specific product functionality is well implemented, but is neutral if it doesn't exist. These types of requirements are in general the attributes that distinguishes different product from each other. The consumers are often not aware of the needs these attributes satisfies and see them as unique for the specific product.¹⁰⁵ Attractive quality attributes are described as:

“...surprise and delight attributes; they provide satisfaction when achieved fully, but do not cause dissatisfaction when not fulfilled...”¹⁰⁶

¹⁰¹ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹⁰² Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹⁰³ Ibid.

¹⁰⁴ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹⁰⁵ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹⁰⁶ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

Companies that wish to distinguish themselves from their competitors should focus on the attractive quality attributes through continuous innovation and continuous improvement of concepts.¹⁰⁷

There is a fourth group of quality attributes that have been defined as indifferent quality. These quality requirements neither create a higher satisfaction level if implemented nor dissatisfy a consumer if not implemented. All together there are six categories of quality attributes, out of which 4 have been described above;¹⁰⁸

- | | |
|---------------------|------------------|
| A = Attractive | I = Indifferent |
| M = Must-be | R = Reversal |
| O = One-dimensional | Q = Questionable |

Kano presents a questionnaire in order to classify the quality attributes into the different categories. The questionnaire is built up of Kano pair questions where each question is presented in two forms; a functional form and a dysfunctional form. The functional form asks how the consumer would feel if a feature is present in a product or application. The dysfunctional form asks how the consumer would feel if the feature isn't present in the product or application. An example of a Kano pair question is shown in exhibit 8.

How do you feel if the Bluetooth headset can take calls?	<ol style="list-style-type: none"> 1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
How do you feel if the Bluetooth headset can't take calls?	<ol style="list-style-type: none"> 1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.

Exhibit 8: An example of a Kano pair question¹⁰⁹

By creating a Kano questionnaire where all the identified customer needs are included, the development team can classify the different quality attributes into one of the six categories mentioned.¹¹⁰ The purpose of the questionnaire is to better understand the characteristics of consumer requirements. The responses from the questionnaire should only be seen as guidelines for the development team.¹¹¹

¹⁰⁷ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹⁰⁸ Ibid.

¹⁰⁹ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹¹⁰ Ibid.

¹¹¹ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

Depending on how the consumer has answered a Kano pair question the team uses the Kano evaluation table to classify a quality attribute. The category can be determined by taking the consumers answer of the functional question and then taking the answer of the dysfunctional question and then find the corresponding classification.¹¹² Exhibit 9 shows the Kano evaluation table.

Quality attribute ↓		Dysfunctional					
		1. like	2. must-be	3. neutral	4. live with	5. dislike	
Functional	1. like	Q	A	A	A	O	A = attractive O = one-dimensional M = must-be I = indifferent R = reverse Q = questionable
	2. must-be	R	I	I	I	M	
	3. neutral	R	I	I	I	M	
	4. live with	R	I	I	I	M	
	5. dislike	R	R	R	R	Q	

Exhibit 9: Kano evaluation table¹¹³

Reverse quality attributes indicate that the opposite implementation will lead to consumer satisfaction, e.g. by not implementing a specific feature the satisfaction will increase.¹¹⁴ The questionable classification is for the situations where there is a contradiction in the consumer's answer, e.g. a consumer has answered that he/she dislikes if a certain feature is present, but at the same time dislikes if it isn't present.¹¹⁵

Customer requirement	A	M	O	R	Q	I	total	grade
1.	1	1	21				23	O
2.		22			1		23	M
3.	13		5			5	23	A
4.	6	1	4	1		11	23	I

Exhibit 10: Kano response matrix¹¹⁶

¹¹² Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹¹³ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹¹⁴ Ibid.

¹¹⁵ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹¹⁶ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

The consumers' answers are then gathered in a matrix showing the different classifications of a quality attribute made by the consumers (see Exhibit 10 above). There are different ways of determine the classification of a quality attribute. The easiest way is to let the dominating category set the classification for a specific quality attribute. If there are two or more classifications that are tied or close to tied, this may be an indication that more information is needed. You might be looking in the wrong segment, or need to define the target group in more detail.¹¹⁷

Another approach to classification is to look at the dynamic nature of the quality attributes. Quality attributes tend to move through time, from being indifferent to attractive to one-dimensional to must-be. If a quality attribute has a close tie between two closely related categories in the quality attribute life-cycle the development team can take this into consideration when making design decisions for the future.¹¹⁸

3.1.4 How can quality factors be measured?

Quality requirements specify how well a system must perform its functions. It must respond within a certain time limit. It must be easy to use. It has to be secure etc. Design decisions aren't just about finding out which quality attributes that are important and then classify them. The design team has to find a way to measure quality factors in a way that makes sense to the whole organization. It is often hard to select a metric for measuring quality, and even harder to decide the value needed. Quality requirements will often have a numerical target to reach, but who sets the targets and why? This is a question that often comes up when the requirement isn't critical.¹¹⁹

There are different methods for measuring quality factors and Lauesen presents two approaches to this challenge: open metric and open target.

Open metric and open target

The open metric and open target approach can give developers of a system or product a way out from the problematic surrounding specification of quality attributes and quality requirements. Exhibit 11 shows four different ways of specifying quality requirements.

¹¹⁷Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4.

¹¹⁸ Ibid.

¹¹⁹ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 228

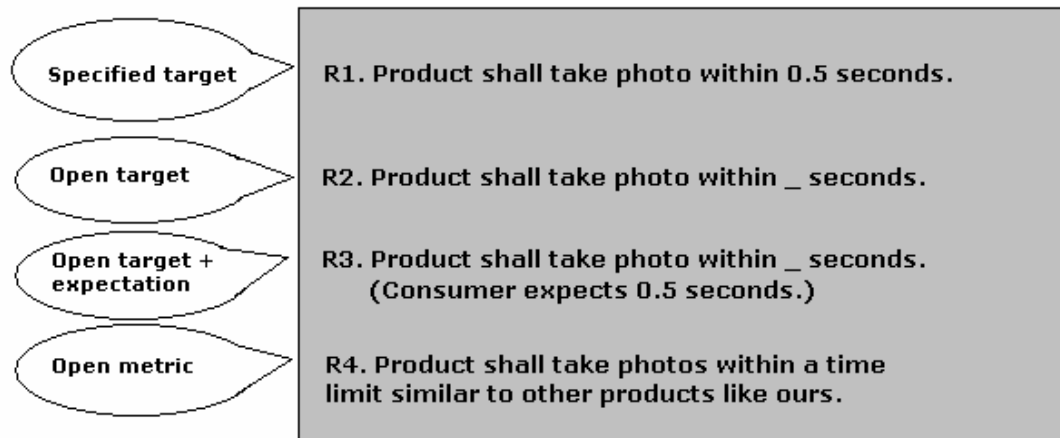


Exhibit 11: Specification of quality requirements

The first requirement R1 is described with a numerical target which sometimes is useful when there are physical limitations to the product. The open target specification used in R2 and R3 are good when one does not wish to set the targets in the requirements specification. In requirement R3 the specification has been added with an expectation that can give the stakeholders and technicians a guideline for what the consumer thinks. The fourth requirement R4 is described as an open metric and suggests that the development team should use other products, in-house or competitive, as guidelines for achieving the quality requirement.¹²⁰

The open metric approach is especially interesting for this master thesis since it allows a development team to compare the developing product's quality attributes with other similar products' quality attributes. Ulrich & Eppinger presents a concept selection method that compares quality attributes between different products against a reference product. The method is supported by a decision matrix and is called concept screening.¹²¹

Concept Screening

The concept screening method consists of six steps out of which the two first are relevant for this thesis:

1. Prepare the selection matrix
2. Rate the concepts

Step 1: Prepare the selection matrix

Inputs like concepts and quality criteria are entered on the matrix. A graphical presentation together with a written description of the concept is the best approach, since this makes it easier for the development team to see the key features of the concept. The concepts are entered along the top of the matrix together with their graphical or textual

¹²⁰ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 228

¹²¹ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 130

labels. The team then picks one concept that will work as the benchmark, against which all other concepts are rated. This concept will work as the *reference concept* and is generally an industry standard or a straightforward concept with which the team members are familiar.¹²²

The criteria are entered along the left side of the matrix. The criteria are described in quality factors, preferably the ones found in the customer needs identification phase. The criteria are described at a fairly high abstraction level and there should not be more than up to 10 criteria listed. It is up to the development team to decide which criteria that determine the quality of the product but they should be chosen so that the outcome of the comparisons is relevant. An example of a concept screening matrix can be found in exhibit 12.¹²³

	Concepts			
Selection Criteria	A	B	C	D (Reference)
Ease of handling	0	0	-	0
Ease of use	0	-	-	0
Readability of settings	0	0	+	0
Portability	0	0	0	0
Functionality	0	0	0	0
Efficiency	+	-	-	0
Maintainability	+	+	0	0
Sum +'s	2	1	1	0
Sum 0's	5	4	3	7
Sum -'s	0	2	3	0
Net Score	2	-1	-2	0
Rank	1	2	3	1
Continue?	Yes	No	No	Combine

Exhibit 12: Concept screening matrix¹²⁴

Step2: Rate the concepts

By comparing the reference concept with each concept in the matrix based on the different criteria a relative score can be set. The score is based on rather broad limits and is set to either “better than” (+), “same as” (0), or “worse than” (-). This type of scoring can be difficult for some people to work with, but in the stage in the development process where the concept screening method is used, detailed ratings are largely meaningless. A way to get more information from the rating is using objective metrics. An example is

¹²² Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 130

¹²³ Ibid.

¹²⁴ Ibid.

“ease of use”, where the rating could be the number of operations required to use the product.¹²⁵

¹²⁵ Ulrich, Karl T. Eppinger, Steven D, (2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 131

4. Empirical Studies and Analysis

This chapter presents the empirical data used in this project and the author's analysis of the outcome of the research. The first part of the chapter describes the work process used to elicit user needs in this project together with the findings from the research and an analysis of the different quality factors found. The second part of the chapter describes the findings from interviews regarding the current quality work at the PBU accessories organization together with an analysis and suggestion of a new work process.

4.1 The voice of the customer

It has been argued that purchase intentions are based on many different factors, among them perceived quality. Perceived quality can be seen as the consumers judgment about a products overall quality feeling.¹²⁶ There are different views of what makes up a products quality, but in the end the decision lies in the hands of the consumer. He or she lays the final verdict if the product at that significant moment satisfies the needs motivating the consumption.

The concept of “the voice of the customer” has been the key ingredient in this projects elicitation process. One of the main focuses has been to find the different quality factors that can be pointed out to be the most significant cues for purchase.

As recommended by the theories surrounding successful new product development¹²⁷, a development process with an early focus on consumer needs was chosen in order to capture the consumers' opinion about Bluetooth headsets. Care was taken when choosing participants for in-depth interviews and focus groups. Even though theories point out that the elicitation process should focus on lead users¹²⁸, the intention with this study was to get both new users as well as lead users to share their opinions about their perceived level of quality. The reason for including new users was because it was important to find the quality attributes that could make them start using a Bluetooth™ headset.

4.1.1 The work process of eliciting quality factors

In order to have a good and solid ground to stand on in the work process of identifying customer needs in the development process suggested by Ulrich & Eppinger¹²⁹ was chosen with some modifications. In this section I will describe how I used the development process and the different directions I took in order to elicit the needs from the in-depth interviews and focus groups. The work process will follow the same headlines used in chapter three in the description of the different steps in the “Identify customer needs” activity in the concept development phase.

