To derive quality from quantity
Turning data into information

Master Thesis

Tutors:

Jens A Andersson

Robert Wenglén

Authors:

Magnus Berger

Peter Czerwinski

Sara Nilsson

Abstract

Title: To Derive Quality from Quantity

Authors: Sara Nilsson, Peter Czerwinski, and Magnus Berger

Tutors: Jens A Andersson, Lunds tekniska högskola
Robert Wenglén, Ekonomihögskolan i Lund

Purpose: The purpose of this master thesis is to present a model that illuminates the important factors when deriving technical information from market data within a company.

Contents: For companies to be able to become and stay competitive in the market, product quality is an important factor. Whilst good product quality leads to customer satisfaction and loyalty, lack of quality brings costs in service and replacements.

To improve product quality, the developers need information and knowledge about what quality issues affect existing products. Most companies gather data from market about known issues, but in order eliminate known quality issues in new products; this data has to be transformed into information and knowledge.

Data, information and knowledge, as well as how to turn data into information and knowledge, is defined using existing theories on the area. Further, theories identifying factors that affect information creation are presented. Based on the theories, the model, "Transformer" is created. Transformer constitutes a grasping framework for what factors affect derivation of technical information from market data.

Transformer is built upon three main areas called; Organizational Factors, Human Factors and Tools. Further, harmonizing synergies have been identified as an equally important factor as each of the three areas.

The practical use of Transformer is evaluated, and is demonstrated by its application to three cases found within a large technology based company. The conclusion is that information can not be created by focusing on only one, or two, of the three areas: Organizational factors, Human factors or Tools. All of the three pillars, as well as the synergies, are equally important in the process of turning market data into technical information. Even if information creation in many ways is a technical problem, it can not be solved by finding a technical solution.

Key words: Quality, Data, Information, Knowledge, Organization, Technology, Product Development

Table of content

1 Introduction

This introduction identifies the importance of investigating the issue focused on in this master thesis. The purpose is emphasized and focus and delimitations are presented. Further, the company that has welcomed the research group to conduct the case analysis is presented.

1.1 Background

For companies acting on competitive markets it is of great importance to understand the relationship between the company and its customers. If a company is to stay competitive it is not enough to offer products that appeal to customers, but customers must feel compelled to take action and buy the products.[1] To obtain such customer behavior, customers must experience the company's products as being superior to any other products fulfilling the same customer need. In turn, this implies that the products' behavior must reach customers' expectations. In this context, product quality is similar to customer perceived quality. However, it is not possible for companies to produce the one and only perfect product appealing to all possible customers. What companies can do, is to investigate how a product's characteristics affect each customer segment, thus identifying which characteristics do not live up to customer expectation and create feelings of dissatisfaction, annoyance or even, rage. Such characteristics must be eliminated.[2] One important character that easily creates customer dissatisfaction is quality; if the product for one reason or another breaks.

A product can break due to several reasons. If the product breaks after its estimated life time, some reasons are acceptable. But, if the breakage occurs earlier, the customer may very well become dissatisfied with the company as well as the product itself. To avoid customer dissatisfaction based on experience of malfunctioning products, it is of utmost importance to eliminate the root cause of the problem. In this way the same type of malfunction is prevented to occur in new products. In order to eliminate the root cause, data about the malfunctioning product, its technical specifications, the reason for its break down, the customer's behavior, etc. has to be transformed into information.

1.2 Problem Discussion

How are companies to identify faults that do not show in products until they are in use by customers, and how are they to eliminate those specific faults in future products? It seems unlikely that there is a way of foretelling what component will break if that specific fault has

---

[1] McGrath (2000)
[2] Ibid

not shown in previous tests. Another way of approaching the issue is to create a process which enables detection of the fault once it has occurred, and then information relays about the specific fault reaches to people within the company that have the power to correct the root cause of the fault. This may seem pretty straight forward, but there are pitfalls along the way.

To visualize the process, consider a small restaurant. The waiter faces customers every day and he receives both praise and complaints about the food. If a lot of customers consider the fish soup being to salty, the waiter tells the chef who changes the recipe. But, this chain of events presupposes that:

a. The waiter takes an interest in finding out how customers perceive the food.
b. The waiter acknowledges the complaints as being true, i.e. the customers honestly find the soup to salty.
c. The waiter tells the chef in a way that makes him take the matter seriously, i.e. the chef understands that it is the customers' apprehension, not the waiter's.
d. The chef considers the information, and he changes the recipe.

The chain of events could easily be broken if any of the links a, b, c or d were to be done in any other way, e.g. the waiter ignores the customer or he offends the chef when telling him. Thus, the process both depends on that every person involved makes the right decision, and that the communication between concerned parties works immaculately.

Imagine a similar process in an international company, with thousands of employees, serving hundreds of thousands customers world wide. Complexion is a meek description of the situation, and the technical side of the problem can be very intricate. To gather data about released products in order to understand how to create better products in the future will only be relevant if it is possible to compile the data, turn it into information, and provide this to the people who can act on it. Actions can be taken in both a proactive and reactive way. The proactive approach is a way of solving problems on products that are in the market or under construction. The reactive approach presupposes that the company uses a process which enables detection of the fault once it has occurred, and that information about the specific fault reaches those people within the company that have the knowledge and power to correct the root cause of the fault. This, in turn, will lead to improvement on future products. The importance of this process is high, since it affects warranty costs and consumer loyalty. However, the problems of having a gimcrack feedback channel are recognized in most technical industries.

When a product breaks, the consumer using the product will be the first who recognizes it. But, when considering technical products consumers' knowledge about product functionality

can be deeply questioned. Because consumers neither have understanding for how the product works, nor the technical competence to specify the failure, the value of the information customers offer about malfunctioning products is limited.[3] However, when a consumer makes contact with the company because of product failure, the company has an opportunity to gain knowledge about how, why and when the product broke in its real environment.

To be able to investigate and analyze the process of turning market data into technical information, a large company based in Lund, which struggles with the problems of having an insufficient feedback channel, has been studied. The company, which in this thesis will be referred to as *the company*, is a producer of high technology products. The business concept emphasized by the company is to create a strong brand by using the latest technology in new innovative solutions."[4]The success of the company depends on the success of the technological solutions created within the company. Quality and product reliability are of great importance to the company.[5]

Products by the company does not break stochastically, every new product generation has areas that are weaker than other, e.g. software, a specific type of component or assembly solutions. To speed up product development, different technical solutions from old product generations are reused in new products. This implies that the root cause of why products break can live in generations causing a steady stream of returned products. This is indeed a serious issue. Re-usage of solutions is nothing that is unique for this company, not even for the industry this company is acting within, it is common for most technical industries.[6]

The company suffers from insufficient communication between the departments, which makes finding the root cause as easy as finding a needle in a haystack, during night. If not being able to correctly identify and eliminate the root cause of different failures the economic consequences will be severe.[7] For the company, every malfunctioning product that is returned drains the economical profit, and in the worst cases, producing and selling that specific product results in a loss for the company. If the company instead of using resources to help the customer and repair the product does nothing, costumer loyalty and reputation is at stake. Getting the image of being a deliverer of bad quality will inevitably destroy the company.

---

[3] Lecturer, Electrical and Information Technology, University of Lund, 2008-04-30
[4] Internet 1
[5] Employee, Product Office, 2008-01-31
[6] Lecturer, Electrical and Information Technology, University of Lund, 2008-04-30
[7] Head of CS, 2008-04-23

Thus, having a well functioning process that escalates valuable information from the market back to the R&D department is vital for the company's future success.

Since it is a wide spread phenomenon, it is of interest to investigate what knowledge that can be found in previous research and studies.[8] Roughly, the issue of how to interconnect technical departments, or production departments, with customers has been studied from two different angles; from the technical angle and the human angle.[9] Among theories from the technical point of view, information technology (IT) is a common area of research. IT is an umbrella term covering different technical solutions for handling and spreading data and information. It has reportedly been seen as an important factor in these processes, e.g. in the healthcare.[10] If studied from the human angle, knowledge management (KM) and organizational learning (OL) are the theoretical areas that approach the issue.[11] These areas emphasize that deriving market data into information is a process of knowledge creation and learning.[12] These aspects are not covered by the technical angle because they demand human involvement. Only a few theories combining the technical and human angle have been identified by the authors. One investigation shows that implementation of IT solutions only are valuable if the people who are to use it have a clear understanding for each other and common knowledge of what they are to achieve together.[13] In order to investigate the reactive process of the feedback channel the authors mean to piece together the jigsaw of existing theories to be able to better explain what the success of the feedback channel depends upon.

Gathering technical data, refining it into information and spreading it throughout the organization is a complex process. *What factors are important in this process? Is it possible to solve this by creating a technical tool, or is there more to it?* By combining theories on the area as well as looking at an actual situation in a technical company, the authors will try to answer these questions. A holistic model for analyzing the whole process of turning data into valuable information is needed, and it is the authors' intention to present Transformer as such a model in this master thesis.

---

[8] Ulwick (2005)
[9] Newell (2002)
[10] Lenz (2007)
[11] Wilson (2000)
[12] Gottschalk (2006)
[13] Barney (2005)

1.3 Purpose of the Master Thesis

The purpose of this master thesis is to present Transformer, a model that illuminates the important factors when deriving technical information from market data within a company.

1.4 Focus and Delimitations

Delimitations are done to the depth of the theory chapter. The model is meant for illuminating the important factors, not to describe these in detail.

The empirical study has been delimited to one company. The company, and the employees that have been interviewed will be kept anonymous. The investigation of the company has been limited to the department referred to as Quality Department (QD), the Improvement Department (ID), and the Research and Development department (R&D). The depth of the empirical analysis is limited to how well the three identified departments derive technical information from market data.

Further, data is primarily considered as data concerning malfunctioning product, thus information and knowledge are also connected to product quality. The model presented in the thesis is created to be applicable to companies similar to the studied company in this thesis, large, complex organization.

2 Method

The method aims at clarifying how the research has been conducted. The basic assumptions and solving techniques emphasized for solving the problem identified in the previous chapter are presented. Further, the actual mode of procedure is presented and the trustworthiness of the thesis is evaluated.

2.1 Methodological Approach

The method emphasized for conducting the research presented in this master thesis is built upon Björn Bjerke's approach which puts the problem in relation to basic assumptions and solving techniques[14].
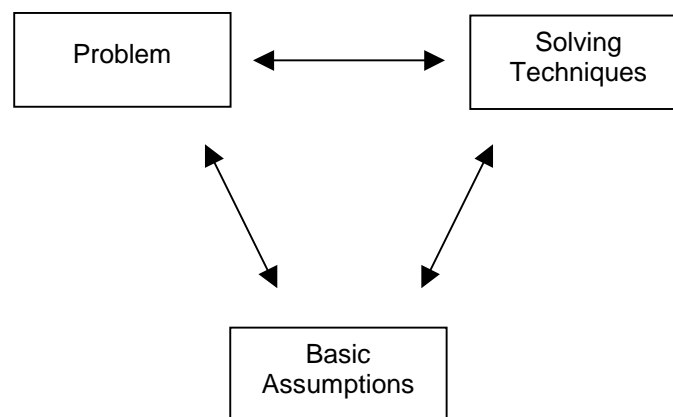
Figure 2. The methodological approach for the research presented in this master thesis follows Björn Bjerkes's idea of that the problem, the basic assumptions, and solving techniques used are interconnected.[15]

2.2 Problem

The character of the problem is that its symptoms are clear and measurable, such as economic loss and customer complaints, whilst the problem it self, why and how the symptoms occur, is complex and diffuse. It is possible to find some building blocks in existing literature that enlighten key areas upon which derivation of information from data depends. When consulting existing theories on the subject, the authors have identified a need for a grasping framework that illuminates the complexity of the problem's nature.

---

[14] Bjerke (1981)
[15] Ibid

2.2.1 Basic Assumptions

To create such framework there are several possible lines of action founded in different basic assumptions. For the purpose of this thesis two types of paradigms containing different basic assumptions have been investigated; the analytical approach and the systems approach.

It is the common understanding among scientists that the analytical approach has descended from natural science, and is built around the basic assumption that the world can be studied as if it was objective, thus independent of individual human beings. Further, it is the task of scientists to study that objective world, as Bjerke relates it, using formal logical judgments and being independent of subjective impressions. A second basic assumption of the analytical approach is that the world has an additive character as described in figure 3.
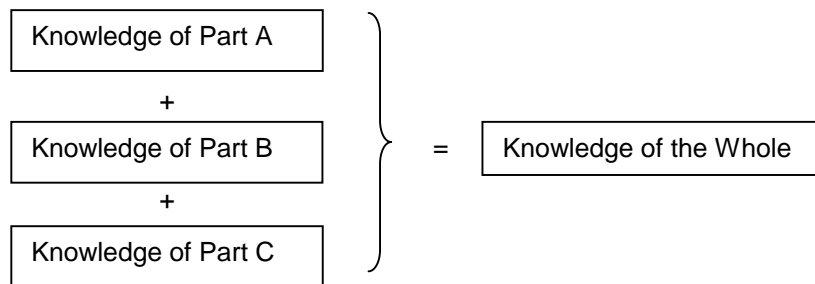
Figure 3. A basic assumption of the analytical approach is that the world has an additive character, which enables scientists to bring knowledge of different areas together to describe a more complete picture of the reality.[16]

A third assumption concerning the analytical approach is that it is of a cyclical nature. Bjerke relates to Albert Einstein that science must start with facts and end with facts, independent of which theoretical structures it builds in between. The cyclical course begins when the scientist studies data. He observes and tries to describe what he sees and expects to see in the future. He then predicts the future in the light of his theories and evaluates his predictions by comparing them to data, which ends the course. However, the scientist working according to the analytical approach can only consider his results as being likely, not necessarily true, and he is therefore prepared to abandon them if facts arise that contradict the results. When that happens, the scientist starts the cyclical course again, looking for better theories.

The systems approach has developed from the analytical approach and is also based upon that the world can be studied as an objective reality. However, unlike the analytical approach, the system approach emphasizes that the reality is arranged in such way that the whole differs

---

[16] Bjerke (1981)

8

from the sum of the parts. Instead of using an additive approach, focus of attention is on the synergy effects created between the parts. Further, the systems approach ignores causal connections in time. This implies that within the approach one does not look for factors earlier on in time, which leads to a limited possibility to use earlier experiences and studies in the research. Every component of a system must be studied according to the system which it is a part of, just like every system must be studied as a part of its surrounding environment.