¹²⁶ Tsiotsou, R. (2006) *The role of perceived product quality and overall satisfaction on purchase intentions*. International Journal of Consumer Studies, 30, 2, March2006, pp207-217

¹²⁷ Van Kleef, E. van Trijp, H. Luning, P,(2005) *Consumer research in the early stages of new product development: a critical review of methods and techniques*, Food Quality and Preference 16 (2005) 181-201

¹²⁸ Ulrich, Karl T. Eppinger, Steven D,(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 58.

¹²⁹ Ibid. p 54

Step 1: Gather raw data from customers

As Ulrich & Eppinger suggested raw data was captured through a combination of the three methods mentioned.¹³⁰ Both in-depth interviews and focus groups were used and in these sessions the product was observed in use. Access to IKDC's usability lab made it possible to video record the sessions and analyze the outcome afterwards. In the analysis process a similar spreadsheet to the one presented by Ulrich & Eppinger was used to gather the raw data. One spreadsheet template was worked out for each session so all together there were four different spreadsheets were two covered the interviews and two covered the focus groups. Each spreadsheet had separate columns for the statements of each participant (see exhibit 13).

Consumer:				Interviewer: Jakob Frey-Skött
Type of user:	Students	Type of mobile	Used headset	Date: 2006-10-23
	Participant 1	SE k750i	HBH-610	
	Participant 2	Samsung e370	HBH-IV835	
	Participant 3	SE w710i	HBH-705	
Question/Prompt	Participant 1	Participant 2	Participant 3	
Attitudes towards wearing the headset				
	[Redacted]	"I found it to be very [Redacted] ly [Redacted] e	"Nowadays I don't [Redacted] t s [Redacted] wearing a headset."	
What can be done to change the attitude towards BT Headsets.				

Exhibit 13: My raw data spreadsheet for a focus group

A similar spreadsheet was worked out for the interviews (see exhibit 14).

¹³⁰ Ulrich, Karl T. Eppinger, Steven D,(2004) *Product Design and Development*, New York: McGraw-Hill/Iwin, p 56-57

Consumer:	Participant 1	Interviewer:	Jakob Frey-Skött
Type of user:	Experienced user/student	Date:	2006-10-23
		Used headset:	HBH-200
		Used phone:	P990. Earlier Z800
Question/Prompt	Participant 1		
Quality in general			
	"When you speak of quality I f F F F I C C C I C S firm and stable...		
In what way?	"And I think it's connected to the design a		

Exhibit 14: My raw data spreadsheet for an interview

All columns with consumer statements were then gathered into one single spreadsheet in order to get an overview of all the statements. The overview worked as a starting point for the interpretation and organization of needs (see Exhibit 15).

Summary Interview findings	Interview 1	Focusgroup 1			
Session Name	Participant 1		Participant 2	Participant 3	Participant 4
Type of User	Student - inexperienced		Student - inexperienced	Student - inexperienced	Student - inexperienced
Mobile Phone	Nokia 7370		SE k750i	SE w710 i	Samsung e370
BT Headset	HBH-GV435		HBH-610	HBH-705	HBH-IV835
Question/prompt	Statements	Question/prompt	Statements	Statements	Statements
Why did you perceive it as wierd?	[Redacted]	Quality in the usage of the bluetooth headset.	[Redacted]	[Redacted]	[Redacted]
	[Redacted]			"One bad thing is that it d [Redacted]	[Redacted]
and when you held it for the what feeling did	[Redacted]			Especially in daylight [Redacted]	[Redacted]

Exhibit 15: Summary of raw data

Step 2: Interpret the raw data in terms of customer needs

I chose not to interpret a need from each statement made by a participant, because I felt that it would lead to too specific descriptions of how a headset should work instead of focusing on the quality attributes the headset's built up of. Instead I wanted to keep an abstract level and group the different statements under a key word.

After gathering all the statements in one spreadsheet I started to look for key words that could describe a larger group of statements. A multi-dimensional approach was used when trying to find ways to describe product quality. I chose a combination of the different lists of quality factors mentioned by different authors and selected those key-words that had the best fit for a certain group of statements. For those cases where I couldn't find a key word from the quality factors, I chose to find a suitable word on my own.

The key words chosen for each target group based on an interpretation of the statements made by the participants can be found in table 4:

Experienced users	Inexperienced users
<ul style="list-style-type: none"> ▪ Design ▪ Material ▪ Brand ▪ Sound 	<ul style="list-style-type: none"> ▪ Design ▪ Sound ▪ Wear ability ▪ Battery-time

<ul style="list-style-type: none"> ▪ Wear-ability ▪ Battery-time ▪ Attitude (towards wearing a BT headset) ▪ Functionality ▪ Connectivity ▪ Expectations ▪ Usability ▪ Thoughts about usage ▪ Compatibility/Pairing ▪ Price ▪ Convenience ▪ Ergonomics ▪ Range ▪ Comfort ability ▪ Music 	<ul style="list-style-type: none"> ▪ Attitude (towards wearing a BT headset) ▪ Functionality ▪ User manual ▪ Expectations ▪ Usability ▪ Thoughts about usage ▪ Compatibility/ Pairing ▪ Price ▪ Convenience ▪ Ergonomics ▪ Range ▪ Comfort ability ▪ Music
---	---

Table 4: Key words for each target group

Step 3: Organize the Needs into a Hierarchy

After defining the key words the different statements were sorted under each key word. The two target groups statements were kept separate during the process and two spreadsheets with the respective groupings were produced. An example from the inexperienced users' hierarchy list can be found in exhibit 16.

Design		"It's kind of bent down, and I v b th s d during a call."		"Design and ergonomics is important to ev it's too difficult to adjust the volume	
Sound		"I had e s h C h th h I t than the one I got with the phone."	"I wish the speaker was is not so noisy."	"The sound situation there is great V m w e a t Wrong."	"I noticed that when running this the headset in the e th d w d b r f k t s v w b because it
Wearability		"I wish it was E C E t P it C p over instead of t		"It suits a lot of things to keep check o th it ir di H there's no more ergonom	
Battery-time				"I wish it had more battery t different features. The last one I had. It's the same thing when I buy a mobile phone, I just V to open time on my charging to time so you can use it."	"Another thing

Exhibit 16: Hierarchical list inexperienced users

As one can see this hierarchical list differs from the one suggested by Ulrich & Eppinger. The authors' suggested list was used as a guideline but I felt that much information was lost if I didn't keep the statements intact in the grouping process. So I chose to sort the statements underneath each key-word instead in order to keep the raw data as far as possible in the process. This made it easy to keep an objective view as far as possible in the elicitation process, and kept me from having to interpret the data all over again.

At this point in the process the main objective was to make sense of all the data. Some of the keywords weren't really suitable and could be grouped into other more explaining key words or quality factors. I realized that it wasn't suitable to have more than 10 quality factors describing a product so the next step was to find the by Ulrich & Eppinger called "labels" that could describe each group of statements for both target groups. The thought was that these labels in their final form could be treated as quality factors.

With the quality factors chosen and suitable descriptions found I started to summarize the statements in each target group's hierarchical list. The summary led to an executive summary report. The report presents each quality factor together with each target groups summarized view of that specific quality attribute. The findings presented in that report can be found in the next chapter.

Step four *establish the relative importance of the needs* in the identification phase suggested by Ulrich & Eppinger was not given much attention since the purpose of the research was to find and explain the different quality factors, not rate or eliminate them.

Reflections on the result and the process were constantly given during the work process. Because of the different approach than suggested by the authors Ulrich & Eppinger I had to review my work continuously in order to make sure that I would achieve the goals of the research project.

4.1.2 Insights from the focus groups

The familiarity has been discussed as a fuel for elicitation and thanks to the big influence that Sony Ericsson has on the Swedish mobile phone market the participants were very familiar with the phones and the brands of Sony Ericsson. The participants were in general very positive to the brand and connected it with a feeling of high quality. It is therefore important to keep this in mind when reading the findings in this study. All participants are from the Swedish market, and there can of course be differences in different markets. The findings from this study shall be interpreted and used with this in mind.

In the following section I will present the 10 labels that I found could work as quality factors, together with suitable descriptions of what they mean in correlation with statements made by the experienced and inexperienced users:

Design - *The perception of shapes, colors, materials and size determines the headsets attraction and quality level.*¹³¹

Experienced users

The experienced users discussed design in terms like plastic, clumsy, big etc. A big part of the perceived quality comes from the perception of the material used. The material cannot feel plastic and the BT has to be robust and solid with a long durability;

Size matters and BTs of too big size are perceived as clumsy. Even though the experienced users mainly didn't care about the esthetics it is still important how the BT is presented.

Inexperienced users

The design is very important to the inexperienced users. Attributes like colors and shapes, size and weight were discussed. Rounded edges add to a good quality feeling. Design together with appearance is important and they felt that the design has to be self explaining.

Sound - *A perception of the sound quality is connected to how speech is heard through the earphone. Is also connected to how the person you're talking to perceives sound on the receiving end of the line.*¹³²

Experienced users

Sound quality is important to the experienced user. The sound can't be too noisy. The sound is described in terms like hollow, metallic, high treble. Some headsets create a hollow sound, some creates a metallic sound, and some has to high treble. This is perceived as signs of low sound quality.

A headset that can give a clear and good sound is perceived as a headset with high sound quality.

Inexperienced users

The inexperienced users expect the sound to be as good as the sound in a regular handsfree if not better. But they have concerns to how the receiving end perceives the sound. They don't want the other part to be disturbed by the fact that they are using a headset, especially not when it comes to important calls.

One participant mentioned that he felt that the point of a headset is that you should be able to talk and that the person you are talking to should hear you just as good as in a mobile phone.

¹³¹ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

¹³² This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

Wearability - *The wearability is the perceived feeling of carrying the headset with you in your professional or personal life.*¹³³

Experienced users

When it comes to the way the experienced users carry around the BT headset, they have concerns towards the fact that they have to carry around two things instead of one. The fact that they have to keep check of two things stops them from bringing the headset along in certain situations. It is seen as something stressful to have to carry the BT headset along in private situations like vacations with the family, because of other things to keep control of.

An easy and flexible way to store the headset when it's not used is important for the quality feeling, because they don't like to walk around with the headset on their ears all the time.

Inexperienced users

The inexperienced users also had concerns regarding the situation of having to wear two things instead of one in order to make and take calls. They mostly wore the headset in their jacket pocket or in their bags. This type of carrying method caused them some problems since they sometimes couldn't find the BT headset in time to take the call. One participant mentioned that it was important to separate between the way men and women carry around the BT headset. She meant that women probably had it in their bags, while men wore it in their jacket pocket or jeans pocket.

They also had concerns towards wearing it on your ear all the time. They pictured it being more suitable for a person that constantly takes many calls. One participant had used her BT headset at her job and found it very convenient except for when she had to move to the coffee machine or going to lunch. She experienced it as annoying to have to bring "a lot of things" with her. She thought that maybe if the BT or the phone had a clip would make it easier to bring it along without having to think about it.

Chargeability - *The chargeability is the combined perception of talk-time, standby-time and charging time. It is also connected to how convenient or inconvenient it feels to have an extra charger for the BT headset.*¹³⁴

Experienced users

Battery-time is a factor that is really important for the experienced users in this study. It is perceived as something very frustrating if the battery time is short. The less they have to charge the BT battery the better. They have a hard time accepting that they would have to re-charge the BT battery at lunchtime if they've used the BT headset during the morning hours. Another important factor is the re-charging time. The BT battery should be long lasting but at the same time it should go fast to re-charge it. They don't want to

¹³³ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

¹³⁴ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

be forced to leave the BT behind because they have to wait a long time for the battery to be fully charged. When buying a headset they look at both talk-time as well as standby time.