Combining assumptions

To create a frame of reference for this master thesis, the basic assumptions through which the problem is examined must be settled. Two methodological approaches are presented above, each of them containing both appropriate and unsuitable assumptions. To solve the problem by creating a generic model that combines different areas of existing knowledge a paradigm of basic assumptions must be settled. Gareth Morgan presents paradigm as a complete view of reality or a way of seeing, which is built up of different schools of thought, which in turn are based upon specific tools or texts. Morgan describes paradigm or view of reality as consisting of three levels, as is illustrated in Figure 4.[17]
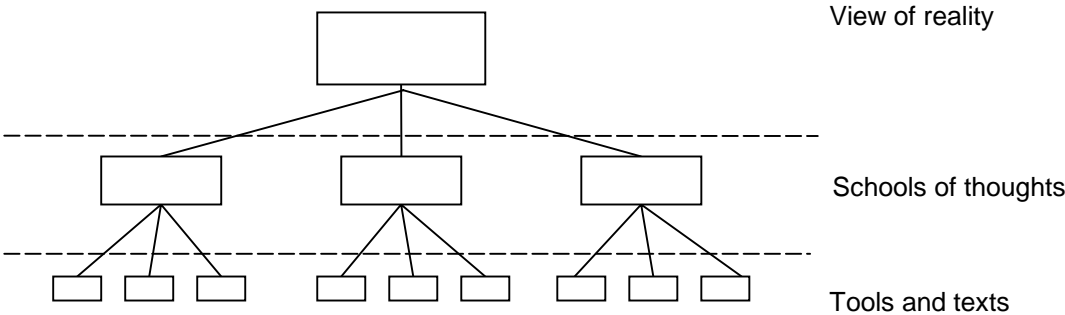
Figure 4. The relationship between different schools of thought as it is presented by Morgan. Every view of reality can build on different ways of thinking, of which every one consists of different tools and guidelines or texts.[18]

In this thesis the view of reality is identified as basic assumptions, which consist of a combination of the analytical and the systems approach, similar to the schools of thoughts presented in Figure 4. The schools of thoughts and the tools and text which make up the basic assumptions on which this master thesis is founded are illustrated in Figure 5 below. Even though the analytical and systems approach do contradict one another in some aspects, the

---

[17] Morgan (1980)
[18] Ibid

9

authors find them supportive of the method emphasized for creating the Transformer model. Since existing theories only illuminates certain isolated factors important for enabling information derived from data, the authors base the first part of the research, the model creation, on the analytical approach. On doing this the authors are taking advantage of prior studies and bringing them together in a grasping framework for information creation. However, when having gathered factors that have impact on the creation of information, the authors use the systems approach when investigating the relative importance and how the factors interact. An investigation that combines and analyzes synergies when deriving information has not been done in any of the prior research that the authors have identified.
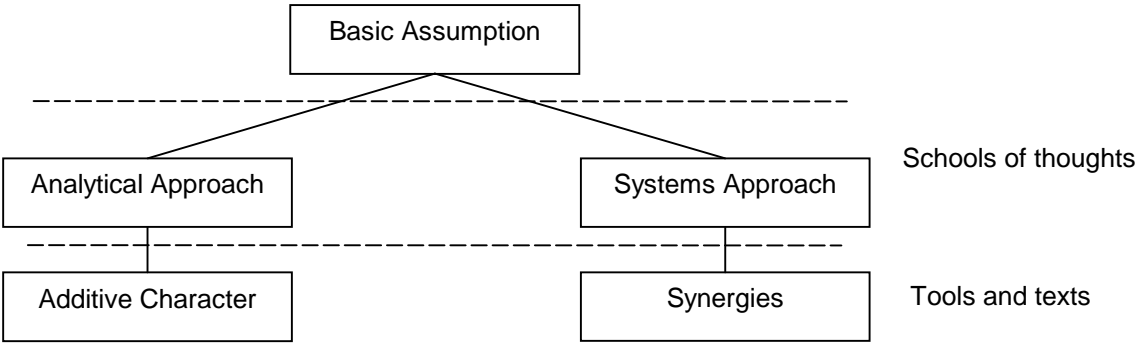
Figure 5. The basic assumption emphasised in this master thesis builds on a combination of the analytical and the systems approach. The characters most significant for this choice is the additive character of the analytical approach emphasised in the model creation, while the synergy focus of the systems approach is used for guiding usage of the model.

2.2.2 Solving Techniques

The problem is confirmed, and understood by using the model on three cases. Case studies are used in examination of contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not evident. Case studies are according to Robert Yin not directive concerning the use of particular type of evidence but case studies can be done using either qualitative or quantitative evidence. Evidence may come from observations, interviews, records, or any combination of these. Neither is any sort of data collection method implied when using case studies.[19]

However usage of case studies has received harsh criticism. Matthew Miles's investigation shows within-case analysis as essentially intuitive, primitive, and unmanageable. Miles argues

---

[19] Yin (1981)

that cross-case analysis are even less well formulated than within-site analysis. According to Miles case studies trade close-up descriptive validity for accurate but thin generalization.[20]

The reason a case study is done despite threatening pitfalls is that the authors wish to examine and show how the created model can be used for investigating how well an organization enables creation of information. The purpose is consequently not to find solutions for the studied cases, but to prove the validity of the model's way to describe the success factors when deriving information from data.

The cases presented in this thesis are all from the same company. Due to a complex organization, and the diffuse boundaries of the problem, verifying the model through a multiple case study will illuminate both strengths and weaknesses of the model in a more complete way than if verified through a single case.

2.3 Mode of procedure

Figure 6 illustrates the work process used to create the Transformer model, which is the purpose of the master thesis.
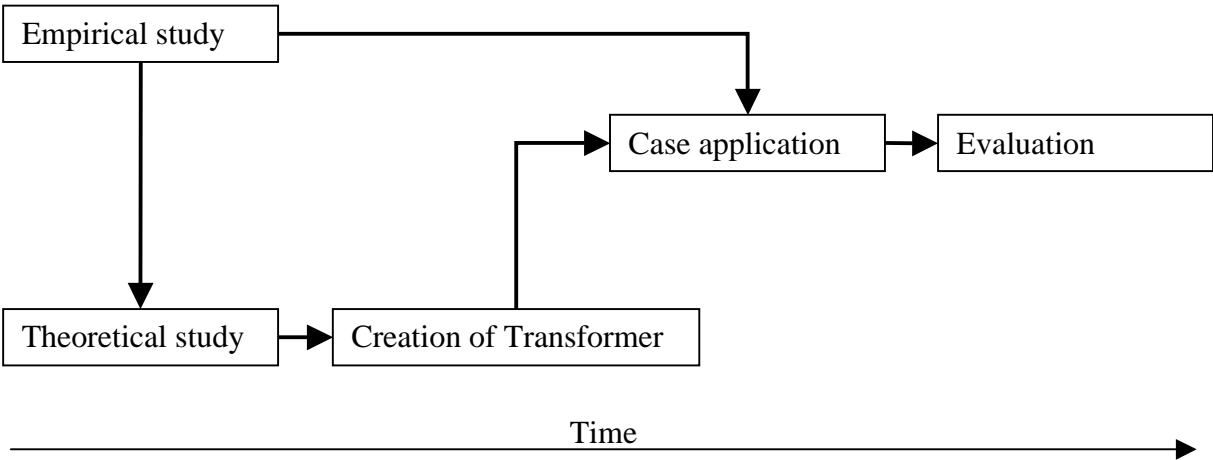
Figure 6. The work process for completing the research was initiated by an empirical study in order to investigate the problem. Previous studies were consulted for the purpose of finding a solution of the problem. Further the Transformer model was created. To verify it, it was applied in a case analysis.

For realizing the aims of this master thesis to create the Transformer model an empirical study was conducted in order for the authors to understand and better specify the underlying problem. This study worked as a guide when searching for relevant theories. Grasping theories such as knowledge management, organizational learning, and information technology

---

[20] Miles (1979)

11

were identified as well as very detailed theories such as theories about data integration and cultural impact on knowledge transfer. However, the authors perceived none of the identified theories as satisfactory concerning what factors that are important when turning market data into technical information. By comparing how current theories differ from each other and evaluating similar findings the authors found that some of the existing theories overlap and could therefore be put together to describe information creation in a more satisfactory way than every theory does on its own. Hence, Transformer has been created through the authors analysis of current knowledge about derivation of information from data. The theories could be bundled into three grasping areas, organizational factors, human factors, and tools. This division was made since the authors found a large number of existing theories approaching these areas in different ways. It is the authors' strong belief that the areas are all important, and instead of only focusing on one or two of them, Transformer takes a helicopter perspective and demonstrated the overall picture of what presumptions that are needed when turning market data into technical information.

Except laying the foundation for the theoretical study, the empirical study continued with the purpose of gathering information about how the feedback process that turn data into information functions at a company. Within the studied company there is a department set out create and support a feedback process. This department, QD, invited the authors to conduct the research that is used to verify and validate the Transformer model. The department also wanted to the authors to deliver guidance for how the department is to perform better. QD- and its interfaces with the R&D department were studied to make it possible to identify factors that are curbing communication between departments within the company. This way the research group gained an understanding both for an information sender an information receiver in this situation. Further, the empirical study also included an investigation of ID, a department which is relatively new and created as a top management initiative. The authors included the ID in the empirical study because of its helicopter perspective of the feedback process. Based on the action of the QD and the ID, three different cases describing information creation were identified: The case of Product Field Quality, Quality Development, and the case of the Improvement Department. Product Field Quality (PFQ) and QD is basically the same department. The department has recently undergone a thorough re-organization and it is reinvented as QD. However, for the purpose of evaluating Transformer, the feedback process managed by the PFQ department is used as a case.

After Transformer had been applied on the three cases the results were evaluated. The evaluation especially concerned judging the relevance of the model, its parts, and investigation of identified synergies.

2.4 Data Collection

Both primary and secondary data have been used in this master thesis. Secondary data has been collected for the purpose of getting information about the company, QD and a deeper understanding of the issue at hand. The sources of secondary information have been various internal presentations and reports, media reports, and a range of organizational charter and descriptions.

Primary data have been collected through semi-structured interviews, meaning that the questions have had a clear target but the interviewee can answer freely, and also be asked further questions on the same area. The aim was to do about 20 face-to-face interviews, where two interviewers were participating. The duration of each interview was about one hour. For the purpose of not making the interviewee feel stressed, the authors did not use any recording equipment. Instead, one of the interviewers was focusing on asking questions, guiding the interviewee through the session while the other interviewer was taking notes of comments around discussed subjects. This made it easier to conduct a conversation because the interviewer speaking to the interviewee was never busy writing. The answers from the interviews were compared to each other in order to identify for similarities and differences which may be specific characteristics for different departments.

2.5 Trustworthiness of the thesis

Reflection on the trustworthiness of the thesis considering the methodology used is based on Sam Porters discussion of criterions pointing out the validity of a qualitative investigation.[21] The authors' relationship to the company referred to in the thesis is that the company has agreed to act as a host, allowing the authors to conduct the research at the site in Lund. However, the model based upon a combination of theories is done to describe what causes the success of the feedback process. Therefore, the model is still of interest to other parties, thus the transparency of the thesis is considered satisfying. The theories that the model is built upon are collected based on the methods used in the researches and how often they are being referred to in other works. It is the authors' belief that the underlying theories used in this

---

[21] Porter (2007)

thesis are honest and accurate. The purpose of the thesis has been supported by the choice of methodological framework. Conducting the research the authors have been careful to proceed in ethical and legal forms.

The Transformer model approaches the issue of the feedback process on a high level, rather than presenting solutions in detail. To assimilate Transformer's full potential, the reader needs to possess some basic knowledge about feedback processes. When putting Transformer into use, the analyst will have to conduct all analysis on his own since the model merely pin point which areas that should be investigated. The theoretical foundation which Transformer is built upon is presented in a grasping way in the thesis. This may create frustration for the reader that desires more detailed information about the factors presented within the pillars in the model. The authors present a thorough list of references and refer to the original sources if the reader is in need of further details.

The empirical study that has been conducted at the company refers to investigating the problem of deriving information from market data. The cases presented in the empirics aim at introducing examples of reality based situations for the analysis. The main purpose of the cases is to evaluate the Transformer model; hence, the reader should not consider any of the cases as being a complete statement of the departments.

The analysis is based upon the empirical facts and the authors' observations when conducting the research at the company. Therefore the depth of the analysis is dependent on the depth of the empirical facts and the authors' conceptions. The authors' conceptions are not completely stated for when describing the cases, but show in the analysis of the applications of Transformer. The reader may feel that the analysis is not thoroughly based on the presented empirics. Since the purpose of the thesis is to illuminate important factors in the feedback process of deriving technical information from market data, there was no reason to go deep into specific details of the cases.

The reliability of Transformer, depends on the mode of procedure and basic assumptions emphasized by the authors, which have been accounted for above. Further, the reliability also depends upon the trustworthiness of the existing theories behind Transformer. The authors have attempted to identify and choose theories that are often related to. Still, the reliability can be questioned upon the grounds of the reliability of the existing theories.

3 Theoretical Framework

The theoretical framework presents relevant theories connected to derivation of information from data. Data, information, and knowledge are defined, as well as knowledge management and organizational learning. Further, theories are gathered under the headings Organizational factors, Human factors, and Tools.

3.1 Data, Information, Knowledge

The feedback process of deriving information from data includes different levels: data to information, to knowledge, to understanding, to wisdom. [22] The different categories are all connected, but of different value. Theorists have developed the model further, adding new dimensions, i.e. enlightenment as a final stage.[23] Confusion on the definitions can result in big costs for a company. It is of great importance to know what the company needs before investing in technical solutions or changing the organizational processes.[24] To understand the connections, there is a need for clear definitions of the different levels. The focus of attention in this thesis is on the chain from data to information that may/should lead to knowledge.

3.1.1 Definitions

Data is a set of discrete, objective facts about events. Without any further refinement, data has no relevance or value.[25] Data has no significance beyond its existence, and does not contain any meaning in it self.[26]

Researchers have different views of what *information* is. Davenport and Prusak defines information as data that is presented in a particular way in relation to a certain context. Information is described as a message, such as a document or an audible or visible communication. The original meaning of the word information is "to give shape to". It is therefore meant to shape the insight of the person who gets it.[27] Other writers suppose that information is data that has been given a meaning by relational connections, but that this meaning does not have to be useful. [28] For the purpose of this thesis the authors follow the definition of Davenport and Prusak.

---

[22] Internet 4
[23] Internet 5
[24] Davenport & Prusak (1998)
[25] Ibid
[26] Internet 4
[27] Davenport & Prusak (1998)
[28] Internet 4

15

Further, Davenport and Prusak define *knowledge* as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. Knowledge both originates and is applied in the minds of the knower. In organizations, knowledge can become embedded, not only in documents or repositories, but also in organizational routines, processes, practices and norms." This complicated definition shows that knowledge is not simple to describe. Knowledge exists within people, and is a collection and interpretation of data and information. [29] The definition used here is that knowledge is an appropriate collection of information, such that its intent is to be useful.

3.1.2 Turning Data into Information

Gathering data is a much easier task than putting it into meaningful information. The information should be used to help make decisions that improve the bottom line, enhance the customers experience or advance employees' performance. The term "information overflow" is often heard. However, this is quite misguiding because what is usually the case is that there is an overflow of data. There is often too much data, but not enough information. To investigate if data is being used effectively, three questions should be answered: [30]

- Are some data collected but not interpreted or analyzed?
- Is there a lag time between collecting data and delivering information?
- Is the data transformed into easy-to-use reports for all the recipients?

If an individual experiences data or information overflow, it could result in a smaller extent of information use when making decisions. If a person does experience overflow it is usual that he or she start to exclude information when making decisions. When a person begins to exclude information because of the feeling that the amount is overwhelming, the filtering of information is not done in a logical way. This leads to increasing misjudgment. Hesitation and evasion from situations that demand handling of information are also typical for a person that experiences data or information overflow. [31]

When creating information from data it is important to bear in mind what need the recipient has. The information need can be explained as the gap between the current information and the amount of information that is needed to solve the problem in mind.[32] The information

---

[29] Davenport & Prusak (1998)
[30] Wohl (2003)
[31] Malmsjö (1989)
[32] Kuhlthau (1996)

need can be divided into two groups: objective and subjective. Objective needs are seen as necessary information from the external observatory. Subjective needs are those who are experienced by the recipient. Another partition of the needs is by dividing them into regular and temporary needs. Regular needs involve monitoring within a specific area to stay up to date and to get new ideas or feedback from the market or the organization. Temporary needs are needs for information on a specific subject at occasional moments, e.g. in a project or a crisis.[33] According to Wohl, the transformation from data to useful information has proven to give positive results in businesses. Managers make better decisions, customer satisfaction improves, time and resources are allocated more efficiently, and forecasting and budgeting are more accurate. [34]

Data can be transformed into information in five ways: [35]

- Contextualized: We know for what purpose the data was gathered.
- Categorized: We know the units or key components of the data.
- Calculated: The data may have been analyzed mathematically or statistically.
- Corrected: Errors have been removed from the data.
- Condensed: The data may have been summarized in a more concise form.