Another issue that was brought up was the fact that they saw a trouble in being forced to have yet another charger. It was not clear to them that you can use one charger for both the BT headset and the phone.

Inexperienced users

The inexperienced users rate the stand-by time and talk-time as two important factors in the sense that they felt irritated if they had to re-charge the BT headset all the time. The re-charge time is also an important factor to the inexperienced user because they don't want to spend valuable time on waiting for the headset to be fully charged.

The issue with being forced to have yet another charger was brought up in this discussion too. Comments about the wish for a common charger were brought up during the meeting.

Functionality - *The functionality is the perceived feeling of the functions that the BT headset provides.*¹³⁵

Experienced users

The experienced users are satisfied as long as the BT headset works as intended. There should be a good balance of functions. They don't expect there to be more functions than to answer a call, and turn the BT headset on and off.

They focus more on the phones ability to provide the choice of taking the call in the phone or in the headset. They want to be able to make an active choice when answering a call. Another thing that was mentioned was the need for a larger display making it easier to see who is calling.

Not being able to listen to music or radio was something that one person felt decreased the quality feeling. He meant that because of the lack of this function he had to switch between his regular hands free and the BT headset when he wanted to listen to music on the phone. He said that the lack of radio or streaming of MP3 has made him look for a better solution.

Inexperienced users

The inexperienced users don't feel or expect that they need all the functions a mobile phone has. By saying it's a headset they feel that the name itself limits its usage and expects that the only thing they should be able to do is talk; therefore they have no other preferences.

¹³⁵ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

But when comparing the BT Headset with an ordinary handsfree, one participant expressed disappointment with the fact that she couldn't listen to radio or music through the headset.

The consensus with in the group was that they felt that in order for the BT headsets to hit the market among young users, it needs to me more focused on music, in combination with the possibility to listen to the music through a stereo headset.

Usability - *Usability is a term used to describe the perceived level of ease with which the user can use a particular tool or other human-made object in order to achieve a particular goal.*¹³⁶

Experienced users

The usability didn't seem to be much of concern to the experienced users. They saw it more as a challenge if the product had new functions that required some investigation. They don't want it to be difficult to learn the new functions, but there must be something new and challenging with the product.

Inexperienced users

During the focus groups and interviews interesting comments and observations regarding the mapping between buttons and their functionality were brought up. These comments indicate that there are issues with the usability of the product that needs to be addressed.

The participants expressed problems with understanding what the light indicators on the different headsets were trying to communicate. They wished for an easier way to see if the BT headset was turned on or off, through an intuitive indication.

When discussing the aid the user-manual could give, all participants first expressed reluctance towards having to open a manual. But after discussing the subject for a while it showed that most of them had opened and looked through the first pages of the manual. The general opinion about the user manuals was that they were too comprehensive and packed with too much information. They wished for a simpler 2 sided user-manual with the most basic get-started-steps printed together with a big picture of the headset, both in the manual as well as on the back of the package.

Compatibility - *The level of perceived compatibility is dependent on how easy the pairing process is, and how easy different brands work together.*¹³⁷

Experienced users

¹³⁶This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups in combination with a definition of the term *Usability* found on <http://en.wikipedia.org/wiki/Usability> 2006-12-02

¹³⁷ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

The compatibility between the phone and the headset is important to the experienced user. They do not think that there should be a difference in ease of pairing between different phone models from the same producer as long as they run the same BT version. The same thing goes for the sound quality between products with the same BT version. They expect that the headset should be compatible with older phone models.

One participant expressed difficulties in knowing whether it's the phone or the headset's fault that the pairing process sometimes didn't work. He just wanted to connect the headset to a new phone without problems. And when it works well it is less likely that they switch their headset for a new one.

Inexperienced users

The inexperienced users didn't have any big issues with the compatibility or pairing. They felt that it went smooth and without any problems. They felt that the process of finding the headset and connecting it to the phone was easy. Those who had phones of a different brand had no problems either. They all went through the pairing process without opening the manual and that was perceived as something positive.

Price - *When speaking of Price as a quality factor, it refers to the connection between price and expected level of overall quality of the headset.*¹³⁸

Experienced users

The experienced users make a connection between price and quality and the following was said about headsets in the different segments;

About headsets in the **lower segment**;

"I don't have high expectations on this type of headset. I imagine that the ear hook will break rather quickly"

"I would probably not buy this type of headset"

"It wouldn't have been worth the while to try it out...something that cheap...then I would rather add a couple of hundred and get a good one instead"

"I would probably accept stranger technical solutions if the price was low..."

About headsets in the **middle segment**;

"Since the market continuously spits out new models on the market, I have a hard time believing that they can include new features every time. Because of this I would probably look at the cheapest ones and the most expensive ones and then pick one in the middle. That gives me an expectation that the headset is good enough when it comes to material and acceptable sound compared to its price"

¹³⁸ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

About headsets in the **higher segment**;

“If the price was high I would expect exceptional material, smaller in size and increased functionality”

“If I had one for 500 kronor and one for 1200 kronor, I would have greater expectations on the more expensive headset...because something has to motivate the price...things like size, design, functionality ...and I would also demand higher quality from the expensive one...”

Inexperienced users

The inexperienced users made the following comments about headsets in the different segments;

Comments about headsets in the **lower segment**;

“You still expect the general functionality even though you might not expect super quality of sound or long range or long battery time”

“Independently of price, you still expect at least a year’s usage”

“If it costs a couple of hundred, I see it more like a disposable item”

Comments about headsets in the **higher segment**

“If I buy something for 800 kronor then I expect it to work a whole lot better than something for 100 kronor”

It seems like the inexperienced users are not willing to pay the price for being wireless, at least not with the functionality that the majority of headsets on the market have today. They don’t feel that they get enough for the money. The low amount of calls together with the price of the headset doesn’t feel motivated. They reason from a private standpoint but can see a value in buying a headset for working purposes. This is because they don’t talk that much in private as they think they would in a working environment.

Comfort and Ergonomics - *The level of perceived comfort is connected to the headsets ergonomic design and how it is perceived physically.*¹³⁹

Experienced users

Comfort to the experienced user is about how it feels physically to wear the headset. Comfort is also about how easy it is to put the headset on and off the ear, and this factor is sometimes as important as sound quality to the experienced users. Another important factor is how easy it is to switch between left and right ear. Headsets with a fixed ear

¹³⁹ This definition is based on the author’s interpretation of what was said in the in-depth interviews and focus groups.

hook weren't perceived as being as good as the headsets were you can easily flip the ear hook.

One participant expressed concerns with the headsets with ear hooks. He wore glasses and therefore he didn't like the idea of wearing a headset with an ear hook.

An interesting observation was that the experienced users based their buy on two general criterions; reviews and comfort. The participants claimed that the rating the headset had got in reviews and tests on the internet had a big affect on their purchase behaviors. But when it came to the final decision it was about how it felt to put the headset on and off the ear, and how it felt when wearing it;

"I would have been satisfied with being able to put the headset on my ear to feel how it fits. I can read the rest in the interview"

"I would have looked at comfort...I wouldn't have bought one like this without trying it out, how easy it is to put on the ear..."

"It's about feeling and testing it out, and looking at reviews before making your choice..."

Inexperienced users

The inexperienced users had issues with how the headset felt when it was sitting on the ear. One participant asked for a better designed placement of the answering button on her headset because she experienced problems when wearing it on her ear.

The inexperienced users felt that the design of the ear hook is crucial for the perception of comfort. They asked for a design that made it possible to wear the headset all the time without hurting or irritating the ear.

Convenience - *The level of perceived convenience is dependent on ease of use, freedom of movement and the headsets ability to produce a feeling of satisfaction.*¹⁴⁰

Experienced users

Convenience to the experienced users is about being able to have freedom of movement of hands and body when taking and making calls. The need is to have the hands free, but if the need is satisfied by a headset or a handsfree is optional. The difference is that the handsfree has a cord that the user can get entangled in.

The perceived level of convenience is a mixture of having enough range, being cordless and being able to wear the headset in a convenient way;

¹⁴⁰ This definition is based on the author's interpretation of what was said in the in-depth interviews and focus groups.

“It gives me the possibility to have my hands free and sit at the computer at the same time. When people contact me at work it’s mostly because they need help with something...I can then sit at the computer at the same time and do my job...”

“And that’s something I find very convenient...to just being able to pick it up from my pocket and...like when I work with my computer...since I can have both hands free...”

“My expectation wasn’t that the BT headset was going to be better than a normal handsfree...but it’s a lot more convenient to use and a lot easier to bring along...”

“...having a cord all the way down along the body doesn’t feel convenient...”

The experienced users didn’t discuss range in terms of numbers, but instead took it as something self-evident that the range was sufficient. They saw the phone at work as a tool and therefore carried it around in a holder like a carpenter carries around his tools. When coming home from work they put the headset away, and therefore situations where they moved far away from the phone and experienced problems with range and connectivity when talking through the headset, did not occur that often.

Inexperienced users

The inexperienced users have used the headset when driving, working or taking a ride on their bicycles and feels that the convenience lies in range and being able to have the hands available for other tasks;

“Something that has been good is that it has been very convenient, in the situations I’ve mentioned like when driving...or doing something else at the same time that you’re taking a call, but in another way than with a handsfree, because when you have a cord you have to have the mobile in your jeans-pocket or something...with the BT headset I can put it on a table or something and just be close to it to talk...”

Most of the inexperienced users requested a longer range.

“...because to me it’s like, if I can move further away from the phone...it indicates higher quality if the sound quality is preserved...”

4.1.3 Insights from market research

During the project there have been two market research reports present. The first one, Bluetooth Headset Research – Qualitative and Quantitative Findings was based on a quantitative web survey but had been preceded by a qualitative study. The study tried to answer the following two questions (among others):

“What influences consumers to buy a certain brand and model of Bluetooth headset?”

“What are the key benefits consumers are seeking when they buy a headset?”¹⁴¹

The qualitative study was performed by conducting three focus groups and 6 in-depth interviews with participants from both the UK and Singapore. The qualitative study assisted in the development of the quantitative questionnaire. All respondents to the quantitative questionnaire were regular Bluetooth headset users and in total 1400 interviews were completed online across seven countries.¹⁴²

The part of the study that I found interesting was the part were results pointing out reasons for satisfaction with Bluetooth™ headsets, since it has been argued that the satisfaction level has an effect on purchase intentions. The study showed that there were several reasons for satisfaction and corresponding reasons for dissatisfaction (see table 5).

Reason for satisfaction	Reasons for dissatisfaction
<ul style="list-style-type: none"> ▪ Ease to use ▪ Very comfortable ▪ Great sound ▪ Good look ▪ Durability ▪ Decent Range ▪ Better due to radiation ▪ Pairs up quickly ▪ Low disturbance ▪ Works as advertised ▪ Clear reception ▪ Good performance ▪ Better when driving ▪ Easier to answer a call 	<ul style="list-style-type: none"> ▪ Drain to much battery ▪ Picks up wind and background noise ▪ Low stand-by time ▪ Not as comfortable as corded headsets ▪ Bigger than traditional headsets ▪ A little to large for ear ▪ Not as convenient ▪ Sound quality is bad ▪ Bad connectivity ▪ Has to be fully charged or it won't connect ▪ Doesn't work sometimes ▪ People have troubles hearing me ▪ Talk time to short ▪ Sound quality not up to standard due to echo-effect ▪ Not very ergonomic ▪ While driving the noise is intolerable to the other person ▪ Unreliable ▪ Not really compatible ▪ Feels awkward walking around with it.

Table 5: Reasons for satisfaction and dissatisfaction

¹⁴¹ Langford, L. & Ha, T. (2005) *Bluetooth Headset Research – Qualitative and Quantitative Findings*, Synovate for Sony Ericsson

¹⁴² Ibid.

In the other study from market research the subject consumer behavior and attitudes is in focus. It is called Consumer Insight Summary and tries to give insights to what Sony Ericsson knows about the consumers' behavior and attitudes for different product categories.¹⁴³

The study refers to the web survey mentioned above but does also include responses to a category of different products. Some interesting reasons for not using a BT Headset are brought up:

- They believe it looks awkward wearing it on the ear (refer to hearing aid)
- They think they are ugly
- They do not know about the technique
- They are afraid of radiation

What is interesting here is that the same type of reasoning can be found in my study. The inexperienced users expressed reluctance towards wearing a Bluetooth headset because of similar reasons as the four presented above.

Some reasons for no longer using a Bluetooth™ headset is also brought up:

- Connection drops
- Sound quality is bad
- Not comfortable on the ear
- Pairing is complicated

The experienced users in my study brought up similar reasons for dislike of Bluetooth™ headsets. One participant especially mentioned the irritation over dropping the connection to the phone all the time.

One interesting subject that is brought up in the market research study is Music. Hypothesizes has been made in the research that the important factors for buying or replacing a headset are:

- Trusted brand
- Packaging
- Color and design of product
- Quality and performance
- Portability

An interesting observation is that when the inexperienced users shared their thoughts about future functionality, they mentioned Music as one of the most important factors for the success of Bluetooth™ headsets on the young market. The portability of the headset was discussed together with a satisfying stereo headphone solution and wearing solution as the key for success when it comes to introducing Bluetooth™ headsets to younger people.

¹⁴³ (2006) *Consumer Insight Summary- what we know about the consumers behaviour and attitudes for different product categories* Sony Ericsson

4.1.4 The identified quality factors

In my study I found 10 different quality factors that can describe the perceived quality of the Bluetooth headsets used by the participants. The ten factors are built up of factors mentioned by both Löfgren et al¹⁴⁴ and Lausen¹⁴⁵, that I felt were important for a product or system.

As the author Lausen¹⁴⁶ writes, the list of quality factors can be endless and the important thing is to use common sense when dealing with them. Quality in my study was viewed from a multi-dimensional perspective and therefore the number of quality dimensions was endless. The way to deal with them was in my eyes to try to keep it as simple as possible. I didn't want to disintegrate the quality factors too much, because I believe that it could have caused a situation were I ended up with a vast number of quality factors that described every single part of a product. Parts that might not be important to the consumer or parts that aren't adding value to the product. Working with 10 quality factors may even be too much to get a comprehensible view over a products quality but it's at least a start. I could have applied an even more abstract view but then a certain level of detail would have been lost.

As both my study and the market research shows there are some basic quality factors that influence the consumer. When comparing the reasons for satisfaction found in the market research material with the 10 quality factors I've found, one can see that they can be matched with each other (see Exhibit 17).

¹⁴⁴ Löfgren, M. Witell, L. (2005), *Kano's theory of Attractive Quality and Packaging*, The Quality Management Journal, 2005, vol 12, number 3, p 7-20.

¹⁴⁵ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 217-218

¹⁴⁶ Ibid.

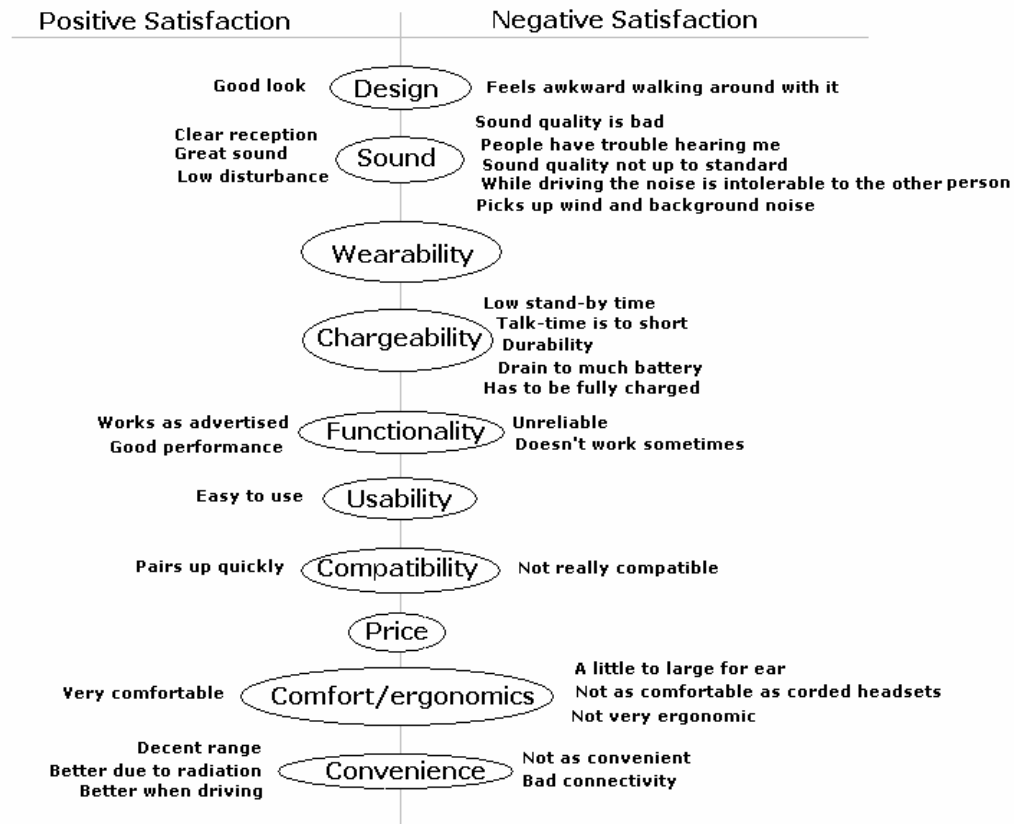


Exhibit 17: Matching between quality factors and reasons for satisfaction.

I feel that this somehow gives me confidence that the resulting quality factors I've found in my study can describe what the market research material has shown is important for the consumer.

The matching shown in exhibit 17 also indicates that my study pointed out some areas that were not touch by the market research. The quality factor *Wearability* couldn't be matched with any reasons for satisfaction or dissatisfaction. I identified it to be an important quality factor since the participants in my study expressed concerns about the issue with being forced to carry around more than one device. *Wearability* can be connected with the portability of a product, which is often mentioned when speaking of headsets and handsfree devices. But since portability doesn't comprise the perception of having to wear two devices instead of one, I felt that *Wearability* was a more suitable description.

My *Chargeability* quality factor can be matched with some of the reasons for dissatisfaction found in the market material, like stand-by time and talk-time. But an area that wasn't mentioned was the re-charging time which was brought up by the participants in my study. *Chargeability* is made up out of the usual factors stand-by time and talk-

time, but I found it important to emphasize the re-charging time as well as the charger-solution: the fact that they were forced to have yet another charger.

So as the work progressed I found areas that didn't have a name or quality attribute that fitted them. So in the light of the recommendations made by Lausen¹⁴⁷, I created my own quality factors for those new areas that I found: *Chargeability and Wearability*.

Other identified areas

Usability was a factor that I found to be very important, but that was only mentioned by the in my eyes generally vague "easy-to-use" phrase in the market research material. The usability of a products is sometimes the most important factor since problems with the usability indicates that the development team has failed to communicate to the user, how to use the product. A usability problem is a situation where the user cannot figure out how to carry out a task or finds it too difficult. Some of the participants in my study had issues with understanding how to use their Bluetooth™ headsets, and didn't feel at all that the mapping between buttons and their functions were natural and easy to understand.

Price was in my study a quality factor that was more connected to the expected quality of a product. Price is therefore not a perceived quality attribute, but indicates what kind of quality level the consumer can expect. My study showed that the participants saw a connection between the price and expected level of quality of the product. The participants didn't discuss price as a quality factor in the same way as they discussed design, performance, comfort etc. It is therefore not so surprising that the *Price* quality factor couldn't be matched to any of the reasons for satisfaction or dissatisfaction. The price was instead a trigger for judgments about the product. If the price was high, the expected and sometimes perceived level of quality was high. But at the same time it can be the other way around. A high price can indicate high quality but if the expectations aren't met, the perceived level of quality is low. And as research has shown; a low level of perceived quality leads to a low level of satisfaction¹⁴⁸. If the consumer isn't satisfied with a product they are not likely to purchase it again. It is therefore important to constantly have the price in mind, and to constantly review what kind of signal the price sends out to the consumer, compared with the level of quality on the other quality attributes.

What factors are important and why?

In order to get the answer to the question above the theory of attractive quality can be applied. The methods presented by Kano¹⁴⁹ can be used to get the different characteristics of the quality factors and give the development team an overview of and a common language when speaking of quality factors.

¹⁴⁷ Lauesen, S. (2002), *Software Requirements Styles and Techniques*, Pearson Education Limited, p 217-218

¹⁴⁸ Tsiotsou, R. (2006) *The role of perceived product quality and overall satisfaction on purchase intentions*. International Journal of Consumer Studies, 30, 2, March2006, pp207-217

¹⁴⁹ Walden D et al., (1993), *Kano's Methods for Understanding Customer-defined Quality*, Center for Quality of Management Journal, Compendium, vol 2, number 4

The team would have to investigate each quality factor and find out which parts it was made up of, typically from viewing the hierarchical list of statements. When this process is finished the team can begin working on the Kano questionnaire. After letting consumers answer the questionnaire the team can continue to follow the methodology presented by Kano and use the Kano evaluation table to classify each answer. The Kano response matrix can then be used to grade each quality attribute. In the final step the development team can achieve a conceptual view of where each attribute is present in the Kano diagram. To exemplify the presence of different quality attributes in the Kano diagram, exhibit 18 shows a simple classification based on simple reasoning.

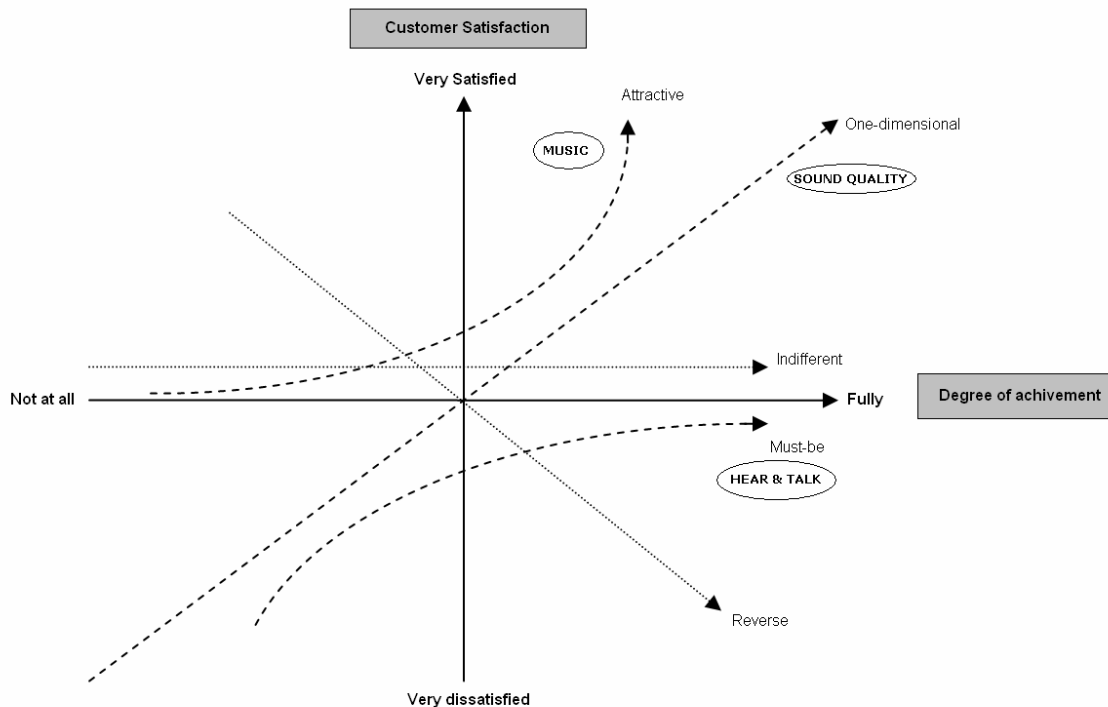


Exhibit 18: Sound attributes in the Kano diagram.