Using information technology, such as databases or web-tools, has been seen as a solution for the process of turning data into information. [36] Computers can help in most of the steps presented above, but they can not help with contextualization. Further, humans must often help with categorization, correction and condensing. Using technology solutions could be a good aid, but it does not always ensure that information is derived from the input data. It is not the sender, but the receiver of the information that decides whether the message is information or not.[37] For information to fill its purpose it is very important that the information is of high quality. To make effective decisions, the receiver will need available information. The information that the decisions are built upon must be accurate and reliable, and it has to be communicated in an effective way. Content, form and language must be adapted to the intended recipient.[38]

---

[33] Höglund & Person (1985)
[34] Wohl (2003)
[35] Davenport & Prusak (1998)
[36] Ibid
[37] Ibid
[38] Coyle (2003)

3.1.3 Turning Information into Knowledge

Information can be transformed into knowledge in four ways: [39]

- Comparison: How does information about this situation compare to other known situations?
- Consequences. What implications does the information have for decisions and actions?
- Connections: How does this bit of information relate to others?
- Conversation: What do other people think about this information?

These knowledge-creating activities are done by humans, groups or by organizational routines. Knowledge can be spread both through personal contact and structured media such as books and documents. [40] Research in the area of strategic management and business has indicated that knowledge is the foundation of a firm's competitive advantage, and it is therefore seen as a significant strategic resource of a firm.[41]

3.1.4 Knowledge Management

Finding, sharing and developing knowledge are all necessary activities when trying to increase the effectiveness of work practice. Merely acquiring, spreading and utilizing data is not enough to achieve success.[42] In times of dramatic change with high level of uncertainty companies must encourage creativity in order to develop information and knowledge for how to stay competitive. Knowledge management (KM) is a concept that has been applied to explain differences in performance among organizations.[43] Rather than simply moving data and documents around drowning employees in a mix of data and information overflow, organizations need to create processes for making distinction between data and information, so that employees can find, share, and develop knowledge in a structured way. [44] Buckland (1991) has presented a grasping framework concerning KM based upon a study of employees working within healthcare. The model describes KM as finding knowledge, sharing knowledge, and developing knowledge. These critical processes depend on different enablers. The model poses a good example of attempts to describe how to enable knowledge creation and knowledge management within organizations, and it is illustrated in Figure 7 below.

---

[39] Davenport & Prusak (1998)
[40] Ibid
[41] Braham (1995)
[42] McElroy (2005), Sandars (2004)
[43] Davenport & Prusak (1998)
[44] Buckland (1991)

Figure 7. The Knowledge Management model and emebalers for the process, emphasised by Buckland.[45]

Finding knowledge or uncovering knowledge means processes that allow the organization to make sense of and use data, information and knowledge objects. These processes concentrate mainly on technical tools, but also on social connected tools, employed to connect individuals with existing knowledge sources. These technical processes represent ways to access the collective knowledge that the organization holds. Finding these processes also implies the possibility of loosing knowledge, through gaps or misuse of technical tools, but also in avoiding loss of knowledge when people leave the organization.[46]

Sharing Knowledge or transfer and spreading of knowledge include processes to improve the willingness and ability for organizational members to share what they know, to help others expand their learning and knowing. Knowledge only has a value if it is owned by the person who actually can make a change, and the transfer of knowledge is therefore very important.[47] Although some technical tools are used to facilitate knowledge transfer, sharing practices involves more social tools directed to encouraging organizational members to talk about things they know. These processes include teaching/training, apprenticeship interactions,

---

[45] Buckland (1991)
[46] Long & Davenport (2003)
[47] Davenport (2000)

conversations and cross-functional teams. [48] The source should be able to identify and articulate potential uses of its own knowledge, have the skills to identify the needs and capabilities of the recipient and act as a capable sender by transmitting the knowledge in a suitable form. To absorb knowledge a unit must be able to evaluate external knowledge, preserve and spread it within the unit. [49]

Developing knowledge or creating knowledge describes the processes that allow organizational members to create new understanding, innovation, and a synthesis of what is already known. The organization can not create knowledge on its own, without the initiative of the individual and the interaction that takes place within the organization.[50] Knowledge management also implies "unlearning" or abandoning existing knowledge in order to develop new knowledge.

Decision making is roughly equivalent to the problem solving process. When issues are not especially clear because the data is voluminous, incomplete, or not very reliable, formalized decision making gives way to handling the situation.[51] Collaborative working thereby becomes extremely important.[52] Although the methods of decision making influence the learning process and vice versa, learning has to be distinguished from decision making. Organizational learning increases organizational knowledge, and might in fact occur before or after actions are taken.

3.1.5 Organizational Learning

A learning organization can be described as the organization which creates opportunities for its employees to learn and develop, and which takes advantage of this learning and uses it in the organization to become better in adjusting itself to the surrounding.[53] This means that organizational learning refers to an organization's ability to find, share and develop knowledge through and between individuals, and use the knowledge to adapt to the surrounding. Since organizational members are easy to move, organizational knowledge regards mechanisms for integration of knowledge prior to focusing on individual knowledge development.[54]

---

[48] McInerney, 2002
[49] Bryntesson (2006)
[50] Tsoukas & Mylonopoulos (2004)
[51] Weick (1995)
[52] Scott & Kaindl, (2000)
[53] Granberg & Ohlsson (2004)
[54] Hult (2001)

To better understand how mechanism for the integration of knowledge works, it is important to understand how learning occurs, both on individual and organizational level. This can be explained by the theories of single and double loop learning. A single loop is a solution to the actual problem without thorough reflection of why the problem occurred and what caused it in the first place. Only having an understanding for how to solve the symptom of the problem will not make it possible to prevent the problem reappearing in the future. To be able to reach lasting change, an analysis of why the problem occurs and the govern values be changed, as called the double loop learning is required.[55] This can then only occur by the mechanism for integration. To show how and through which parts a learning organization can be built, five areas that affect the learning in the organization has been set up:[56]

- *The strategy.* Talks about the importance of working with the organizations strategy, policies and goals to learn. All members of the organization should take part in this process.
- *Look inwards.* Information technology should make it possible for everybody to be able to take part of all information in the company. Budget and economic should be accounted regularly, so the members of the organization can see the effect and aspects of the work that is done. All units should see themselves as customers and producers in a production chain. A lot of focus should then be on interaction and learning between the units. This should be rewarded.
- *The structures* should be allowing, where organization charts, rolls etc should be seen as temporary and be easy to change.
- *Look outwards.* Everybody who has contact with customers or suppliers must give information back to the organization. Benchmarking should also be done.
- *Learning opportunities* should be given through a culture that allows questioning, learning and reflection. There should be given an opportunity for development for everybody.

The learning organization can then be concluded in the relationship between how the mission, vision and values creates the goals and strategies in the organizations. This creates behaviors, relations and structures that lead to actions to profile the mission and vision of the organization.[57]

As one can see from the theories of data-information-knowledge (DIK), KM and OL, the process of creating information and knowledge from data depends on many factors. Everything from the technological tools to the organizational structure, processes and structure has an impact on the complex process of turning data into information and knowledge.

---

[55] Granberg & Ohlsson (2004)
[56] Ibid
[57] Ibid

The further investigations of these factors are done in the following chapters: Organizational factors, Human factors, and Tools.

3.2 Organizational Factors

Organizational factors are the more tangible factors of the organization, such as official goals, organizational structure and formal processes. These are all factors that affect the learning organization and its ability to turn data into information and knowledge.

3.2.1 Organizational Strategy and Goals

Depending on whether it is the organization or its surrounding that has the greater power of influence, strategy either evolves from a top-down or a bottom-up process. A bottom-up strategy implies that it is both the planned and the spontaneous processes within the organization that shapes its strategy. This is possible when the organization has the power to influence its surrounding. The other definition of how strategy evolves, the top-down process, implies that it is the influences of the surroundings that shapes an organization's strategy.[58]

The goals of an organization are often tied to its strategy. In fact, it can be hard to clarify whether it is the strategy that has created the goals or vice versa. Hence, a strategy can be seen as the means to reach certain goals, or the goals can be a part of the organization's strategic process. In most complex organizations strategy and goals have been divided so that strategy has become an issue concerning top management, while the goals of the organization get more focus on lower levels in the organization. This way of parting strategy and goals creates a symbolism that strategy is more important than goals because it is given more attention on a higher hierarchical level. But since strategy and goals are inseparable this is a false image. By giving more attention to one of the two, the organization diminishes its ability to adjust itself to its surrounding.[59]

3.2.2 Social Structure

An organizational structure is the relation between the different elements of the organization. Here, special attention is given to an organization's social structure, the relation between the people within the organization, their positions and the internal groups they belong to.[60] As discussed in the chapter of knowledge management, the social structure has an important impact on the DIK process.

---

[58] Hatch (2001)
[59] Ibid
[60] Ibid

Types of Social Structure[61]

Whether the different parts of the organization will create success or failure depends on how well people within the organization handle the social structure. Three types of social structures are presented; hierarchy, coordination, and work division.

Hierarchy within an organization defines formal authority relationships and describes how power and control is spread in the organization. Power and control are connected to certain positions, not the specific persons. Hierarchy also forms communication channels. However, hierarchy alone is not enough to the interactions and support needed to nourish the processes within the organization. Coordination means formal and informal rules, such as work procedures, time schedules, and both vertical and horizontal communication. Work division defines how responsibility is divided within the organization.

Measurement of Social Structure[62]

Social structure can be measured by many different variables, of which complexity, centralization and formalization will be presented here.

Complexity refers to the vertical and horizontal differentiation of the organization. Vertical differentiation describes the number of levels and position from a vertical point of view within the organization, while horizontal differentiation describes the number of units and departments. The more complex the organization is the more communication is needed to coordinate the differentiated parts. Complexity is thereby associated with communication-problems, e.g. information is distorted or lost.

Centralization refers to which level decisions are made at in the organization. In a centralized organization almost all decisions are made by top management, whereas decisions are made by the people who are most influenced by the decision in a decentralized organization. However, different decisions may have different levels of centralization. An organization can be very decentralized when it comes to decisions about how to work, but very centralized when it comes to strategic decisions. Further, studies show that decentralized organizations need more communication, engagement and work satisfaction. Centralized organizations usually react faster, but only if top management reacts fast enough on the changes in the surroundings.

---

[61] Hatch (2001)
[62] Ibid

Formalization refers to the extent of rules, directions, procedures and policies used to control the activities within an organization. The opposite of formality is informality, which involves spontaneity, flexibility and a less controlled environment. Studies show that formalization tends to decrease innovation and communication.

Forms of social structure[63]

There are several different forms of social structure, and there is no "correct" structure suitable for every situation. The most usual forms of social structure are simple structure, function based organizations, divisional structure, and matrix structure.

The simple structure has many flexible relations with a low degree of complexity, because of that the differentiation is very limited. Simple structures are characterized in new organizations or organizations that remain small.

Function based organizations group different activities according to the logical similarity in the work task, function and goals. This type of structure is effective because double work is limited and it gives the top management extensive control and overview. This can also be the biggest disadvantage because of the bottleneck the centralized decisions creates.

An organization that grows out of a functional structure becomes a divisional structure. This makes it easier with the overload and centralized decision. The divisional structure builds upon many separated functional structures, which have responsibility for the daily work. Individuals are grouped according to the following criterions: similarity in production processes, products, customer type or geographical area. Because of the dependence between the divisions, more weight is put on coordination between these.

The matrix structure was developed to combine the best parts of the functional and divisional structure. The thought is to take the functional based structure's efficiency, with the divisional based structure flexibility and sensitivity. The matrix structure can be seen as two structures that both have a leading group that is responsible. The members of the organization, who are specialized in a special function, are tied to one or many projects in the organization. An employee in a project has two managers, functional and project; employees in many projects have several different managers. A problem with matrix structures is to handle the conflicts that are brought by the dualistic authority. The employees are often pressured by contradictory demands. They have to work fast to reduce costs and accurate to reach quality targets. It is important to keep in mind that such conflicts are actually the strength of the

---

[63] Hatch (2001)

24

matrix structure; that it has a focus on both the function and the project in the same time. The importance lies in keeping a balance of the interests of both sides of the matrix, otherwise advantages with the divisional flexibility or the functionalized efficiency are lost. A high level of flexibility means quicker reaction to demands from the surrounding. A specialist has, through the projects a connection to many different parts of the organization. This makes it possible to use and exchange valuable competence and knowledge within the organization.

3.2.3 Processes and Process Management

Success in achieving business goals and objectives depends on large, complex, cross-functional business processes. Thus is a process orientation important to organizations to succeed in the feedback process.

A business process is the logical organization of people, materials, energy, equipment, and information into work activities designed to produce a required end result, i.e. product or service. If the business processes of an organization are not carefully managed, there is a risk that one or several of the processes become obsolete, overextended, redundant, excessively costly, ill-defined, and not adaptable to the demands of a constantly changing environment. [64]

There are three principal dimensions for measuring process quality; studying the process effectiveness, efficiency, and adaptability. Effectiveness refers to whether the output of the process meets the requirements of its customers. Efficiency, on the other hand, measure the output in relation to the costs, while adaptability refers to how effective and efficient the process is over time. [65]

Traditionally, a process can be divided into functional pieces, and every piece is under a certain department's responsibility. But someone responsible for the whole of the process is seldom to be found. As a result, it is up to every department involved in the cross functional process to divide attention between the process and the function. In the competition of attention, functional goals and priority of functional resources often deprive cross functional processes of attention. This way, the processes are neither effective nor efficient, and certainly not adaptable. [66]

Process quality management is distinguished from quality management by a conscious orientation towards customer needs, and a certain focus on a few specific key cross functional

---

[64] Juran (2001)
[65] Ibid
[66] Ibid

25

processes which most affect customer satisfaction. Further on, process quality management includes a clear ownership and accountability of each key process.[67] The process owner is responsible for making the process effective, efficient, and adaptable. For large, complex, processes two-tier ownership is often used. An executive owner works as a sponsor of the project is a supporter at the upper management level and is responsible for process results. At the operating level, a working owner leads the process management team and is responsible for day-to-day operations.

Juran uses two tables to summarize and explain the key points of process quality management and point at key success factors of implementation.[68]

---

[67] Juran (2001)
[68] Ibid

Process Quality Management is distinguished by a strategic orientation, that is:	Critical Success Factors for process quality management implementation:
• A clear mission, values, and vision for the organization.	• Leadership from the top of the organization.
• Strategic goals tied to the organization vision, which are shared by executive leadership and deployed throughout the organization in the form of key business objectives.	• Management which communicates the vision, strategic goals, and key business objectives throughout the organization.
• Alignment and linkage if the organization's processes to its vision strategic goals, and objectives.	• Vision shared by all in the organization.
• A cross functional orientation in place of the hierarchical organization.	• Employees empowered and accountable to act in support of theses key business objectives.
• Cross functional process teams, supported by the management system (education, communication, performance management, recognition and reward, compensation, new career path structures, etc.). The mission of each team is to dramatically improve the effectiveness, efficiency, and adaptability of each major business process to which it is assigned.	• Expertise in change management available throughout the organization to facilitate dramatic change. • Continuous improvement. • Widespread skills in project management to enable the many process quality management teams to manage schedules, costs, and work plans being coordinated and implemented throughout the organization.
• Prime organizational focus on the need of customers, external and internal, and business needs such as cost, cycle time, and waste elimination.	• Executive management promotion of the importance, impact, progress, and success of the process quality management effort throughout the organization, and to external stakeholders.
• The driving of all work processes by quality of products and services and overall value creation.	

3.3 Human Factors

Human factors refer to theories that focus on human factors and relations. Special attention is given to service management, organizational culture, and communication.

3.3.1   Organizational Culture

It can be difficult to separate the organizational culture from the culture that influences us from our surroundings, but the authors never the less believes it to be important to do an analysis of what impact culture has on information development and learning.

There are many opinions of what a culture is. What is common for most interpretations is that culture describes the lifestyle in the organization; norms, values, and knowledge are robust factors of that lifestyle. A culture is created over time and depends on past experiences. Similarities and differences between cultures within an organization can either facilitate or curb information and knowledge creation.[69] According to Scheins theory of organizational culture there are three levels; artifacts, assumptions, and values. [70]

The first level is the surface of the organization, which can be described as *artifacts*. Artifacts are norms, physical assets, and rules used to control behavior and actions. When studying cultures, artifacts are often the easiest to identify. Artifacts include physical manifestations, such as choice of design, clothing, and furnishing. Behavior manifestations are to do with communication paths, traditions, and reward and punishment systems. Verbal manifestations refer to anecdotes, jokes, nicknames, and metaphors.[71]

Assumptions are ideas taken for granted. Usually assumptions are difficult to observe because they are subconscious and seen as a common truths within all levels of the organization.[72]

Values can be seen as the factors that estimates what is right and wrong, and can bee seen as a moral and ethical codex. It explains what is important for the organization members. Values are unwritten rules for how the members of an organization shall behave. [73]

A culture in an organization can be divided into subcultures; in fact the homogenous description of a culture consists of several different subcultures. A subculture can either support the overall culture or oppose it. However, differences between closely related subcultures also exist due to different occupations, work teams, and hierarchy levels. Subcultures exist because people tend to attach to others that are similar to themselves. Another explanation to the subculture phenomena is that people who regularly have contact tend to have strong connections to each other. A dependence relation, physical contact, common work environment, common break rooms and so on, all tend to effect and increase the sub cultural frames.[74]

---

[69] Hatch (2001)
[70] Schein (1986)
[71] Ibid
[72] Ibid
[73] Ibid
[74] Hatch (2001)

There is a discussion if cultures are able to be ruled. Some scientists argue that it is possible to rule a culture if one focus on norm and values. Others say that culture is difficult to rule due to the deep roots of the subconscious assumptions.[75]

Cultural impact on knowledge transfer

Knowledge transfer within an organization can be diminished or slowed down because different contradictory cultures prevent effective transfer. Some of the most common reasons for dissatisfactory knowledge transfer are listed below.[76]

- Lack of trust
- Different cultures, vocabularies, and frame of reference
- Lack of time and meeting places
- Status and rewards go to knowledge owners
- Lack of absorptive capacity in recipients
- Belief that knowledge is prerogative of particular groups, not-invented-here syndrome
- Intolerance for mistakes or need for help

Basically, people can not share knowledge if they do not share a common language, and do not have an understanding for other parts of the company. It is important to find ways that enables translation between cultures and value systems. However, some knowledge is hard to transfer in reports, memos, or in other forms of generalized transfer. Such attempts may even increase the culture gap between the parts which are to share the same knowledge. Organizing face-to-face meetings minimizes misinterpretations and facilitates communication between the knowledge sharers. They also get a chance to overcome prejudices about each other. Face-to-face meetings are especially suitable when aiming to transfer tactic knowledge, which can be very difficult to describe in words. Face-to-face meetings, which enable two way communications, as opposed to written instructions, may be received more positively if people involved mistrust written instructions. [77]

3.3.2 Communication

There are many different definitions of communication. The definitions are presented in this thesis in order to describe what impact communication has on the feedback process of market data into technical information within a company.

The arrow approach

The arrow approach is described as "shooting an arrow at a target", thus communication is

---

[75] Ibid
[76] Davenport (2000)
[77] Ibid

seen as a one-way activity, primarily based on the skills of the sender. This approach implies that effective expression is the same as effective communication, and is often described with a linear model diagram, shown in Figure 8.[78]

```
         ┌──────────────────────┐
         │  Information source   │
         └──────────────────────┘
                    │
                    ▼
         ┌──────────────────────┐
         │      Transmitter      │
         └──────────────────────┘
                    │
                    ▼
┌──────────┐   ┌──────────────────────┐
│  Noise   │──▶│       Channel        │
└──────────┘   └──────────────────────┘
                    │
                    ▼
         ┌──────────────────────┐
         │       Receiver        │
         └──────────────────────┘
                    │
                    ▼
         ┌──────────────────────┐
         │      Destination      │
         └──────────────────────┘
```
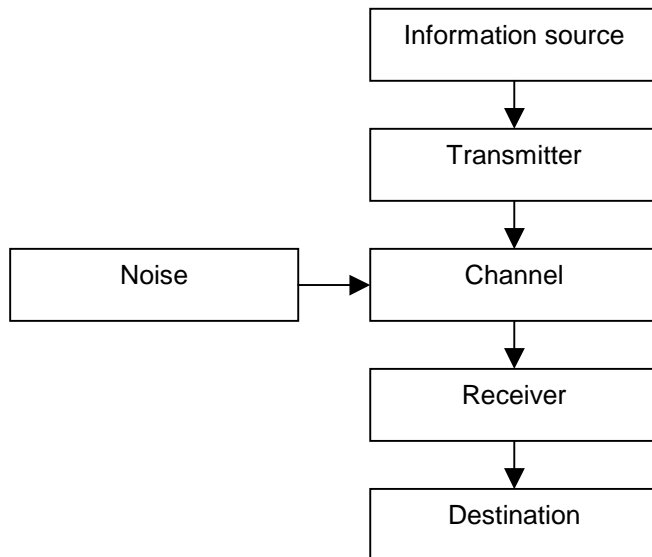
Figure 8. The linear model diagram, as it is described by Hartley, illustrates the linear communication from the source to the destination.

The linear model is one of the most popular models of communication and it is founded in the notion that communication is linear and one way. The model suggests that communication consists of messages which flow from sender to receiver along specific channels. On its way through the channel, the message can be affected by noise from outside the channel, which may alter the original message. However, when studying communication from an interpersonal perspective the linear model has a fundamental weakness, interpersonal communication is always a two way activity. This is explained by Hartley with an example:

> "/…/imagine a conversation where A is telling B about the good time he had on holiday. A does most if not all of the talking. Does that make him the sender? He is also able to observe B's reactions to what he is saying - *receiving* information from the way B is acting as an audience. In this sense A is also both receiver and sender. He may grunt, nod, look attentive - all *may* be acts of communication which are interpreted by the other person."[79]

The circuit approach

The circuit approach is seen as a two-way approach which stresses feedback over response,

---

[78] Hartley (1999)
[79] Hartley (1999)

30

relationship over content, connotations over denotations, and understanding over compliance. The fundamental belief is that effective communication is the same as understanding.[80]

However, both the arrow and circuit approach have been criticized for having fundamental weaknesses. Philip Clampitt argues that the arrow approach is inaccurate due to its way of presenting the listener as passive and the words communicated as being much less ambiguous than they actually are. The circuit approach, on the other hand, argues that understanding is the only goal of communication, and it assumes that understanding automatically will lead to agreement.[81]

The dance approach

Clampitt suggests that communication consists of partners, who like dancers, have to coordinate their movements and arrive at a mutual understanding of where they are going. There are rules and skills, but also flexibility and either of the partners can inject their own style into the movements.[82]

Recent research shows that the most popular definition of communication among managers is either the arrow or the circuit approach.[83]

3.3.3   Service Management

Customer orientation is a concept long spoken of. Its original notion was that of the importance of organizations having a customer focus to gain advantages.[84] Studies also show that superior value and optimal service only can be offered to external customers when requirements of employees are satisfied.[85] Further, an internal customer orientation depends on that the needs of employees' are identified and understood, thus can internal customer orientation only be developed if the organization creates and cultivates ways of integration and knowledge sharing.[86]

Having a service perspective on the internal communication within the company is a way to make sure that a circuit or dance approach is taken. The customer in this case is the internal customer; the receiver of information.[87]

---

[80] Ibid
[81] Ibid
[82] Ibid
[83] Ibid
[84] Mohr-Jackson (1991)
[85] Narver (1990)
[86] Hult (2001)
[87] Grönroos (1992)

31

There are many definitions of the word service. Grönroos defines a service as "An activity or a series of activities of a more or less abstract nature which normally, but not necessarily, takes place in the interaction between the customer and the workforce and/or the commodities or systems of the service provider. The services are supplied as solutions of the customer's problem."[88]

Rules for service management[89]

Grönroos introduces five rules for service management:

1. **The general attitude**

   The service providers should act like consultants, with the demands of the customer in mind at all time. The service provider should have a flexible mind when facing the customer, making it possible to understand the customer's situation so that the service provider can become an entrusted partner when it comes to solving the customer's problem.

2. **Analysis of demand**

   The service provider, who is producing the service in contact with the customer, should analyze the customer's needs and wants while the service is produced and consumed. That implies that the service provider should meet the customer regularly to ensure that the service being produced is aligned with the customer's need. It is important to constantly analyze the demand of the customer, because of the risk of misinterpretations and change in customer demand due to external factors affecting the customer.

3. **Quality control**

   The service provider should control the quality of the service while it is produced. Since a service often consists of cooperation between the provider and the customer it is harder to use a generic quality control system. Every one working to provide the service must take responsibility for the quality of the service, but especially those persons who are in contact with the customer, thus are able to get an impression of the customer perceived quality.

4. **Marketing**

   The service provider should market the service he or she is producing. All service

---

[88] Ibid
[89] Ibid

organizations have many so called part-time-marketers. Those who are in contact with customers experience "moments of truth", moments when customer's impression will affect his or hers future behavior. If the customer's impression is positive, it is very likely that the relationship between the customer and the service organization will be strengthened. The reverse will of course be more likely if the customer's impression of the interaction with the organization is negative. A service organization is thus dependent on every employee's ability to affect the customer when it comes to marketing.

5. **Organizational support**

   The organizational structure, technology and management, as well as clearly defined service concepts, should provide the guidance, support and encouragement that is needed for the service provider to give good service. If the services of an organization are not included in the organization's offerings to customers, the service activities are likely to being less prioritized in the organization. If this is the case, it is not possible for the organization to make use of the forceful competitive advantage a well functioning service organization may provide.

Services are in fact an interaction between the provider and the customer. These moments of truth have a big impact on the perceived quality. Quality is of great importance, and can both save costs and lead to higher customer loyalty and increased income. The customer perceived quality can be divided into two dimensions; a technical and a functional. The technical dimension covers *what* results the customer gets and the functional is the process related dimension of *how* the service is performed. Good total quality is received when there is none or a positive gap between experienced quality and expected quality. [90]

3.3.4 Image

Organizational image has direct effects on customer's expectations. A positive image facilitates effective communication and customers' willingness to listen to word-of-mouth. A negative image has of course the opposite effects, but customers are in this case more interested to listen to negative word-of-mouth. An organization's image affects potential customers in a way that they become more likely to listen to messages supporting their perceived impression of the organization. This implies that an organization with a positive image may benefit from the image in times of negative publicity. On the other hand it may be

---

[90] Grönroos (1992)

difficult for organizations with a negative image to convince customer of its offered value. It should not be forgotten that an organization's image also affects its own employees. Image has a large impact on employees' behavior and attitude towards the organization, which in turn has an impact on the customer through customer relations.[91]

The nature of the image for a department within an organization is much the same as for an organization and its customers. The image is built up over time, and is a result of the quality the products and services as well as the communication and delivery of these.[92]

3.4 Tools

The authors have identified areas within the process of deriving information from data, which in the thesis are defined as tools. Tools are identified as auxiliary means that helps integrating data to derive it into information. This can be done statistically, through reports or in a process, but usually data integration is based on some kind of IT system. The case below shows previous studies in the area of IT within healthcare.

Case example: IT support for medical treatment processes[93]

The medical treatment process is often denoted as diagnostic-therapeutic cycle comprising observation, reasoning, and action. Each pass of the cycle is aimed at decreasing the uncertainty about the patient's disease or the actual state of the disease process. The observation stage always starts with the patient history (if available) and proceeds with diagnostic procedures which are selected based on available information. The job of IT support is to assist healthcare personnel in making informed decisions. Consequently, the IT system should present relevant information at the time of data acquisition and at the time of order entry. An important question is how to determine what is relevant. Availability of relevant information is a precondition for medical decisions, decisions guided by medical knowledge. Medical knowledge, on the other hand, is not limited to what is found in medical textbooks, it evolves over time.

There are different levels of knowledge that have to be handled within the diagnostic-therapeutic cycle: Domain-specific knowledge (e.g. guidelines and standards), site-specific knowledge (e.g. knowledge about the medical treatments available at a specific site, this require consensus among cooperating healthcare professionals), and individual information (e.g. knowledge and information held by acting nurse or physician).

---

[91] Grönroos (1992)

[92] Ibid

[93] Lenz (2007)

Medical decision making must integrate best available evidence with personal experience and patients values. IT can support such decision making in various ways, some documented examples are:

- Computer system can contribute to improve different aspects of data quality, e.g. completeness, timeliness, etc, thereby improving the information basis for decision making.
- Computer systems can contribute to better monitor the current status of a patient, e.g. by presenting patient data in a more coherent way, by providing optimized views to patient data for dedicated purposes, or by generating alerts if some parameter develops dangerously.
- Computer systems can detect mismatches between existing guidelines and the actual patient treatment process, e.g. contradictions for some planned procedure.
- Computer systems can generate reminders to ensure that planned actions are not forgotten.
- Computer systems can calculate drug doses from previously entered data, e.g. age, weight, gender, check compatibility with other medication, and check compatibility with allergies. Such computerized physician order entry systems (CPOE) are estimated to reduce medication errors up to 81 %.
- Computer systems can calculate disease probability.

IT can be a great aid in improving and calculating data and supporting decision making. But, it is important to remember that IT systems can not make decision without human interaction. The IT system presented in the case above is only used as a tool to integrate data in order for humans to derive information from it. Thus, the IT system helps handling data and information within and between the different levels of the diagnostic-therapeutic cycle.

3.4.1 Integration of data

IT resources are valuable when they enable firms to increase the efficiency or effectiveness of processes. In customer services, for example, studies show that the shared knowledge between line and IT managers determines the strategic use of IT. A shared knowledge implies that the IT manager understands the processes of customer service and vice versa, that the manager of customer service has an understanding about the potential opportunities applications of IT have to improve customer service processes. Previous studies have shown a strong connection between shared knowledge and increased operational and service performance of companies.[94]

Such efficiency may originate from systems which sort the same data multiple times. This means that a large amount of data is integrated in different ways and stored in a central database. However, such a system is very complex and a failure in a single component might

---

[94] Barney (2005)

bring the whole system down. To avoid this, the original data must be available, for instance by direct access to the source, depending on the origin and appearance of the source. Non-integrated data must be handled carefully. There is a risk such data is put into the wrong context, thus the information derived will not be reliable. Time symbolizes a good example of data context. Three categories of data integration in connection with time has been identified.[95]

1. **Manual data integration**: Manual data integration is a slow process, but is often used when the amount of data is small or the data mining is slow. The disadvantage is the danger of inconsistencies and high error rate.
2. **Periodic data integration**: Periodic data integration means that data is integrated in predefined periods. This allows large amounts of data to be integrated with only minor time adjustments.
3. **Near real time data integration**: Near real time data integration is used when up-to-date data is required. Data is integrated immediately after mining, no matter if it is needed or not.