By starting to speak about quality attributes as attractive, one-dimensional and must-be the development team can get the common view requested. Some attributes can be classified directly by using common sense. Being able to hear and talk to through the headset is a must-be attributing. The sound quality can be seen as one-dimensional; the better sound quality the more satisfied consumer and vice versa. Being able to hear music through the Bluetooth™ might still be seen as an attractive attribute but will slowly, as time and market matures, go towards a one-dimensional classification. The team could use the same type of reasoning when it comes to other quality attributes. The important thing is that the whole organization is clear about what each quality attribute stands for and what classification it has.

4.2 The quality approach

“The mobile phone sits at the intersection of three fast-moving industries; it is a communications device, computer and, with the addition of new media functions, consumer-electronics product.”¹⁵⁰

With these three markets in mind, many firms want a piece of the cake as the markets grows even bigger. Traditional players on the market face new challengers and opportunities, and have to transform in the same pace as the market. The barriers to enter the market used to be bigger before but the situation has changed the last couple of years. Radio chips and software to make a mobile phone work, can be bought of the shelf. Manufacturing can be outsourced and companies specialize in their own areas like handset design, chip design, testing and software.¹⁵¹

The market for handsets and handsfree products is characterized by constant innovation and change and when connecting this to the fact that approximately 90 % of newly introduced products on the market fail within their first few years, it is even more important for companies to have a good and healthy approach towards handling the fast pace and changes on the market. A way to do this is to have a well-formulated development process with clear interfaces between different parts within the product development team.

During my time at Sony Ericsson I have had the opportunity to study the flow of information that pass between different departments within the PBU Accessories organization involved in the development process of new Bluetooth™ headsets. With guidance from the Head of Quality Assurance (QA) I interviewed the involved parts within Product Planning (PP) and Consumer Related Test (CRT). In this section I will present the findings from these interviews, together with my view of how the quality work can benefit from using the theories and methods described in this master thesis.

4.2.1 The quality approach in general

In SEMC's Quality Policy the company presents a quality vision characterized by world-class quality products and services – as perceived by its customers. In order to achieve world class quality four quality mission points are presented, all with a customer approach in mind¹⁵²:

- We focus on improving end-user satisfaction by offering the most attractive, reliable and innovative products and services.
- We work closely together with our customers to understand their need and requirements and ensure that products exceed their expectations.

¹⁵⁰ (2004) *Special Report; Battling for the palm of your hand – Mobile phones*, The Economist. London: May 1, 2004. Vol.371. Iss.8373. p 79.

¹⁵¹ Ibid.

¹⁵² Larsson, J (2006) *Quality Manual Sony Ericsson Mobile Communications AB* Lund: SEMC, p 8

- We work closely together with suppliers and manufacturing partners to ensure that supplied parts and finished products are of the highest quality.
- We constantly improve the quality of our products, services and work processes by learning from our experience and our customers' feedback.

The quality objectives are sustainable growth and profitability. Through an understanding and continuing work of increasing the perceived quality of their products and services they hope to reduce the total cost of poor product quality.¹⁵³

When discussing the customer approach it is important to recognize is that by customer SEMC refers to operators, distributors and retailers. The end-user is referred to as the consumer. Consumers are the individuals who are actually using SEMC products. They are provided support through regional call centers, Sony Ericsson Consumer Website and through warranty repair and/or exchange provided by authorized service centers.¹⁵⁴

Consumer surveys are administered on a regular basis and the results are compiled and then circulated to the different marketing teams to develop corrective action plans.¹⁵⁵

Product development at PBU Accessories

PBU accessories use a product development process consisting of a set of project processes. The development process starts with a concept study where a concept is defined (see exhibit 19).

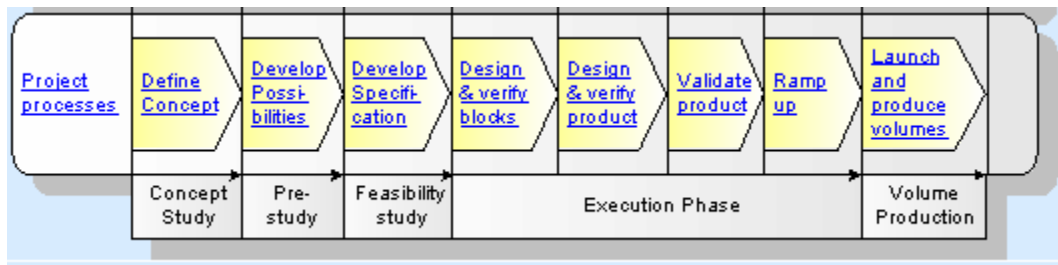


Exhibit 19: PBU Accessories product development process¹⁵⁶

The define concept process is constituted of three activities¹⁵⁷:

- **Collect requirements:** Investigate requirements to satisfy market/customer needs in future products.
- **Collect Technological Capabilities:** Collect available technological capabilities to achieve market/customer requirements.
- **Define one Concept Proposal:** Define concept proposal for product development based on market requirements and available technological capabilities.

¹⁵³ Larsson, J (2006) *Quality Manual Sony Ericsson Mobile Communications AB* Lund: SEMC, p 9

¹⁵⁴ Ibid. p 9 & 11

¹⁵⁵ Ibid. p 10

¹⁵⁶ Agora, Sony Ericsson intranet, 20070110

¹⁵⁷ Ibid. 20070110

4.2.2 Quality Assurance at PBU Accessories

The Quality Assurance department has been formed to put high emphasize on quality parameters which stretch across the whole PBU Accessories business case. Areas such as product quality, processes, execution and behavior are in focus together with interfaces and operational development between departments.¹⁵⁸

Quality Assurance is responsible for fulfilling PBU Accessories quality targets and to secure the balance between quality, cost and ready-to-launch into Product Council (PC) decisions.¹⁵⁹

4.2.3 Quality Assurance and the QRM¹⁶⁰

Thoughts behind the QRM

One of PBU Accessories quality targets is to fulfill consumer needs. In order to fulfill this target QA feels that there is a need to strengthen the common understanding of perceived quality within the organization. To do this the thought of a QRM came to surface. The purpose of the QRM is to present a products consumer quality requirements compared to some reference products (see table 6). The QRM shall be used to align the understanding of different quality requirements within the organization in order to produce products with good enough quality from a consumer’s point of view.

Product X’s QRM	Quality Factor 1	Quality Factor 2	Quality Factor 3
Reference product 1			
Reference product 2			
Reference product 3			

Table 6: The foundation for the QRM

The main idea behind the QRM is that it should be used through the whole department as a guideline for what quality level a product must achieve. When the PP creates the PRS he or she shall create the QRM for the specific product. The buyers shall be able to look at the QRM to get guidelines on what quality level the components should achieve. CRT shall be able to use the QRM as guideline for testing and so on.

QA recognizes that it is unreasonable that PP has to find new reference products every time a new product is to be developed. A way to approach this topic is to may be to set a limited number of reference products to choose from, at the same time as the roadmap for the coming year is produced. The PP could then have a couple of well-defined competitive products to relate to when setting the quality levels for the products.

¹⁵⁸ Wejfeldt, G (2006) *Functional Description for Quality Assurance on PBU Accessories*. Sony Ericsson

¹⁵⁹ Ibid.

¹⁶⁰ All information in this section is based on interviews with Quality Assurance supervisor between 20060911-20061220

When it comes to importance rating between different quality factors QA feels that it can be both good and bad approach. In a situation where there is limited time it might be good to be able to prioritize between quality factors, but it could lead to the situation where low rated quality factors are overseen. And that's not the purpose of the QRM. It is important to keep an objective perspective when speaking of prioritizing quality attributes and not let certain attributes fall behind or get less focus.

4.2.4 Consumer related testing's view¹⁶¹

Consumer Related Test (CRT) handles all testing of Sony Ericsson Accessories from a consumer perspective in the development phase.¹⁶² Two types of tests are performed: quality testing and Compatibility testing. When the quality tests have been conducted the accessories are given to compatibility testing. All tests are conducted in order to validate the product requirements against the PRS.

CRT's view of the PRS

The consumer test department feels that they are in a difficult situation. They feel that they are missing important input from PP that they feel should be in the PRS in order to perform their tests accurately. From their perspective there is a need for a common understanding of the products background and purpose.

“We want answers to questions like: why do we develop this product? Is it a moneymaker? Is it for ‘people on the move’? Is it Brand strengthening? What are the target groups? What price spectrum? Is it bundled? And so on ...”

CRT wants the PP to push for what's important with the product and they picture a future PRS with the following parts added to the current version of the PRS:

1. A diagram with the product placed in the fitting quarter (see table 7) together with a brief summary of purpose, background and “scenario”. Why do we develop X? Keywords like “ergonomic” or “24/7 wearing”, or “Portability” should be used together with an explanation of the aim and intention of the product.

High cash flow	Kitting
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¹⁶¹ All information in this section is based on interviews with Consumer Related Test between 20060927-20061215, except where otherwise referred.

¹⁶² <http://agora.sonyericsson.net> Sony Ericsson Intranet (2006-12-05)

●	
Brand strengthening	New technology

Table 7: Product placed in suitable quarter based on the intentions with the product

2. Detailed Ready-to-Launch information: when? why? Example: “the product shall be launched prior to Christmas to match the increased demands for products at that time of year”

3. The intended quality level: This is where the QRM comes into the picture.

CRT’s view of the QRM

Today, every time a new product is up for testing, CRT has to ask PP what product to test against. Earlier they used to go out to stores and buy a competitor’s product for ca 200 kronor and compare it to Sony Ericsson’s 400 kronor product and realize that they had the same audio quality from a consumer’s perspective. If there were a matrix like the QRM and a general way of working, they picture themselves being able to easier determine what quality level the product is meant to be competing on.

CRT visualizes the QRM as something that comes with each PRS for a product, containing the main criterions for quality.

“We would like to know what level of quality the product is meant to achieve. What segment maybe? We see a QRM where the product is compared to old products, new products, competitors’ products, even our own Sony Ericsson products”

The QRM should work as a guideline for testing the quality of a product. CRT wants to know in which direction to go when testing a product, because currently they set their own targets. This doesn’t always reflect the consumer’s satisfaction level or the PP’s intention with the product. CRT sometimes target for a higher quality level than expected from the consumer.

“Our target span is in all directions right now. We want guidelines for which direction to take when it comes to a certain quality attribute. It would help us if we could be able to make statements like ‘accessory X should be equal accessory Y when it comes to audio’, ‘better than accessory Z when it comes to design’ and so on...”

In CRT's eyes the QRM can function as a guideline for which way to aim when testing the quality level of the product. CRT visions a QRM similar to the one presented in table 8.