Data integration should result in compiled data that facilitates derivation of information. The information can be presented in different ways, and there are several tools available for presenting data, e.g. pareto chart, bar chart, histogram, and diagram. Which tool that should be used depends on the situation. A Pareto chart is especially effective for presenting market quality issues. The pareto chart defines correlations and differences between groups of data in a way that creates information.[96] The chart can show what technical issue creates most failure in products in the market according to Pareto Principle (80/20 rule). The 80/20 rule was established by Vilfredo Pareto, an Italian economist, who identified that 80% of something is correlated to 20% of something else. For example, by eliminating 20 % of the technical issues in a product 80 % of failures are avoided.[97]

3.4.2 How to handle quality

To better understand how a tool should facilitate the transfer of data, information or knowledge it is important to understand how the quality of the tool can be assured. ISO is the organization of international standardization and has developed a family of standards which describes fundamentals of quality management systems (ISO9000)[98]. Due to the fact that the discussed tools usually is based on, or has a connection to some kind of software based IT

---

[95] Schwinn & Schel (2005)
[96] Internet 6
[97] Interview, Field Quality Manager, 2008-01-11
[98] Internet 7

system, ISO9126 is a suitable framework for evaluating the quality. The dimensions of ISO9126[99] are:

1. **Functionality**
   The functionality of a software based IT system is described by the contents and functions available in the software. For example its suitability, accurateness, interoperability, and security.

2. **Reliability**
   Reliability contains a set of attributes that describes the adaptability of the software to perform under stated conditions. Such attributes are maturity, recoverability and fault tolerance.

3. **Usability**
   The usability is connected to the interface between the software of the IT system and the user. Usability can be described as learnability, understandability and operability.

4. **Efficiency**
   The efficiency focuses on the relationship between the performance of the software and the used amount of resources. Efficiency is often evaluated according to the time behavior and resource behavior of the software.

5. **Maintainability**
   Maintainability covers the possibility of making modifications on the software, and is identified as the analyzability, changeability, stability and testability of the software.

6. **Portability**
   The portability of the software reflects the efforts needed for transferring the application between different environments, e.g. installability, replaceability, and adaptability.

Each attribute has its own sub-categories, but the framework is meant as a starting point for quality evaluation, and each user has to customize the attributes after his needs. A tool that is used in the process of deriving information from data must be adjusted to the specific situation and have the range and focus of all dimensions noted above.

4 The Transformer Model

The model presented in this chapter composes the authors' contribution to the pool of theories on the subject of turning market data into technical information. Theories presented in chapter 3 are combined in this model to show the factors that enable the feedback process in a more complete way than single theories do.

The Transformer model created by the authors has the shape of a house. Transformer illustrates that in order to derive information from data organizational factors, human factors, and tools must support the transformation. Transformer is illustrated in Figure 9.

---

[99] Internet 8
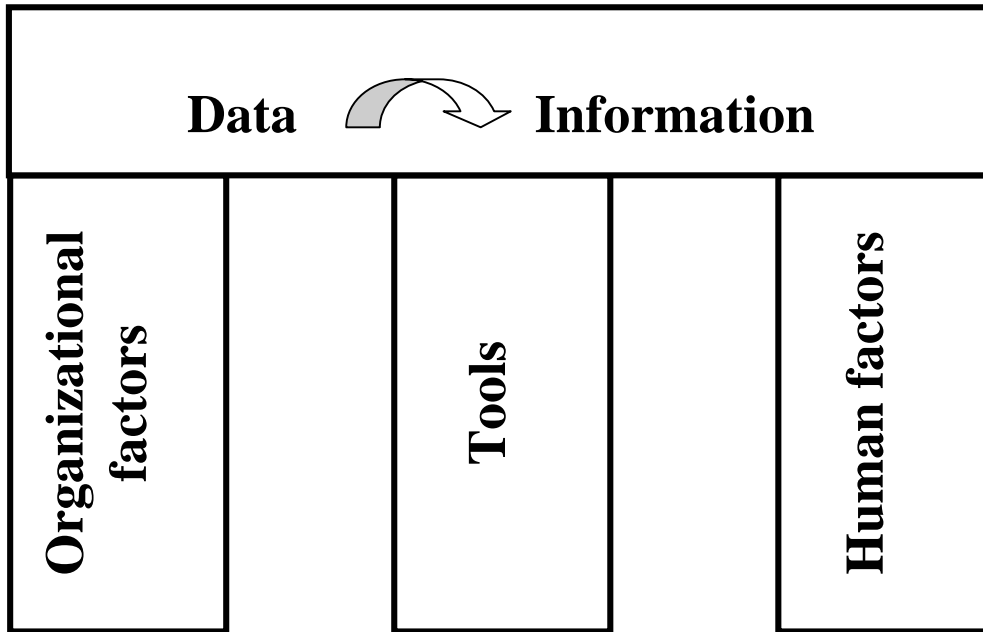
Figure 9. The model presented in this thesis is in a form of a house. The feedback process turning data into information, and in extension also knowledge. The process depends upon factors within three areas, represented by the three pillars Organizational factors, Tools, and Human factors.

To be able to analyze processes and systems for turning data from the market into information and knowledge within an organization, a framework is needed. There is no holistic, generic model in the existing pool of theories, the authors of this thesis have therefore decided to create such a model. The framework presented in this master thesis is based on presented theories of data, information, knowledge, knowledge management, and organizational learning.

To turn data about malfunctioning products in the market into information so that the fault can be eliminated when creating new products the organization needs to be able to adapt both organizational and human factors within the organization as well as taking advantage of available technology and tools. The authors have chosen to split the enablers of the process into three separate parts in order to emphasize that all parts are needed. Further the synergies created by organizational factors, human factors and technology are vital for an organization to enable creation of information from data.

Information and knowledge creation are often cross-functional processes involving individuals representing different functions and departments within the organization. The interfaces within the process consist of sources and recipients. It is therefore important to illuminate the importance of understanding those who are going to use the information or knowledge derived. In order to improve business results the information received must be

available, accurate, trustworthy and effective. The content, form, and language must be adapted to fit the recipients' needs and ways of working. Only when the organization can gather data, manage to put it in a greater context, transfer it to concerned parts within the organization, and make use of it, the organization is creating both tactic and explicit knowledge at individual, team or organizational level. Having a high level of organizational knowledge enables the organization to take advantage of opportunities that arise, thus staying competitive.

The purpose of the model is to present guidelines for analysis of feedback processes within organizations. It is a generic model that can be used in different organizations and market areas. To put the model in its context, the strategic importance of knowledge within the organization should be a starting point for the analysis. Following that, a step-by-step guide helps the analyst through the process. All three pillars and the synergies need to be analysed, resulting in a complete view of the organization's capability of creating information and knowledge. Notice that the model neither points out an optimal solution for deriving information and knowledge from data, nor does it direct how the analysis within the pillars shall be conducted. The model aims to show which factors need attention when enabling information and knowledge creation within an organization. The analysis and the further solutions must be conducted and created in a way that suits the specific organization.

The analysis process consists of four steps:

1. **Mapping the strategic importance**

   By analyzing the organization's strategies the importance of creating information is mapped. A company's strategies and goals should lie as a foundation in all work within the company. This is especially important when changing structures and ways of working. Some companies are in need of more and deeper information than others, and the costs of information and knowledge creation must be proportional to the actual needs. If information is considered an important competitive advantage, this analysis work should receive much attention and resources. Optimizing an organization and its processes for creating information can impact other parts of the company, and alignment is therefore valuable. Coordinating the change with the overall planning of resources, both human and financial, is also of a great importance. For instance, an ice-cream company should do the changes during the autumn and winter instead of during the hectic spring and summer season.

2. **Analyzing the pillars**

   All pillars are to be analyzed for them selves. This makes sure that the different parts which the process of turning data into information depends upon are given proper attention. Each pillar; organizational factors, human factors, and tools; show what areas have an impact on, and are important enablers for turning data into information. When using the model as a guide for analysis, the analyst must judge which of the factors within each pillar that are of most importance and relevance for the specific organization. Thus, when conducting the analysis focus of attention should always be on how each factor affects the process of turning data into information within the organization.

3. **Analyzing the synergies**.

   By combining the parts from step 2, the links and effects of combining the pillars need to be studied. In that way, a combined bigger picture of how market data can be turned into information within the organization can be created. Factors within each pillar affect one another and it is therefore important to investigate these effects, e.g. what impact the organizational factors have on human factors, etc. Such analysis will guide the analyst in the search for why a feedback process is not working satisfactory.

4. **Drawing conclusions**.

   By both studying the pillars and the synergies, a conclusion for the company's capability of turning data into information and knowledge can be drawn. By combining the analysis of the three pillars and how they affect each other, it is possible to see how they affect the feedback process. At this point, the analysis will show how far the organization has got in creating a functioning feedback process, and what areas need more attention in order to complete it.

4.1 The Pillars

4.1.1 Organizational factors

In this chapter the organizational factors, strategies and goals, organizational structure, and process orientation are accounted for.

|		Data	Information	Knowledge	
Organizational factors			**Tools**		**Human factors**
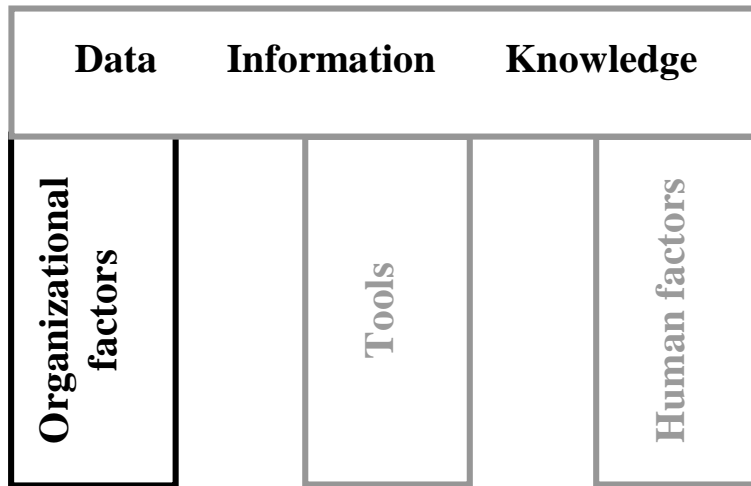
Figure 10. In chapter 5.2.2 the organizational factors are accounted for.

The knowledge management framework emphasises that an organization should have a robust infrastructure with active networks and an effective communication to achieve the goals of developing knowledge. Aligning the processes and the organizational structure to the strategies and goals are an important part of enabling organizational learning. Strategies and goals, organizational structure, and organizational processes are therefore in focus in the analysis of these pillars.

Strategies and Goals

An organization's strategies and goals that are effectively used point out and communicate how the organization creates value, thus direct activities within the organization. Strategies and goals on operational level can be broken down into operational levels, that direct and align operational work. However, operational strategies and goals have to be cleverly stated in order to control and align complex operations and activities so that they contribute to the feedback process's effectiveness, efficiency, and adaptability. Effectiveness and efficiency are easier to affect by directives, goals and strategies than adaptability because the adaptability refers to the ability of dynamic change, thus directives must encourage dynamic action taking.

In order to evaluate strategies and goals, there are especially two aspects that need attention because they clearly show how well strategies and goals are aligned. First, the feedback process builds upon employees that within the organization send data and information to one another. For the process not to be interrupted, the sender and receiver need to share common goals. Second, for employees to clearly understand the common goals, managers must communicate visions, strategic goals, and key business objectives, and how the single department is to interact with its cooperative departments.

Organizational Structure

The combination of an organization's formal and social structure has great impact on the organization's ability to convert data into information. The combination consists of a balance between different factors: power distribution, levels of hierarchy, how the organization is coordinated, the centralization, complexity, and formalization. Different organizations need different combinations of formal and social structure to enhance performance; it is therefore not wise to point out specific combinations as being superior to others. None the less, the combination must permit that information is created and transferred across interfaces within the organization.

To understand how the organizational structure affects the feedback process, the formal and social structure of the organization need to be mapped, e.g. degree of centralization, complexity, formalization, coordination, and numbers of hierarchical levels. Further, one must evaluate whether the combination of formal organizational structure and social structure supports or curbs the feedback process.

Process orientation

In order to enable the whole process of improving products, relevant and timely data have to be gathered and put in connection with people having knowledge that makes the data meaningful. Being able to convert data into information that makes it possible to correct the error causing the malfunctioning, there has to be knowledge of how this transformation is to be done in the three specific levels: domain-specific, site-specific, and individual knowledge. There are several organizational processes to be handled when turning data into information. Employees have to cooperate with each other, both forward and backward in the process, e.g. data providers and information receivers. Meetings have to be organized and tasks and personnel have to be coordinated. To get an estimation of how well current processes support the feedback process, the following should be investigated:

The feedback process needs to be well known, and understood within the company. Grasping guidelines and standards for how to approach and use data about malfunctioning products should be clear. This also requires specific roles and responsibilities. Further, it should be possible to monitor the process.

4.1.2 Tools
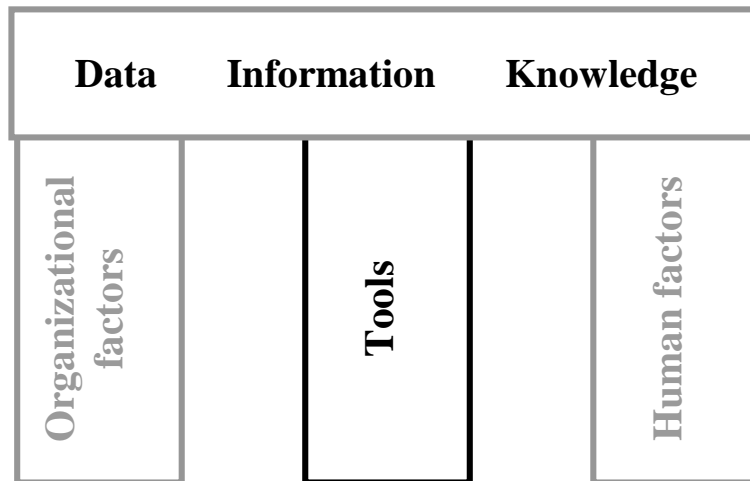
Figure 11. In chapter 5.2.2 tools important when turning market data into technical information are accounted for.

According to the data, information, and knowledge framework, IT tools can be a good supportive tool when turning data into information, as well as taking the next step into knowledge. The role of information technology can be all from calculation and categorization of data to acting as a link in knowledge transfer. Both the knowledge management framework and the theories about organizational learning discuss technological tools as an aid for the knowledge creation process. Technological tools can increase the efficiency and effectiveness of the processes in a company, and is often seen as a necessity to be a competitive actor on the market. The alignment of the tools with the strategies and goals as well as the organizational structure and processes is of great importance. Technological tools can increase the efficiency and effectiveness of the processes in a firm. Spending resources on IT has often become a necessity to be a competitive actor on the market.

Tools have to be evaluated of how they fulfil their purpose and their user friendliness. Data within an IT system must be found on the basis of its completeness, timeliness, and relevance connected to a certain issue for the system to be appreciated. The interface should provide coherent data, clearly displaying abnormal parameters. Further, the language and vocabulary used should be understood by all employees. Every organization changes and so must its IT system. The IT system must therefore be kept up to date with the overall organizational change management process.

4.1.3 Human factors
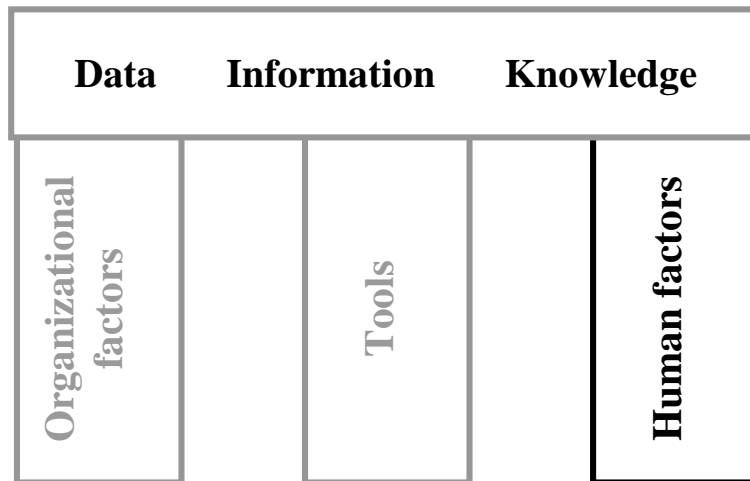
Figure 12. In chapter 5.2.3 the human factors are accounted for.

Information and knowledge creation is not done by IT tools or organizational goals alone. Theories of data, information, knowledge, knowledge management and organizational learning all emphasise the importance of the softer issues in the organization. Human interactions, relationships, and culture all affect the ability of an organization to learn and spread information or knowledge. With this in mind, an analysis of the culture, communication, and service management should be done.

Organizational Culture

The culture affects transformation of data into information and knowledge by affecting the relationship between people and departments. Organizational culture has to do with the language that is spoken, the climate between people, and the view on time, trust, tolerance, and status. It difficult to describe a culture due to its complexity, but it can be understood by analyzing the subcultures. Through such analysis it is possible to identify similarities and differences on different levels of a culture; subconscious assumptions, values and norms, and artifacts. Subcultures exist because people tend to be affected by the people they interact with. This makes it difficult to affect and change cultures from outside. However, it is possible to inform the individual on how his or her work and actions have impact on others. This can be done by first identifying how the three levels of culture affect similarities and dissimilarities in the subcultures that exist within the organization.

Senders and receivers of data or information need to be able to cooperate in order for the process to reach its purpose. For the analyst it is important to investigate and understand how their different cultures affect the feedback process.

Communication

Communication is the core of all relationships, including the relationship between data, information and knowledge. No matter how we interact with one another, we always communicate in one way or another. Of course there are differences between interpersonal, face-to-face, and medial communication. Furthermore it is important to understand how formality guides communication, and if it is linear or two-way. It is also important to analyze the quantity and quality of the communication. Quantity refers to the mass of communication and how often it occurs, while quality refers to the relevance of the data or information sent. For the analyst it is important to investigate if messages sent within the feedback process contain relevant data or information, seen from the receiver's point of view. Communication should be a two-way process, so the sender needs to make sure that the receiver understands the message in order to facilitate the feedback process. Further, the sender must make sure that messages sent are accurate, and must be careful not to make promises that can not be kept.

Service Management

The process of turning data into information and knowledge within an organization is much facilitated if the sender exercises internal customer orientation. A company can only satisfy external customers if the internal ones are satisfied. This process depends on that there is an understanding about the internal customers' needs within the organization. Interaction with the company affects the customer's experiences of the service quality. This experience can either be functional, how it is delivered, or technical, what is delivered. Furthermore, the experience is based on the knowledge and professionalism, attitude, behavior, flexibility, trust, and reputation of the sender. The service provider has to be able to encourage creation and transfer of information and knowledge. When analyzing the service management of an organization it is of special importance to notice if the sender is flexible concerning fulfilling the needs and goals of the receiver. Further, it is important that the sender adapts the message, so that it will fit the work process of the receiver.

Image

Image and reputation have influence on how the receiver interprets the signals of the sender. If the image is positive, the receiver will be more willing to cooperate. This of course affects the transaction of data to information and knowledge in the sense the receiver integrates with

45

the sender. It is therefore important for the sender to be aware of his image and how he is perceived by the receiver. The image can either be good or bad, but it can also be unknown because the image is old or indistinct. If the image is bad or negative, the receiver has probably had bad experience from interacting with the sender. This is rooted in bad functional or technical quality. If this is the case it is important to understand that it is not the image that has to change, but the deliveries. It is no use to try to improve the image without improving deliverables, results, service, and quality. If the image is unknown, the cause is bad communication. The image will get better after the receiver gets to know the sender, but the process can be sped up by more efficient and active communication. However, it is important to understand that the image will deteriorate if the actions of the sender do not support the communicated messages. Thus, the sender must understand which core actions affect the image, and work to improve these.

5 Empirics

This chapter contains the empirics found at the studied company. The three cases are presented on a high level. Further, Transformer has been used as a guide directing the investigation. Therefore the areas specifically pointed out as being important by Transformer have been investigated by the authors.

It is the aim of the company to continually improve the quality of its products, services and work processes by learning from experiences and from customer feedback.[100] The quality focus is wide spread throughout all departments and is built upon the international standards series ISO 90001:2000 and ISO 14000:1996, as well as directives from the European Union considering telecommunication industries.

After a brief presentation of chosen parts of the company with respect to the purpose of the thesis, the three cases are accounted for.

5.1 Product Development within the company

The company creates business-to-business opportunities by producing desirable and entertaining products for end users.[101] To realize its business opportunities, the company uses two different types of projects to produce new products; concept study projects and product projects.[102] Product development at the company is based upon the time pacing methodology. A platform of software solutions is created and valid for one year. Products produced during that year are all based upon the software platform, which is improved over time. After one year the platform is scrapped and replaced by a completely new platform containing other software solutions.[103] Concept study projects propose to find business opportunities for the technical applications created within the company. The aim is to find consumer needs, or wants, that can be fulfilled by the company. Once such a connection has been identified, a product concept is generated.[104] The product concept is as specific as to present a complete blue print of the new product. The product project continues to complete the product so that it answers to production parameters. Specifications settled in the design phase are rarely changed when the product has entered the product project phase. Once the new product is prepared for production, production sites prepared, negotiations with suppliers and retailers

---

[100] Larsson (2005)
[101] Internet 9
[102] Internet 10
[103] Employee, Product Office, 2008-01-31
[104] Senior Staff Engineer, 2008-01-31

48

completed, and other necessary precautions taken the product is launched.[105] After launch the product project enters a maintenance phase, where focus is on control and audit, repair and field service. The product project is closed when the product is scrapped.[106]

5.2 The case of Product Field Quality (PFQ)

The cases below are merely presented for the purpose of evaluating the Transformer model. Transformer has been applied to three different cases, and then the authors evaluated the relevance of Transformer. Transformer was used as a template, so that the authors could judge whether the cases are successful in creating technical information from market data or not.

The PFQ department is a function within Customer Services. Customer Services focuses on development, implementation, and maintenance of services that enhance the value of all the company's products. Within the scope is also preparation for service and escalation of product quality feedback.[107] PFQ's mission is to enable the feedback process investigated in this thesis, which is the reason the authors chose to conduct the research at the company.[108] Further, it is not only PFQ's responsibility to escalate feedback, but also to ensure that the market information about product and service quality is used within the company in order to improve product quality.[109] For achieving this PFQ has access to all data sources that are related to what happen to products in different markets. These data sources represent the input in the feedback process.[110] PFQ as a department does not possess resources to take part in data mining, thus, the department always tries to find patterns in secondary data. The sources of input to the feedback process PFQ handles are many, for example call centers where operator talk directly to consumers, repair centers where malfunctioning product are mended, production sites, and in-house analysis of malfunctioning products.[111] Reliability of data differs from different sources, and to find accurate relationships in the data that describes a specific failure, the employees conducting the analysis must make decisions based on qualitative and quantitative experiences from previous analysis. PFQ struggles with the feedback process to enable learning within the large organization. At the same time learning at the department level is a vital for how successful every employee is at performing

---

[105] Senior Staff Engineers, 2008-02-12
[106] Quality Improvement Managers, 2008-02-04
[107] Intranet 1
[108] Intranet 2
[109] Field Quality Manager and Head of QD 2008-01-11
[110] Interview, Statistics and Data Analyst, 2008-01-29
[111] Head of QD, 2008-01-14

analyses.[112] However, this case will be used at a generic level and has therefore focus of attention on how PFQ as a department acts to enable the feedback process.

PFQ derives information from market data so that technicians within the company will be able to approach quality issues that produce product failure on markets. PFQ is a support function to product project. Employees within PFQ work as quality resources in different product projects. Every PFQ employee is responsible for providing market information to as many as 10 different product projects running parallel. PFQ resources analyze data obtained from the markets to in advance identify what would be driving returns of the product that is currently being developed. After launch, PFQ employees use reports from technical evaluation of why the first released products have been returned to compare with market requirements so that they can identify what types of faults that needs to be corrected.[113]

No matter who will receive the information there are some important issues to illuminate. The input into the feedback process shows what kind of "symptom" that is common in sold products. A symptom is the fault the consumer experience, e.g. "key doesn't work". PFQ correlates the data around a symptom, e.g. "key doesn't work" with technical data from repair centers and in-house analysis to find the reason for why the key breaks.[114] Such analysis may show that the symptom "Key doesn't work" is experienced by consumers because there is dust on the key contact. However, the root causing the symptom "key doesn't work" is neither that there is dust on the contact, nor the contact problem, but the reason why there is dust on the contact.[115] In order for PFQ to deliver information so that technicians within R&D take action and perform quality improvements the information derived must be understandable for the technicians. They need detailed information about the failure; why, how, and when it occurred. [116] The major problem curbing PFQ's work in escalating market feedback is that the information the department derives is seldom used for quality improvements when delivered to product projects.[117] The situation experienced of PFQ, the enabler of the feedback process is illustrated in an example below.

---

[112] Field Quality Manager and Head of QD 2008-01-24
[113] Field Quality Manager, 2008-02-22
[114] Head of QD, 2008-01-30
[115] Product Integration Responsible and RCA Team Leaders, 2008-02-04
[116] Head of QD, 2008-01-30
[117],Field Quality Manager, 2008-02-22

Example of what cost malfunctioning products generate[118]

By developing, producing, and selling products of a specific model the company creates a profit of 10 Euro. For every product that is returned for repair there are different repair actions to choose from. However, repair actions also generate costs.

Costs for repair actions:
          Upgrade software: 10 Euro
          Mechanical repair: 12 Euro
          Electrical repair: 15 Euro
          Swap: 10 + 20 Euro

Because a lot of the same kind of component is used in different products, PFQ can deliver accurate estimations of return rates created by one specific component. As is shown above, every repair action for this product will generate economic loss. If it is possible to lower the return rates it will also be possible to lower costs.

Which components that are to be use are decided in the product planning and concept development phase within the concept study project. Decision makers in these phases are not aware of what impact usage of specific components has on return rates, so they often base decisions on component costs. Two different suppliers, A and B, deliver the same component to different costs. But, as is illustrated below, components delivered by supplier A break more often, thus driving higher return rates.
          Supplier A: Cost = 8 Euro   Return rate = 12 %
          Supplier B: Cost = 10 Euro   Return rate = 2 %

Since supplier A delivers components cheaper than supplier B, supplier A is chosen because of the lower price. But, since the return rate is high, and the company loses money for every repair action that choice results in much higher costs compared to if supplier B would have been hired.

5.2.1 Application of Transformer on the case of PFQ

In order to investigate whether PFQ possesses presumption to derive technical information from market data, the Transformer model is used as a guide for investigating the areas which have been identified as important when deriving information from data.

Organizational factors: strategy and goals:

Even though there is an overall goal of lowering return rates, it is almost impossible for PFQ to reach its goal of improving products and lower return rates. The problem is consequently not differences in goals, but lack of power. PFQ does neither have power to affect choice of solutions nor components in new produt.[119] Even though lowering return rates is a clear and

---

[118] Field Quality Manager, 2008-02-22
[119] Ibid

51

distinct goal within the company, the authors can not find that the strategy of how to reach the goal has been implemented so that it affects operational work. Further, the goal of lowering return rates is not prioritized by departments who's success is not measured in return rate terms.[120]

An unclear strategy about how to work with product quality and return rates diminishes the value of the goal to lower return rates, thus thwart the feedback process.

Organizational factors: organizational structure:

The organization is combining a line function with a project organization. These two parts are surrounded by other supportive functions, such as sales, legal entities and corporate functions. It is the task of PFQ's to provide the product project with market information, especially how the product behaves in the market.[121] The differentiation within the organization creates a need for coordination and communication, which is not fulfilled by the work of PFQ.[122] The hierarchy admits power to the department only within product projects. Even if the coordination inside product projects was to be improved, the power structure of the company would still prevent PFQ from improving product quality. The reason is that neither PFQ, nor project managers, are authorised to make changes in product specifications.[123]

The authors want to describe the structure as a bureaucratic structure, with high level of complexity and formalization, but low level of centralization. The company works with delegation of authority[124], but the high level of formalization can be seen even in smaller departments. Even if it is possible for employees to take initiative within his or her department, it is hard to take initiative that stretches across department boarder because of the formality that implies that every department focuses on its own interest.[125] However, it is the authors perception of the situation that the bureaucratic structure would not pose a problem for transferring information if managers worked with strategies and goals that were aligned on both official and operative levels concerning the feedback process.

The fact that PFQ does not have any formal contact with the parts of the organization that need market input prevents PFQ from deriving information from data.[126]

---

[120] Senior Staff Engineer, 2008-01-30
[121] Internet 1
[122] Head of CS, 2008-04-23
[123] Field Quality Manager, 2008-02-22
[124] Internet 1
[125] Senior Staff Engineer, 2008-01-30
[126] Field Quality Manager, 2008-02-22

52

Organizational factors: process orientation:

In order for information from the market to be used as input in product development a process including both CS and R&D is needed.[127] Today, quality work is conducted on many different levels, and by different departments, focusing on different areas.[128] For the quality work to reach better result and performance within the organization, the quality work should be more coordinated.[129]

The lack of a process orientation concerning quality work within the company creates sub optimizing and waste of resources because many different people perform the same work. Neither is there any process that facilitates cooperation and data and information transfer between different departments.[130]

Human factors: culture

Since information concerning malfunctioning products is not given to the right receiver, the information cannot be used for product improvements. Culture poses in this case neither an aid, nor an obstacle.

Human factors: communication:

The authors perceives the communication as characterized by linear communication. Like the arrow approach, it emphasises that effective expression is the same as effective communication. Communication is built around formal reports, leaving little possibility for PFQ to communicate to other parts of the organization. The reports are directed to a few receivers, but still so general that they can be reached by other people within the organization in a collective database. [131] This is the only way for people working within R&D to get information of what kind of faults occur in products that have reached the market. Because the information either is customized to fit people working within the product project or of more general nature, the information is perceived as mass information by people working within R&D.[132] This form of communication creates an insecure feeling about how to use the information, how the information has been obtained, and if it is reliable. Further, the general information does not fulfil the detail level needed at the R&D department.[133]

---

[127] Head of CS, 2008-04-23
[128] Internet 10
[129] Head of ID, 2008-02-01
[130] Two Senior Staff Engineers, 2008-02-12
[131] Field Quality Manager, 2008-02-22
[132] Product Integration Responsible and two RCA Team Leaders, 2008-02-04
[133] Two Senior Staff Engineers, 2008-02-12

Human factors: service orientation:

PFQ provides services for product projects. Whether or not this is done with the service receiver in focus, it does not affect product quality, since the service receiver is not authorized to make changes in product specifications.[134] However, the authors find it is interesting to notice the lack of customer orientation in PFQ. Working within product projects PFQ is providing services to the wrong customers considering the department's goals.[135]

Human factors: image:

By not actively producing services for the R&D department an image of the PFQ department has been created without the direct involvement of PFQ. R&D has created an opinion about PFQ based upon the documents they have found in the database, documents that are not satisfying the needs of R&D simply because they are not created to satisfy those needs.[136] Whether or not the image is true or false, it is still the image that R&D perceives that will be the truth in their eyes, no matter if the image is representative or not.[137]

Because R&D has not been the intended receiver of the information PFQ provides, the R&D department does not consider PFQ as being a provider of relevant information.[138] On the contrary, the opinion of R&D is that PFQ is providing information that is inappropriate to be used within the R&D department.[139]

Tools:

The information technology used by PFQ when providing other parts of the company with information derived from data is mostly electronic reports, which is distributed by e-mail and stored in a database.[140] The e-mails, which are of a standardized nature, are sent to a large number of people within product projects.[141] Except for PFQ's internal customers it is not possible for the receiver to in advance affect what information he or she will get.[142] By using such e-mail based tool the authors perceive that PFQ makes it hard for the receivers to assimilate the information because PFQ is producing an information overflow.