HBH 608	Audio	Range	Usability	Etc.
Jabra	=	>	>	=
Bluespoon	>		=	
Nokia	<		<	

Table 8: Consumer Related Test's view of the QRM

In CRT's vision they picture a matrix where the PP has set the different targets for each quality factor in relation to reference products. The values '>', '<', and '=' are used to indicate whether the product aims at being better than, worse than or similar to a preference product when it comes to the specific quality factor. In table 8 above, the product "HBH 608" is intended to be equal to Jabra when it comes to the quality factor Audio, but better in Range and Usability.

About setting targets in the QRM

CRT believes that it is essential that the PP sets the level of quality for the product. They feel that the PP has to pick the reference products for the reference matrix and then describe the wanted quality level. If the PP doesn't have the resources for picking reference products, CRT pictures a solution where a person can be assigned to look up information on the internet about competitive or guideline products, and then provide the PP with such information. It can then be easier for PP to match the product against those products.

CRT feels that the importance rating can work as a guideline for testing. At times where the time is short and priorities have to be made it is good to have some guidance to know what to focus on. The importance factor can also give hints about what's important to push for with the product.

4.2.5 Product planning's view¹⁶³

The market today

There are both natural competitors on the market like Nokia, who just like Sony Ericsson, produces Bluetooth products to their own handsets and then there are new challengers like Jabra who is focusing only on producing accessories to different kinds of products and handset producers.

Bluetooth accessories are rather expensive on the market. The overhead-, distribution-, and packaging costs makes up the bigger part of the production cost. Approximately 55-60 % of the cost can be directly connected to the different mechanics used in the product. PP believes that if costs could be lowered on parts without losing product quality, much could be gained.

¹⁶³ All information in this section is based on interviews with Product Planning between 20060914 and 20061211

But it is important to keep the warranty on a low level as well since this is an unwelcome factor that constantly needs attention. It is very critical if there is something wrong with the quality of the product, since this will lead to a high return-rate. There is constantly a battle between the warranty and the quality requirements put on new products. But so far there has been a low return-rate on Bluetooth accessories, much due to the fact that the consumer generally has the attitude that the damage was self-inflicted, instead of blaming it on poor quality.

Another perspective on quality is the “brand-protection”. Sony Ericsson chooses not to fight in the lower cheaper segments in order to protect the brand from being connected with poor quality. This is to avoid that the consumers considers the Sony Ericsson’s products to be garbage.

Testing

Historically there has been cases where cigarette chargers were put to monstrous test where they had to stand being taken in-and-out of a cigarette lighter holders on cars more than 10 000 times. They were stuck in old test traditions and an old view of quality. PP feels that there must be a smarter way to obtain good quality in comparison to the price.

“It’s important to know where and on what level the quality work should be focused on. How do you obtain good and reliable values? Because of the lack of a tool or methods, we must take a more careful approach. To get a good balance, the products price has to be put in relation to quality. Does the consumer expect top class quality from a product that was bought for 200 kronor, or is there another way to find the right level of quality for that price?”

About the PRS

PP recognizes that there are ways to improve the PRS from its current form. But there are some important factors that need consideration before re-designing the PRS. The quality level of the PRS depends on three different circumstances:

- Time: *“There just isn’t enough time to write detailed and long descriptions about purpose, intentions and similar subjects”*
- Target group: *“It is often the project leader who is the target group for the PRS and they want everything to be as short and precise as possible, which leads to short background descriptions.”*
- Mutual understanding: *“The PRS many times works as a ‘handshake’ of something that has been worked out over time step-by-step in conjunction with other departments. This leads to a common understanding of the background and similar things, without it being forced to be printed in words on a document”*

But at the same time PP understands that the PRS can’t be too vague in its descriptions of quality requirements. The PRS can’t be generalized to fit everybody’s requests, since this would lead to a too fuzzy and indistinct PRS.

“It is important to be clear about whom the target group is and what forum to use for the communication. The most important thing is that the PRS gives results. You don’t want to spend time on writing detailed descriptions, and then get to know that nobody reads them or use them. There is no time for that type of situation”

About setting targets in the QRM

The QRM should be used as a way to communicate a quality feeling, but PP feels that all fields mustn’t be filled in order to complete it. It’s better if the factors that are given focus are filled in, and that other factors can be left empty.

The PP thinks that a distinction should be made between emotional factors like design and technical factors like sound, chargeability. There is a need for a test-center to test competitive products with the same tests as the Sony Ericsson products in order to get a correct value on e.g. frequency or Sound-to-Noise ratio.

Emotional factors are easier for PP to describe in words rather than a simple value. The measure points should be descriptions of how the PP wants the product to look, feel or function.

About reference products in the QRM

When it comes to benchmarking there is a flora of competitors. The competitive benchmarking should be conducted by some third part, since PP feels that they don’t have the tools for testing each competitive product against each quality factor. It would require too much time and focus to first measure the quality attributes of each reference product and then compare them with the new product. If instead a competitive analysis group could give input on how different competitive products matched up against the different quality attributes it would be much easier to use them as references when developing a new product.

The PP’s whole world is about adjustments and negotiations. They can only deliver an overall picture of the product and that’s also what they look for in competitive products. As PP you can say that the sound must be better than product X, but at the same time not know what it means in technical terms, which can lead to devastating consequences when it shows that product X technically ends up being really poor in sound quality. It would have been better if there were a group that could measure the three important target values needed in order to say something about the sound quality, because then it would be easy to say that product A needs to be better than product X.

It is in PP’s eyes CRT who can give the subjective picture of how well the different competitive products match up against another product. If CRT can give the quality levels the competitive products holds together with the technical values from the competitive analysis group, then PP could set the levels in the QRM. PP lacks the possibility to test sound quality in the same way that CRT can.

The problem with reference products

There is a problem with using competitive products as references in the PRS and in the QRM since they, due to the constantly innovative market, might be out of date and not suitable as references when the product is ready to launch. If say for example, PP picks three competitive products to work as references for the level of quality the product must hold, when the PRS is written, it might take months until the product reaches the market. During that time-span things have changed and in order for the concept of reference products to hold, PP must be updated with new reference products. New products that match the same type of need mentioned several months earlier. PP feels that the concept of the QRM relies on up-to-date information and on the condition that somebody is responsible for constantly collecting competitive products and testing them against relevant quality factors.

A wish for a common language when speaking of quality

PP wishes for a couple of key-references in order to have a framework so that both Research and Development (R&D) and the stakeholders can speak the same language when referring to “high” quality. The framework mentioned above could then work as the foundation for the quality requirements in the PRS.

“We are not clear on how we position ourselves on the market today. The tool could work as a guideline. For example, today we have an 8-12 weeks coloring test. Does the consumer understand the value gained from this test? Is the test motivated from a consumer’s perspective? Does the consumer even consider this?”

A lot of work has been put into Sound Quality, but PP questions if the consumer realizes this and values it. They can see today that customers many times just want a temporary solution because external factors like regulations or social circumstances. The consumer can many times not separate Digital Signal Processing (DSP) supported bluetooth accessories from cheaper versions without support for DSP. Time and cost is put in development of Bluetooth™ headsets with a high sound quality but PP asks if it is justified from a consumer perspective.

By obtaining concrete values compared to competitive products PP can see if Sony Ericsson is positioning itself unnecessarily high within a certain segment.

“It is important to find the values the consumer holds and their way of thinking...we might come to realize that we don’t have to buy the most expensive mechanics for our products. Competitors might have lowered their quality levels, giving them the advantage that they can buy cheaper components and lower their production costs and still have a high quality within the segment. Sony Ericsson needs to become better at studying their

competitors, in order to get a grip of its own quality requirements”

4.2.6 The identified gap

With the distinct separation between customers and consumers made in the quality policy it is clear that more focus is put on the customers such as operators, distributors and retailers than on end-consumers. PBU accessories contact with the consumer is through market research studies and consumer surveys, conducted during a concept study early on in the product development process. The concept study includes a requirement collection activity where requirements from the market and customers are investigated.

The Sony Ericsson’s contact with consumers in questions relating to warranty and complaints goes through its retailers. Those are the ones who report different consumer issues from the field to the Sony Ericsson product managers. This leads to second hand information, which of course is better than no information at all. But to improve the understanding of its consumers Sony Ericsson needs to get closer to the end-consumers.

This has been identified by QA who in order to fulfill quality targets has recognized that there is a need to improve the understanding of quality attributes and the consumer’s perception of quality when it comes to Bluetooth™ accessories. To do this, QA has, in cooperation with CRT suggested a tool to visualize quality attributes in relation to a number of reference products. CRT believes that this tool can give them a guideline for testing the quality level of a product. CRT sees the QRM as an integrated part of the PRS and wishes that the PP’s can complete the necessary information needed in it. PP agrees that there is a need for improving the understanding of the consumers’ values and views on quality. PP identifies that the QRM can be used to communicate a feeling of quality, but it is important in the PP’s eyes that the QRM stays as simple and uncomplicated as possible.

After interviewing the different involved departments it is clear that focus should be put on improving the PRS. According to CRT, the PRS isn’t working as wished for and by clarifying different parts within it both PP and CRT can benefit from working more closely together. It is not in PP’s interest to develop a detailed PRS if no one is interested in reading the information in it. PP want’s to be sure that the correct focus is put on the PRS. CRT is very interested in a more detailed PRS since this can guide them in their usability and compatibility testing. They both want the same thing; a clear and well defined interface between the two departments.

There are different viewpoints regarding the QRM. CRT sees the QRM as a guideline provided by PP with quality levels set compared to the different reference product. In their eyes PP is the only one that can determine the quality level of a product, since PP is the one who orders the product. Here is a collision and somewhat a gap between the two viewpoints. In PP’s eyes it’s only CRT who can give a subjective picture of how the product matches against other reference products. PP feels that the decision on quality levels only can be set after CRT has made their judgment of a product in relation to other reference products.

It is not in the scope of this master thesis to suggest in what order the different elements of the QRM is going to be put together, but it is clear that a work process for using the QRM needs to be worked out through close cooperation between QA, CRT and PP. More of this topic is discussed in future recommendations in chapter 6.

4.2.7 The new tool for perceived quality

The perceived quality of a product can be said to be the consumers judgment about a products overall quality feeling¹⁶⁴. Therefore perceived quality has a dominant role on consumer satisfaction and by emphasizing product attributes that affect the perception of the product, marketing communication strategies can be formed that in the end result in successful products from a profitable viewpoint.

The Quality Reference Matrix (QRM) can be used in these strategies to communicate the quality of a product within an organization by combining identified quality attributes, a concept screening matrix and the Kano model for attractive quality.

A description of the different elements in the QRM presented is presented in exhibit 20. This description is an interpretation of the requests made in the interviews together with the theories and methods presented in this master thesis.

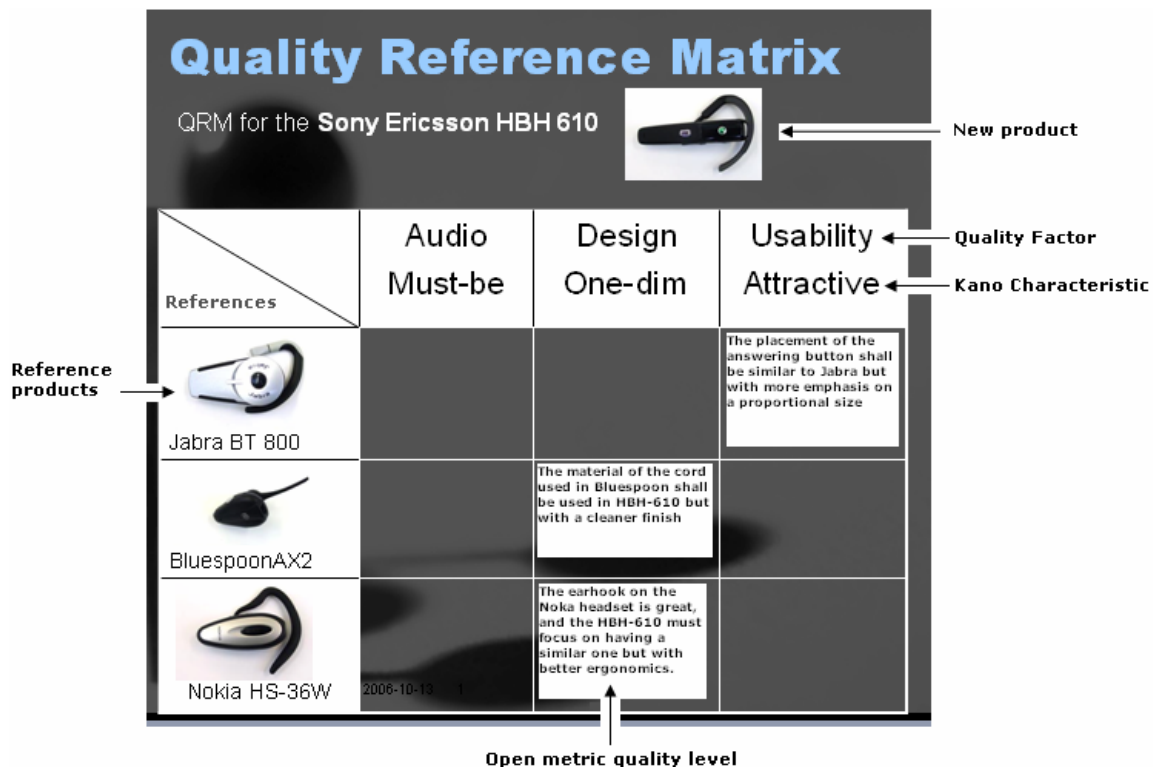


Exhibit 20: The Quality Reference Matrix

¹⁶⁴ Tsotsou, R. (2006) *The role of perceived product quality and overall satisfaction on purchase intentions*. International Journal of Consumer Studies, 30, 2, March 2006, pp207-217

The QRM is built up of five elements; the reference products, the new product, the quality factors, the Kano characteristics and the open metric quality level.

The reference products: These are the product with which the new product shall be compared to when it comes to a specific quality attribute. Who's responsible for producing information about the reference products is not clear at this time. A good start could be that the PP out of own knowledge picks reference products that he/she is comfortable with and knows a lot about. One thing is important to remember here; the reference products don't have to be other BT headsets. They can actually be any type of product that the PP wishes to reference to, as long as the level of the quality factor is clearly described.

The new product: This is the product for which the QRM is produced. The QRM will be added to this product's PRS and it is against this product that the wanted quality level is set in reference to the reference product.

The quality factors: These are the quality factors found to be important to the consumers. In this case the three quality factors *Audio*, *Design* and *Usability* have been chosen to exemplify how the quality factors are used. The list of quality factors can be made endless, but it is up to the PP to choose as many as he/she thinks can communicate the intended quality feeling. As a standard the ten quality factors found in my study will be present in the QRM, to give the PP a hint about what the consumer thinks is important when it comes to perceived quality. Other factors from CRT or market research can be added if requested. The process of changing quality factors is so easy that it should not be a problem in case the ones suggested aren't enough or not suitable for the new product.

The Kano characteristic: The Kano characteristic is determined through use of the Kano methods for attractive quality. The characteristic is good for achieving a common understanding and a common language when speaking of the different quality factors. When the QRM is produced, each quality factor will have its characteristic. The PP can then be sure that the rest of the organization knows what characteristic and importance a quality attribute has. A must-be quality attribute is a must-be, without any questions. The development team can start to speak a language where they can ask themselves: "*Which are our must-be's? Which are our one-dim's? Which are our attractive ones?*" When the whole organization understands this they have come one step closer to understanding what it is with their products that appeals to the consumer.

The Kano classification is also a way to push for what type of product the PP wants to produce. If the majority of the quality attributes chosen are *Attractive* this can indicate that it is an innovative product with a lot of exiting new features.

The open metric quality level: To be able to measure the quality attributes in relation to other products the development team can use the open-metric methodology discussed earlier. In this methodology the quality attributes are described and compared to different competitive products of interest in order to get a conceptual view of the strengths and weaknesses of the different products.

As one can see is the QRM built up of parts from the Concept Screening Matrix (CSM) presented in the frame of reference for this master thesis. Exhibit 21 shows which parts that have been transformed and used in the QRM.

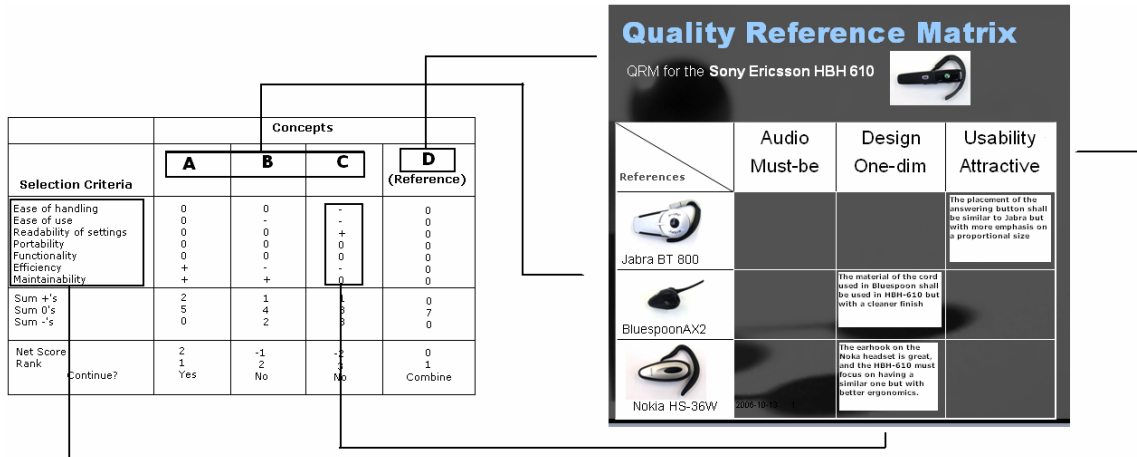


Exhibit 21: The QRM in relation to the concept screening matrix

The selection criterions in the CSM are the quality factors in the QRM. The concepts in the CSM can be compared to the reference products in the QRM. Instead of using the theory of a reference product as a “zero” product, I used the reference products in the QRM as the base for judgments. The PP sets the target level for the new product based on the reference products characteristics. The reference products then become the “zero” products, and the new product’s quality attributes are described in relation to these.

4.2.8 The new work process

As discussed earlier, one of the main factors for successful product development is having an early focus on consumers and their wants and needs. It is essential for FMCG-companies to obtain the knowledge of the-voice-of-the-customer in order to be competitive in a market that is characterized by constant innovation and change.

Perceived quality has a dominant role on consumer satisfaction and purchase intentions and it is important to achieve a balanced and relevant quality level in new product development processes that fit the expectations and needs of the consumer. Below is a suggestion on how PBU Accessories in an easy way can combine the different theories and methods presented in this master thesis.

Step 1: Identify Quality Attributes.

A way to do this is using a generic development process with an early focus on identifying user needs. The *Identify Customer Needs* activity presented by Ulrich&Eppinger has been used in this master thesis and has shown to be a comprehensible way to obtain information about the consumers’ ideas about quality. An overview of this master thesis implementation of the activity can be found in exhibit 22. Raw data from consumers is gathered through mini-focus groups and in-depth interviews.

The raw data is made up of consumer statements that will be summarized in a document and then analyzed for consistency and redundancies. The hierarchical list is then produced based on the different group of statements found in the summarization. The groups are labeled in an appropriate way and then organized under either set quality attributes or newly found ones.

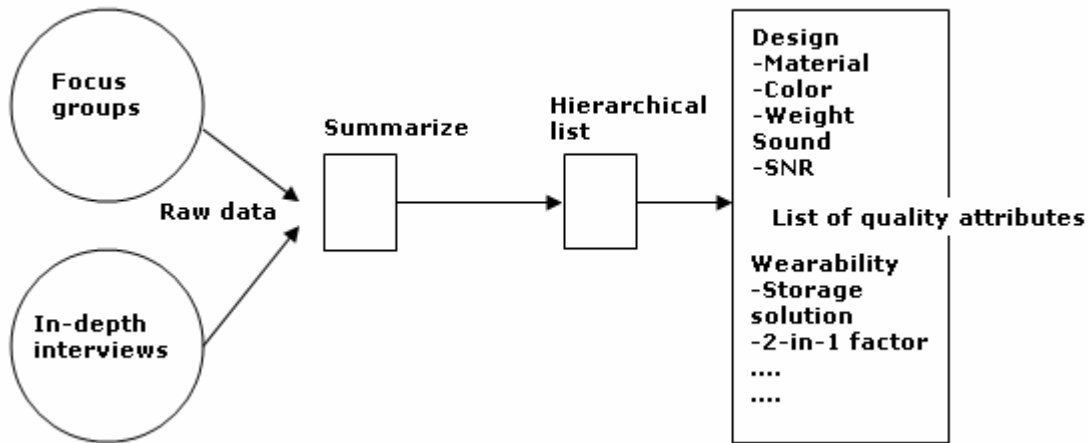


Exhibit 22: Identify Quality Attributes

Step2: Identify the quality attributes Kano characteristics

When the development team has identified a set of needs it is important to be able to classify them and prioritize them. This can be done by using Kano's theory of attractive quality. The theory and its methods can give a direction and classification of quality attributes so that the right focus can be given to attractive, one-dimensional and must-be quality requirements. A work process similar to the one presented in exhibit 23 can be used to classify the different quality attributes.

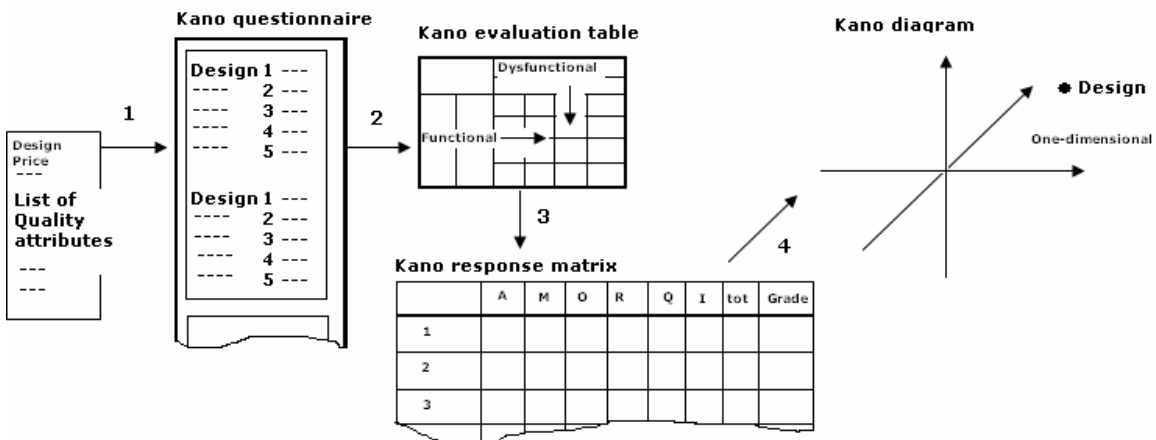


Exhibit 23: Identify quality attribute characteristics

The starting point is the list of quality attributes found in *Step 1: Identify Quality Attributes*. The different quality attributes can be divided into smaller entities with use of

the hierarchical list and final list of quality attributes. The Kano questionnaire can be worked out by taking each entity and make a Kano pair question out of it (1). Each question can then be classified through the Kano evaluation table (2). The Kano response matrix can then be used to get the quantitative picture of classification process (3). At this point the quality attribute's characteristics should be easy to see, and it's presence in the Kano diagram can be determined (4). The development can now by knowing the quality attributes characteristics speak of the quality attribute in the same language. Is it a must-be? Is it just attractive or is it one-dimensional?