---

[134] Field Quality Manager, 2008-02-22
[135] Head of QD, 2008-01-24
[136] Two Senior Staff Engineers, 2008-02-12
[137] Senior Staff Engineer, 2008-01-30
[138] Product Integration Responsible and two RCA Team Leaders, 2008-02-04
[139] Senior Staff Engineer, 2008-01-30
[140] Field Quality Manager, QD, 2008-01-11
[141] Field Quality Manager, QD, 2008-02-22
[142] Two Senior Staff Engineers, 2008-02-12

54

Summary – Application on PFQ

- Not enough power to reach the goals – wrong strategy.
- No formal contact with important recipients.
- Lack of a process orientation concerning quality.
- Information is insufficient and pushed instead of pulled.
- Lack of customer orientation.
- Information overload for the recipient.
- Technology-based communication restricts the information and knowledge creation.

5.3 The case of the Quality Department (QD)

To better reach its goals, PFQ has reinvented itself and has taken the name of Quality Department. QD aims to change its way of working in two ways. First, estimations and predictions of return rates will not be derived by product, but QD will change focus to analyze the symptoms on a global level. Second, QD is not to deliver to the product project, but to suitable receivers within the organization, depending on the root cause of the symptom. [143]

The same kind of fault often occurs in many different products due to the same root cause. The root cause can for example be the usage of a specific component, or a mechanical solution. Both components and assembly solutions are often reused in new models, so if one or the other causes faults in the products when having reached the market it is important to change the component or develop a new solution for assembly. Working in this way means that QD also will change its internal customer focus. First when having identified the global top symptoms QD will know what department they will have to contact.[144] To identify what causes a certain problem in a product, QD wants to establish an iterative process together with concerned departments. QD can not provide solutions for how to correct the issues they find, but QD can provide those who can with information about the behavior of malfunctioning products so that they can eliminate the same type of failure in new products.[145]

---

[143] Field Quality Manager, and Head of QD, 2008-01-24
[144] Head of QD, 2008-01-30
[145] Ibid

5.3.1 Application of Transformer on the case of QD

Organizational factors: strategy and goals:

The vision of QD builds upon the same goals concerning lowering return rates, but includes a different strategy. The strategy emphasized is created within QD, and it can therefore be considered as a starting point for a bottom-up development of an operational strategy for reaching the goal of the department. [146] However, it is the authors' belief that for this new strategy to gain ground and increase performance it is important that QD pitch for the implementation of the strategy on higher levels in the organization.

What is important to notice about QD's vision is that the strategy only focuses on reaching the goal's of QD. Lowering return rates is still not a prioritized goal within all of the possible receiver departments, especially not R&D.[147]

Organizational factors: organizational structure:

As a rather small department, QD needs sponsorship from managers on high levels in the organization, authorizing the new way of working. Sponsorship is needed if QD is to succeed in performing the bottom-up manoeuvre because of the many interfaces that has to be managed. When acting as a support function within the organization, QD needs to develop a clear focus on how to approach the possible receivers.[148] The authors believe that improving products by identifying the failure and then getting those responsible for the malfunctioning part to correct it, is tricky, because it can easily lead to turf protection among the receivers.

Organizational factors: process Orientation:

QD lacks an overall process focus. Instead, the authors have perceived that there is focus on internal work processes and much attention on how to use different tools. Since QD is trying to establish an iterative process with other parts of the organization, there must be guidance, directions, and support from an overall process control.[149] Reasons for the lack of an overall process for deriving information from data can be many. One reason is that it takes someone with power over all the different parts and departments of the process to create an overall process, and since it is a bottom-up manoeuvre, there is no such person involved. Another reason is that it is uncomfortable for QD to connect with sponsors that have the power to create an overall feedback process, because an overall process will not identify QD as the most central part. However, employees within QD believe that they have the power to

---

[146] Head of QD, 2008-01-30
[147] Head of ID, 2008-04-28
[148] Head of CS, 2008-04-23
[149] Ibid

56

influence other parts of the company, and that they have enough authority to establish the new way of working within the organization.[150]

Human factors: culture

According to the theories Transformer is based upon, the iterative process demands a high level of cooperation and coordination between employees working within QD and the receiver department. Differences in culture can easily destroy such cooperation and coordination, thus it is important that QD consciously acts to overcome such differences. To begin with, there is little understanding in other departments for what kind of new information QD can provide, and that makes these departments unappreciative in not understanding what value such cooperation can bring.[151] Especially in technical departments, employees can be reluctant to pay attention to such a soft issue as market feedback. There is little understanding for what they can do with information from market side, since such information does not hold required detail level to satisfy R&D employees.[152] No matter how marvellous ideas QD has, they will never be appreciated by R&D as long as QD does not approach R&D employees on their conditions.[153] However, it is the authors belief that QD would not have had to tip toe when approaching R&D if R&D had realised the value of feedback from the market. But, as long as R&D tend to diminish market information QD needs to approach R&D on their terms.

Human factors: communication:

What is curbing the communication is that there are no natural interfaces between QD and the new receivers that might facilitate realization of QD's strategy.[154] This means that QD will have to fight hard to gain trust and power to establish new communication channels in the organization. However, establishing an iterative process does have the potential to improve quality improvement at the company dramatically, but the process builds upon action taking and decision making on both the sender and receiver side.[155] As long as the receivers do not know what kind of information they want, and much less what kind of information they can get, the communication will still be more linear than circuit.[156] Of course people will eventually learn, but since QD will have to approach many different receivers, QD will have

---

[150] Head of QD, 2008-04-28
[151] Two Senior Staff Engineers, 2008-02-12
[152] Senior Staff Engineer, 2008-01-30
[153] Senior Staff Engineer, 2008-01-30
[154] Head of ID, 2008-04-28
[155] Head of QD, 2008-04-28
[156] Field Quality Manager, 2008-02-22

to start up a new cooperation over and over again, and the learning process will therefore be very slow.[157]

Human factors: service orientation:

The service mindset of QD's iterative focus is greatly improved considering the traditional way of working.[158] The new vision actually includes internal customers as an active part, and that task of QD is to provide information, not just deliver it.[159] However, the service orientation is not as good as it could be. QD is the part that initiates the contact by presenting issues that they consider will have to be dealt with. By doing this, QD puts itself in the centre and dictates the condition, which will have negative effects on the receiver's willingness to cooperate.[160] The authors do not think QD can expect the receiver to initiate cooperation, so QD needs to handle the early phase in the interaction very carefully, and always put the receiver first.

Human factors: image:

The authors believe that when actually facing the internal customers, QD has opportunity to affect the image the internal customer perceives. QD is able to correct a negative image by acting differently, by acting in a way that the other part will perceive as positive.[161]

Tools:

For the new way of working, QD are searching for new information technology.[162] Since the new way of working, so far, is built around face-to-face meetings, the authors do not believe that the communication tools will be as central as before. This is good, because communicating through technical instruments is limited.[163] The tools used for conducting analysis is the same, but it is the strong belief of the QD employees that new analysing tools will generate better information[164]. However, the author perceive that it is no use creating new calculation and analysis tools before thoroughly investigating how the receiver needs to have the information in order to be able to use it. Analysis tools used today at QD combined with

---

[157] Field Quality Manager, 2008-02-22
[158] Head of QD, 2008-01-30
[159] Field Quality Manager, 2008-02-22
[160] Head of ID, 2008-04-28
[161] Head of QD, 2008-04-28
[162] Field Quality Manager, 2008-02-22
[163] Senior Staff Engineer, 2008-01-30
[164] Head of QD, 2008-01-30

the experience employees posses pose a very good foundation for enabling the feedback process.[165]

Summary – Application on OD
- Same goals, new strategy created by QI. Bottom-up.
- Organizational support is needed.
- Lack of an overall process.
- Demands a high level of understanding. Culture can be an obstacle.
- QI will have to fight hard to gain trust.
- Improved service mindset, but more to be done.
- Face-to-face meetings are introduced as a new tool for creation and spreading of information and knowledge.

5.4 The case of the Improvement Department (ID)

In December 2007 an experimental project, ID, involving cross functional departments within the company started. ID was set up to find specific solutions for a few specific symptoms and technical quality issues. It resulted in significant increase of efficiency in the process of deriving solutions for symptoms and quality problems. The aim of ID is to create a process of consumer feedback.[166]

ID does not create new processes for deriving information about quality, but aligns and secures current processes and creates links between existing forums. The main purpose is to find a way for R&D to prioritize quality improvement work. Today, R&D receives quality issues escalated from several parts of the organization, including QD. This has resulted in that the R&D has a vast number of quality issues to solve. To prioritize quality issues ID mainly focuses on coordinating processes, roles, ownership, and communication connected to quality improvement in the organization. Within ID, there is a customer feedback process, a process which has the same goal as QD. In the customer feedback process ID tries to connect symptoms on the market with technical quality issues identified at R&D.[167] A quality issue is problem or a failure identified by R&D. If it is possible to make such a connection employees at R&D will have much more understanding about what to do to eliminate the symptom on

---

[165] Head of CS, 2008-04-23
[166] Head of ID, 2008-02-01
[167] Head of ID, 2008-04-14

59

the market. It is the belief of ID that symptoms and issues can not be connected by a single department, but rather by a multifunctional team. [168] By participating in the multi functional team, support functions on low levels within the organization will get more authority.[169]

5.4.1 Application of Transformer on the case of ID

Organizational factors: strategy and goals:

ID aims to succeed in lowering return rates by directing work so that it is aligned with the overall goal. Departments working with ID will have the same strategy and mission to lower return rates.[170] However, in order to realise the new work procedure, there has to be an owner of the overall process.[171] Indeed, the work process of ID is in some ways a feedback process for escalating market information. This process needs a clear owner, if involved departments shall rearrange their prioritizing of goals.[172]

Organizational factors: organizational structure:

By judging of the organizational chart ID is organized as a functional organization, despite the aims of having a high process orientation.[173] The authors find that the number of hierarchical levels, coordination and division of work is high, and there is much focus on the demands from those who sets the prioritizing of R&D's work. ID should gain a lot by organizing as a matrix, rather than a bundle of functions. In order for a range of different departments to together make a list of what should be changed in products produced in order to reduce return rates, the complexity needs to be low.[174] Cooperation must be facilitated further, at the same time as top management needs to offer support and guidance for how the cooperation shall be realised.[175]

Because of the use of a functional organization at the same time as a high level of interdepartmental cooperation is needed, there are some issues that should be considered. The authors insist that the hierarchy, coordination and division of work should be high. Further, the lack of overall processes orientation brings a lack of division of work and low coordination. This has a negative impact on service orientation, because of the old way of working implies that every department consider their own priority of issues as most

---

[168] Head of ID, 2008-04-28
[169] Head of CS, 2008-04-23
[170] Head of ID, 2008-02-01
[171] Head of QD, 2008-04-28
[172] Interview Head of CS, 2008-04-23
[173] Organizaiton chart ID
[174] Head of ID, 2008-04-14
[175] Head of ID, 2008-02-01

relevant.[176] Again, the lack of leadership, ownership, low level of centralization and formalization creates possible problems for the implementation of ID.[177]

Organizational factors: process orientation:

ID is a way of coordinating processes in order to approach and use data about malfunctioning products. The problem lies in implementing ID so the formalization of these guidelines is high and to ensure that these guidelines will be used and understood by all parts involved.[178] It is difficult for the individual department to monitor the whole feedback process, and because the ownership is not clear, the authors think it pose a problem for managing the overall process. ID identifies ways of working, but fails to communicate how these ways of working are to be realised considering differences in cultures and way of communicating between involved departments.[179]

Human factors: culture:

Hopefully, the people within ID will get influenced by each other and together form a positive subculture. This will be enhanced if employees take part in the work of the multifunctional team. The responsible for ID has an opportunity to influence the culture by recruiting the right people that has the same assumptions of how things should work. It is also important to set specific sets of norms and values from the beginning and have these rooted in the work process. [180] The authors believe that artefacts that attract people to joint and cooperate with ID should be created. Since ID has not been around for long, there has not been any opportunity to create subculture. ID implies commitment from certain departments, who will be functioning as coordinators, but report channels are not completely clear which makes some of these departments doubt the value of participating.[181] By not approaching differences in cultures early on, the authors have sensed that suspicions are raised within departments, and this might curb the cooperation further on. As it is now, the individuals that participate in ID work as hired resources from other departments.[182] This does not make whole departments buy in the concept of ID, and it makes ID dependent on specific individuals rather than functions or departments.[183]

[176] Two Senior Staff Engineers, 2008-02-12
[177] Head of QD, 2008-04-28
[178] Head of ID, 2008-02-01
[179] Field Quality Manager, 2008-02-22
[180] Head of ID, 2008-02-01
[181] Engineer, ID, 2008-04-28
[182] Head of ID, 2008-02-01
[183] Head of QD, 2008-04-28

Service Orientation:

Since ID aims at facilitating prioritizing at R&D, ID must recognize the importance of service orientation. Further, this implies that departments working within ID must be coordinated and have the same focus concerning internal customers and service orientation.[184] The authors have found that this is hard to manage within the company, even on departmental level, and that makes it a hard nut to crack for ID. Today there is not enough attention on the differences in service management between departments in order to keep the departments working aligned towards the same goal in the same way.[185] In order for the multifunctional team to function as desired, every department participating must understand and share the goal of service orientation.[186] Obtaining a service orientation will be hard for ID until service orientation is recognized within the whole company. Once ID emphasizes on service orientation, the image of the ID will be very much improved. [187]

Human factors; communication:

Communication within ID is based on a two-way communication according to the circuit or dance approach. This means that there is a constant communication until market data is derived into information, understandable to R&D. The two-way communication creates opportunity for the receiver to ask for more information or different information when desired.. Every department has issues they want to escalate so that R&D prioritizes that specific issue. The department has the best argument for why their issues should be brought forward, will gain more power in the discussion. By discussing in a creative way the departments represented in the multifunctional team will probably gain more understanding for each other. [188]

The problem in the communication lies in communicating to managers of the involved divisions during the start up. Initially, ID has experienced some difficulties in getting resources from departments within the company.[189] The authors have found that this most likely depends on that t the purpose of ID is not clearly communicated.

Human factors: image:

As can be seen in the discussion above, the image and the communication is closely related in ID. If the receiver of the information understands the importance of what the sender sends,

---

[184] Head of ID, 2008-02-01
[185] Field Quality Manager, QD, 2008-02-22
[186] Head of ID, 2008-02-01
[187] Field Quality Manager, QD, 2008-02-22
[188] Head of ID, 2008-04-14
[189] Engineer, ID, 2008-04-28

and this message is correct, the image will be positive.[190] Thereby, much importance lies in that the multifunctional team gets enough authority and resources to perform their job properly.[191] For the moment, the authors find the image of ID unclear within the organization, probably because ID has not had the opportunity to deliver any tangible information to R&D.

Tools:

The lack of tools for achieving the goals is a disadvantage for ID. Tools identified are very simple, and are only partly compatible to other tools used in the company.[192] The authors find that the meagre range of auxiliary means possessed is threatening the realisation of the feedback process being created.

Summary – Application on ID
- Alignment through common goals, strategies and processes.
- No clear owner or coordinator of the process.
- Difficult to get an overview for all included divisions.
- In need of a clear and formalized implementation to work.
- Lack of tools.
- Dependent on a good culture and a service mindset throughout the organization.
- Two-way communication enables knowledge creation.

---

[190] Field Quality Manager, QD, 2008-02-22
[191] Engineer, ID, 2008-04-28
[192] Engineer, ID, 2008-04-28

6 Analysis

The purpose of this analysis is to evaluate Transformer. The relevance of the parts gathered under organizational factors, human factors, and tools is evaluated by analyzing their importance in presented cases. Further, synergies interacting between the pillars are recognized as an additional relevant area to investigate when studying the feedback process investigated in this thesis.