Step 3: Put together the different elements in the QRM and set the perceived quality target levels

When knowing the quality attributes, and knowing the characteristics of them, the team now can put together the QRM, and set the target levels for perceived quality (see exhibit 24). The team starts with adding the quality factors that they find suitable for the product (1).

References	Audio Must-be	Design One-dim	Usability Attractive
Jabra BT 800			The placement of the answering button shall be similar to Jabra but with more emphasis on a proportional size
BluespoonAX2		The material of the cord used in Bluespoon shall be used in HBH-610 but with a cleaner finish	
Nokia HS-36W		The earhook on the Noka headset is great, and the HBH-610 must focus on having a similar one but with better ergonomics.	

1. Add quality factors

2. Add reference products

3. Add open metric quality target level

Exhibit 24: The work process when putting together the QRM

These should be chosen based on the new product's wanted characteristics. A base for this can be each quality attribute Kano characteristic, in combination with the chosen reference products. After adding quality factors, the team chooses the reference products they find suitable to use as examples when describe different quality targets (2). The quality targets are then presented in an open-metric manner, with enough detail so that the reader can understand exactly which quality target that is intended for the new product(3).

5. Conclusions

This chapter summarizes the findings in this master thesis by presenting the answers to the earlier presented problem setting for this master thesis.

5.1 Perceived quality requirements

In my study I found that the following nine factors can be used to describe the perceived quality of the Bluetooth headsets:

- **Design** - The perception of shapes, colors, materials and size determines the headsets attraction and quality level.
- **Sound** - A perception of the sound quality is connected to how speech is heard through the earphone. Is also connected to how the person you're talking to perceives sound on the other end of the line.
- **Wearability** - The wearability is the perceived feeling of carrying the headset with you in your professional or personal life.
- **Chargeability** - The chargeability is the combined perception of talk-time, standby-time and charging time. It is also connected to how convenient or inconvenient it feels to have an extra charger for the BT headset.
- **Functionality** - The functionality is the perceived feeling of the functions that the BT headset provides.
- **Usability** - Usability is a term used to describe the perceived level of ease with which the user can use a particular tool or other human-made object in order to achieve a particular goal.
- **Compatibility** - The level of perceived compatibility is dependent on how easy the pairing process is, and how easy different brands work together.
- **Comfort and Ergonomics** - The level of perceived comfort is connected to the headsets ergonomic design and how it is perceived physically.
- **Convenience** - The level of perceived convenience is dependent on ease of use, freedom of movement and the headsets ability to produce a feeling of satisfaction.

The quality factor "Price" was defined in this study but was found to be more of a trigger for the expectation of overall quality of a product. A high price indicated expectations of high quality and vice versa. In that sense it is not a perceived quality factor in itself but rather an expectation of what quality level the product has.

5.2 A new work process

It is important for FMCG companies that wish to compete on an innovative market, to have a development process with an early focus on the consumers and reasons for satisfaction. Perceived quality has been found to be the consumer's judgment about a product's overall excellence, and perceived quality has been discussed to have a dominant role on consumer satisfaction and purchase intentions. With this in mind this master thesis have presented a methodology for how perceived quality factors can be elicited and implemented in a tool called QRM. The QRM can be used to validate that the important quality factors recognized by the consumers actually have been implemented in the product. The tool uses a combination of a concept screening matrix together with the Kano theory of attractive quality and an open-metric measurement technique. This allows functional teams within a development project to take motivated actions when trying to find a balance between price and quality. The recommended methodology is based on the theories and methods presented in the frame of reference for this master thesis and can shortly be described in the following steps:

Step1: Identify Quality Attributes.

Step2: Identify the quality attributes Kano characteristics

Step 3: Put together the different elements in the QRM and set the perceived quality target levels

6. Discussion and future recommendations

In this chapter a small discussion takes place with focus on paths taken during the project, and things that could have been carried out in a better way. In the end of the chapter the author's future recommendations are presented.

Number of participants

In some peoples eyes it might seem like a little too few participants in the focus groups and in-depth interviews to give any substantial answers to my problem setting. But the focus of my study was to be qualitative not quantitative. I found that after the focus groups and interviews a certain level of saturation developed. Both the in-depth interview and the focus group for respective group gave similar answers to how they perceived their Bluetooth headsets. And after going through the market research material I found that I had touched all of the reasons for satisfaction found in those studies.

Number of quality factors

During my interviews with Consumer Related Test I was given their view of which product attributes that were important for them to look at when they test their products. These product attributes were made up of both functional attributes as well as quality attributes. They have been considered during my elicitation process but not analyzed in depth. When comparing them to the ones I've found in my study they correlated with most of the quality factors found through my research. It is important to remember that the QRM isn't limited to the quality factors I've found. The development team must choose those quality factors that best fit the product quality they are aiming at achieving with the product.

Future recommendations

The following three subjects will need attention in the future in order for the QRM to fully function as intended:

- **Implement Kano methodology on the Quality Factors**
The quality factors found in this master thesis needs to be classified to be properly used in the QRM. A classification will help the development team to understand the different aspects of how consumers evaluate a product. It will also facilitate in helping the team to get a common language when speaking of quality.
- **Implement and test the QRM on an upcoming products PRS.**
The QRM has not been tested on an upcoming product. It needs to be tested and fine tuned in order work as intended. The different users of the PRS must come together and find a way to use the QRM. I have suggested a work process for putting together the QRM but in the end, it is up to the functional teams within the development project to find a way that fits them.
- **Develop a policy for retrieving information about the competitive products.**
There is a need for some sort of test-center or other sort of resource to gather information about competitive products. Both Product Planner and Consumer Related Test agreed on the fact that this resource would help them to deliver higher quality on their respective areas of expertise. It will then be easier to add competitive products and measure them against the new product.

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Appendix A – Time Frame

Activities	w.37	w.38	w.39	w.40	w.41	w.42	w.43	w.44	w.45	w.46	w.47	w.48	w.49	w.50	w.51	w.52	w.01	w.02	w.03	w.04	w.05	
1: Planning																						
2: Pre-Study Methodology draft ready																						
3: Elicitation																						
4: Specification																						
5: Validation																						
6: Development Theory draft ready																						
7: Testing																						
8: Report Vacation																						
9: Presentation																						

Appendix B – Discussion Guides

Perceived Quality Bluetooth™ headsets Experienced Users Focus Group Discussion Guide

(10 min.) Introduction

- Greeting
- Purpose of focus groups
- Ground rules
 - Role of Moderator
 - Recording equipment/one-way mirror
 - Confidentiality of comments
 - Individual opinions (no right or wrong)
 - Speak one at a time and as clearly as possible

(10 min) Brief warm-up discussion

- When speaking of a car/mobile phone/other object of interest:
- About the usage of mobile phones in the workplace/school. Social signals and behavior. Attitude towards BT and headsets in general?
- What is good quality to you? Why? Can you give an example of a product with good quality?
- What is bad quality? Why? Can you give an example of a product with bad quality?

(20 min) Usage of Bluetooth™ Headset

- When you received your BT headset and looked at the package – What quality did you expect? Why? What made you feel that way? What quality did you perceive?
- Describe your BT Headset in terms of quality. Is there something with your BT Headset that you feel is extra good quality? Extra bad quality? Why?
- When and how do you use it? Walk us through a typical session using the BT Headset. Is there anything in the process that gives you a feeling of quality?
- What is important to you from a quality perspective in the way you use your BT Headset? Why? Can you describe it? Can you give an example?
- When carrying the BT Headset – what feeling does it give you? Why? Think from a quality perspective.

(20 min) Quality factors

- What is important to you from a quality perspective in the way you use your BT Headset? Why? Can you describe it? Can you give an example?
- What do you like about your current BT Headset from a quality perspective? Why? Can you describe it? Can you give an example?
- What do you dislike about your current BT Headset from a quality perspective? Why? Can you describe it? Can you give an example?
- **Expose participants to BT Headsets**
 - Can you place them in the right segment? What made you place a certain BT Headset in a certain segment? Think from a quality perspective? Did you perceive one having better quality than another? Why? What made you feel that way?
 - What would you be prepared to pay for the different BT headsets?
 - What do you expect in form of terms of quality?
 - High
 - Mid
 - Entry
- Looking from a quality perspective; do you perceive that there should be a decreasing quality level when going from High to Entry?
- What issues would you consider when purchasing the product looking from a quality perspective? Why those issues? Can you give an example?
- What quality factors do you feel separate a BT headset from another one?
- What improvements would you make to the product looking from a quality perspective?
- Synthesize findings
 - Pick top 10 quality factors. Why did you choose them?

Thank the participants and close the meeting. Give them the gift.

Perceived Quality Bluetooth™ headsets Inexperienced Users Focus Group Discussion Guide

(10 min.) Introduction

- Greeting
- Purpose of focus groups
- Ground rules
 - Role of Moderator
 - Recording equipment/one-way mirror
 - Confidentiality of comments
 - Individual opinions (no right or wrong)
 - Speak one at a time and as clearly as possible

(10 min) Brief warm-up discussion

- When speaking of a car/mobile phone/other object of interest:
 - What is good quality to you? Why? Can you give an example of a product with good quality?
 - What is bad quality? Why? Can you give an example of a product with bad quality?

(20 min) Usage of Bluetooth™ Headset

- When you received your BT headset and looked at the package – What quality did you expect? Why? What made you feel that way? What quality did you perceive?
- When you opened the package – What quality did you expect? Why? What made you feel that way? What quality did you perceive?
- When you held it for the first time – what quality did you expect? Why? What made you feel that way? What quality did you perceive?
- When pairing the BT Headset to phone – how did it go? Did it add to your perception of the product? Any problems? Any surprises?
- When wearing the BT-headset – Can you describe the feeling? Think from a quality perspective.
- Taking or making the first call – buttons, material, ring signal, answering method, answering. Can you describe the feeling? Why did you feel that way?
- The call itself – wearing, distance, audio, freedom of movement. Can you describe the feeling from a quality perspective? Why did you feel that way?
- Ending the call – hand movement, buttons, ending signal. Can you describe the feeling from a quality perspective? Why did you feel that way?
- When carrying the BT Headset – what feeling did it give you? Why? Think from a quality perspective.

(20 min) Quality factors

- What is important to you from a quality perspective in the way you use your BT Headset? Why? Can you describe it? Can you give an example?
- What do you like about your current BT Headset from a quality perspective? Why? Can you describe it? Can you give an example?
- What do you dislike about your current BT Headset from a quality perspective? Why? Can you describe it? Can you give an example?
- What issues would you consider when purchasing the product looking from a quality perspective? Why those issues? Can you give an example?
- What quality factors do you feel separate a BT headset from another one?
- What improvements would you make to the product looking from a quality perspective?

- What do they expect from in terms of quality?
 - High
 - Mid
 - Entry
- Looking from a quality perspective; do you perceive that there should be a decreasing quality level when going from High to Entry?
- Synthesize findings
 - Pick top 10 quality factors. Why did you choose them?

Thank the participants and close the meeting. Give them the gift.