The purpose of the thesis is to construct a framework identifying factors upon which information creation depends. Transformer is created to in an easy and understandable way explain the complexity of the process of turning data into information. By introducing the three pillars, holding up the process of deriving information from data, the importance of focusing on all three parts is emphasized. When approaching the problem, the authors had a preconception that the solutions would be found by unraveling technology and other auxiliary means that are connected to the pillar called Tools. However, previous studies and research make it clear that the factors collected under the concept of tools is excellent for collection, sorting, calculation, refinement, and distribution of data. Notice, that the activities stated do not form information, not even if they are conducted as a process. So, when searching for a way to describe how information is derived from data, neither technology nor modes of calculation or virtual tool will do the job. The same reasoning can be done for both organizational factors and human factors. By this, it is not said that organizational and human factors, as well as tools are worthless, only that each pillar represents factors that on its own may have practical uses, but is not enough to constitute the secret behind information creation. Instead, the authors argue that only an interdisciplinary approach can uncover it.

Transformer is created to describe information creation from three different perspectives. The model identifies important areas within each perspective that need to be analyzed when searching for how to enable information creation. The intention is to offer a guide that helps in identifying which areas that do not support the process of deriving information from data. When in use, Transformer neither replaces the analysis needed to evaluate a feedback process, nor does it identify specific solutions for what to do in order to create a well oiled process. Instead, the model functions as a guide, displaying which areas that must support the feedback process in order for it to perform satisfactory. Further, the model is of a generic character, but by using it, answering the questions *"What are we doing wrong?"* and *"What should we do*

differently?" will be much facilitated. The model specifies areas to which attention and resources should be focused.

6.1 Pitfalls of Transformer

A finger of warning should be raised concerning usage of Transformer. The model expresses information derivation in a general and theoretical vocabulary. If the reader or user who wants to apply the model can not scale down the guidelines and translate it so that they are applicable to the situation, the model will not create much value for the user. Further, because of the generic nature of Transformer, it will generate endless number of guidelines when applied to a specific case. It is therefore required of the user to understand to what depth it is suitable to go in each analysis.

6.2 Case Evaluation

6.2.1 Evaluation of the case of PFQ

The investigations of how data is derived into information in presented cases recognize different factors as either pitfalls or enablers. This supports the model by showing the relevance of its components, organizational factors, human factors, and tools. Concerning the case of PFQ, most of the factors identified in the model as being vital for derivation of information are not fulfilled:

- Structure, strategies, and goals are not aligned
- Insufficient coordination between departments
- The overall process for creating desired information is not identified
- Cultural differences between departments; different languages, different preferences
- Communication between departments is of a linear nature
- PFQ is perceived as a deliverer of unreliable information, thus has a negative image
- Lack of customer orientation
- Information technology used does not offer user friendly interfaces

What is interesting to notice is how the deficiency in one factor impairs the insufficiency of other.

Even though the overall goal of lowering return rates is recognized within the organization, the overall strategy for how to reach this goal does not offer enough support and guidance for how to accomplish it. Instead, different departments have developed their own operational strategies and goals for how to act. The investigation of PFQ thereby confirms that strategies

and goals on a strategic level affect those on operational levels. Further, the investigation suggests that the insufficiency of strategies and goals on the strategic level mak them non-congruent on operational level concerning how to lower return rates.

The Investigation of PFQ shows that cooperation between PFQ and R&D is needed if information is to be derived from data. This implies that several supportive interfaces must be established.

Since the goals are non congruent, there are no natural processes ushering cooperation. Because flexible cooperation is an unnatural behavior, willingness to take initiative in creating cooperation within the organization is diminished. Theories and earlier studies stress the fact that information creation depends on the actions of individuals possessing different knowledge. When solving the specific issue of return rates, it is clear that unaligned departments affect the attitude towards cooperation across department boarders. The cultural differences are amplified because attitudes and behavior is strongly connected to each department's strategies and goals.

Communication follows formal paths and procedures, and it does not offer any unexpected surprises, neither good nor bad. This form of communication has affected and developed the image that others perceive of PFQ. The meager communication aggravates the gap between desired and offered information. By not being able to communicate in a satisfactory way with other parts of the organization, PFQ has not been able to reach its goals, which in turn has affected the work environment and culture by nourishing a feeling of not being able to influence. On the other hand, the same problem makes others look upon PFQ with skepticism so that the messages that PFQ actually delivers are not taken seriously.

The case of PFQ presents synergies between communication, cooperation and cultural differences. The factors presented here all impact on and influence each other. In this case, the net result is negative describing a downward spiral in which the presumptions for creating information from data deteriorate. It has been emphasized that a service mindset may spring better relations and more efficient communication. The apparent lack a service mindset is taken as evidence for how the culture draws out guidelines for employee behavior. That behavior deeply affects the impression others get of the department, which pose the foundation for future cooperation.

6.2.2 Evaluation of the case of QD

The case QD is of a slightly different character than the case of PFQ. Still, it can be shown that the factors identified in the model do describe what areas need to be focused on if to improve the feedback process. However, the constitution of the case of QD enables information creation in a better way than the case of PFQ:

- Same overall goal but different doctrinaire principles for how to reach it
- Lack authority to enforce the work procedure of others
- The process lacks owner on overall level
- Cultures dominated by turf protection and disparaging of others
- Circuit communication
- QD is being perceived as working in the wrong direction
- Customers are identified, but not understood enough
- Information technology used do not offer user friendly interfaces

The case of QD includes a change of the department's strategy for how to reach its goals. The new work procedure involves the action of other departments, which stresses cooperation. But, QD does not possess required authority within the organization to push other departments into cooperation. If QD instead had applied more service mindedness and attracted cooperation, QD would have much larger chances to succeed. However, the case of QD includes better forms of communication than the case of PFQ. Beginning communication by asking what the other part desires instead of opening by delivering a report has resulted in other parties agreeing on taking a first step towards cooperation. The model suggests that because QD is acting more service minded, cooperation has improved. However, the new approach of QD's presupposes that QD is the central actor, driving the process of deriving information. The investigation shows that this behavior is a part of the culture within QD. Such behavior may very well incite a more cautious and awaiting behavior in other departments with which QD tries to establish cooperation. The last statement has not been confirmed in a satisfactory way when investigating the case of QD for verifying the model. However, it is a strong perception of the authors' that there is a culture of turf protection in several of the possible cooperating partners of QD. Further the intentions, actions, and behavior of QD has created an image of QD perceived by other departments in the company as working in the wrong direction. QD has not aligned its operational strategy with the overall operational strategies of the company.

6.2.3 Evaluation of the case of ID

The case of ID does not pose an example that makes it possible to investigate every aspect of organizational factors, human factors, and tools. However, the case includes some good examples of both enablers and pitfalls:

- Strategy, goals, and operational goals are aligned within ID.
- The feedback process is being structured.
- Neither owner for overall process, nor for sub processes
- Limited commitment from departments

ID is started as an attempt to align overall and operational strategies, goals, and activities. This confers authority to ID, which empowers it to change deeply rooted routines. The primary strength of ID is the evident process focus. Recognizing information creation as a process puts pressure on involved departments because new clear tasks and deliveries are required. Presenting the work procedure of ID as a process also creates new interfaces and common arenas where departments can build natural cooperation. However, as presented in the case of ID, the process lacks an obvious owner. In order to direct the process in the right direction an owner is necessary.

The synergy effect created by congruence of structure and strategy deeply affects employees' attitude toward new ways of working. Investigation of the case of ID even suggests that this change may even overcome behavior settled in cultures. By creating meeting places and interfaces between departments and at the same time presenting clear and aligned operational goals and strategies, positive spin off effects are enabled. This implies that the synergies created are more valuable than the sum of the value of each pillar.

6.3 Evaluation of Synergies

Due to the complex nature of turning data into information, the pillars and their contents are all related to each other. For example: if the goals and strategies are unclear or not the same within an organization, it will curb communication and process focus and thereby diminish the potential of the organization to create information from data. Goals and strategies are interconnected with the formal and social structure of the organization. Whether goals and strategies are shaped by the structure or vice versa differ from organization to organization. However, to enable the feedback process, an organization's formal and social structure must be congruent with its goals and strategies. Turning data about malfunctioning products must

at the same time be considered important and urgent so that it is emphasized in strategies and goals.

On the operational level of an organization, information creation is accomplished by specific actions of individuals. As has been argued earlier in this thesis, information can not be created by single individuals within isolated departments, but only through cooperation and common understanding between departments and individuals. This calls for alignment of employees in operational levels and a higher focus on service management. The organizational structure also affects culture, communication, and service orientation within the organization. The organizational structure sets a guideline for the culture and service orientation and implies how and in which way it is accepted to communicate. Thereby it is important to be aware of the relation of how the organizational structure impacts on culture, communication, and service orientation.

Performing an analysis of synergies is very important, but it is difficult to use a standard framework for this. There are many links between the different parts of the pillars and the situation will be different from case to case. The analysis should therefore be tailor made to the specific case, leaving much of the decisions to be made by the analyst. The list below shows a collection of possible areas that need attention in such analyses.

- In what extent the goals and strategies are supported by the formal and social structure.
- How and in which way the combination of formal organization and social structure affect the culture, communication and service orientation in the organization.
- How the service orientation affects the processes running through the whole of the organization.
- What impact subconscious assumptions, values, and norms has on the service orientation, goals, strategy and processes and vice versa.
- How the norms, values and artifacts affect (and is affected by) communication and organizational structure.
- How the service orientation influences how members of the organization communicate.
- Which effect the service orientation has on goals and strategy and how this affects overall processes.
- In which way information technology and other auxiliary means support activities when deriving and spreading information.

The authors find synergies between the pillars of the model as important as the pillars themselves. By demonstrating information creation as built up by three pillars contribute to the existing pool of theories by emphasizing that information can not be created in one, or two, of the pillars, but only when all three pillars are supporting information creation. However, to fully understand how to enable the feedback process, the synergies describing how the factors within the pillars is vital to reveal Only focusing on the factors in the pillars can be compared

to the training of a football team. Imagine the coach isolating every player of a football team and train them all individually so that they each get marvelous on each task. Even though the team might have the best players, the team will never put up to the competition of another team that has been training together. Training every individual can be seen as improving communication, aligning goals and strategy, improving information technology, or reconstruct organizational hierarchy. Such training will however improve activities connected to data handling: i.e. collecting, sorting, calculation, refinement, or distribution, not improve information creation by gathering data in relation to specific contexts. Thus, the authors argue that the effects of synergies must be emphasized in connection to derivation of information from data.

7 Conclusion

Below, the conclusions concerning the model are presented. Further, the authors point out future areas of research in connection to derivation of technical information from market data.

The purpose of this master thesis is to develop and present a model that illuminates the important factors when deriving technical information from market data within a company. The model was given the name Transformed.

Transformer is an holistic model that consists of three pillars; the organizational factors, human factors and tools, illustrating the three most important factors of turning data into information concerning product quality in companies.

Transformer has been tested by applying it to three live cases at a company. The analysis has led to the conclusion that all the three pillars of the model are equally. Another important conclusion is that these pillars do not live a life of their own. Due to the complexity of the issue, the pillars rely on each other, and must be harmonized in order to fulfill their mission. It is difficult to build a concrete analysis guide for these synergies and each case has to be analyzed individually.

Data **Information**

Organizational factors

Tools

Human factors

- Strategy and goals
- Social structure
- Process management

- Integration of data
- Information Technology

- Culture
- Communication
- Service Management
- Image
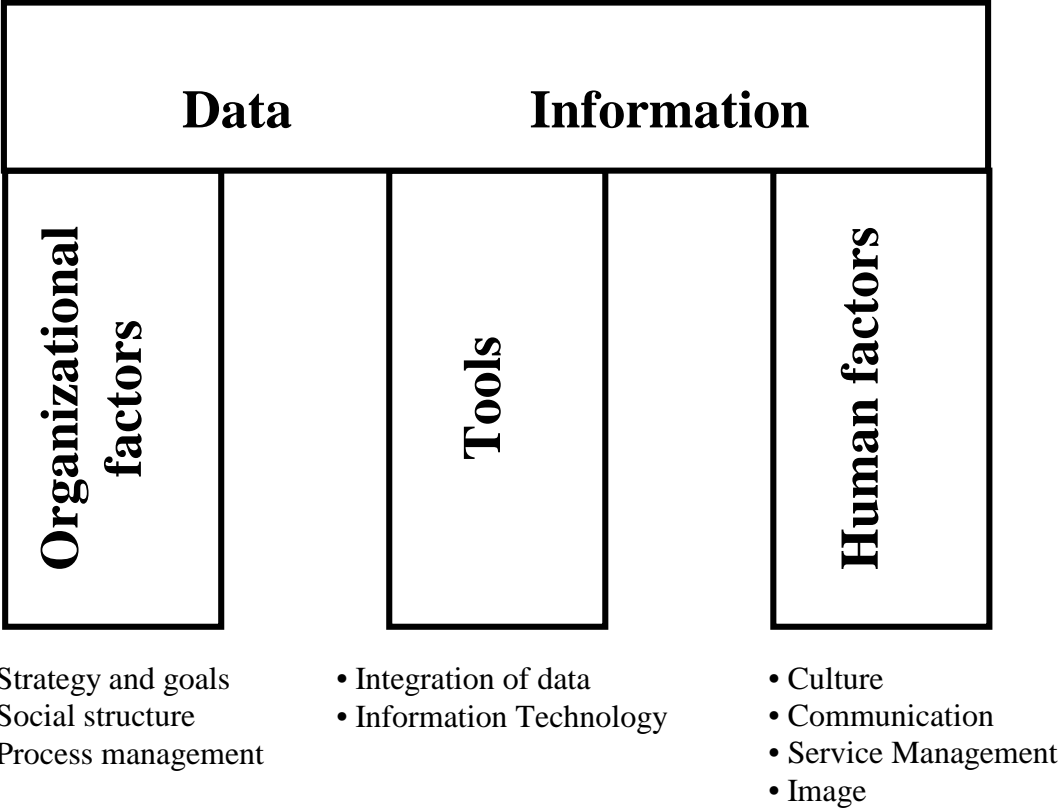
Figure 13. Transformer emphasizes that information can be derived successfully from data if organizational factors, human factors and tools support the process. The contents of the pillars are stated in the figure.

The aim of the model has not been to give a detailed checklist to follow, and much of the work is left to the analyst. This implies that the output quality of the model actually depends on the analyst itself. The big advantage of the model is that it points out the important factors to look at. Using the model for analysis gives the advantage of getting a helicopter view of the situation, so that all factors are taken into consideration. One can not look at only one of the pillars, even though this seems as the most important part at the initial view of the case.

This brings us to the conclusions drawn from the case. In the beginning of this master thesis work, the authors were introduced to a technical problem of which the company wanted a technical solution. By applying the model on the cases, it became clear that the technical tools were not the bottlenecks of the process of turning data into information. Other parts, such as the image, culture and communication was the root cause to the problems at the company.

The general nature of the model makes it easily transportable to situations in other companies and industries. Although the focus in this master thesis has been on a big, technical and multi-cultural company, it is of the authors' opinion that it can be used in many different areas. The high level of competition in several markets and the strength of the customer in the rapidly changing global market demand a high level of customer awareness. Being able to improve the products to achieve customer satisfaction in the long run is therefore of high importance. By using Transformer, the authors hope and believe that companies can improve their work and processes in this area.

For the authors of this thesis it has been an exciting experience to research the area of creating information from data. We hope that other students or researchers will be inspired by our thesis and continue working with the subject.

There are many interesting areas for further research. One interesting area would be to look at the problem across the borders of science. Collaboration between experts within the different areas could be a good way of combining the expertise with the big picture. Another interesting area would be to look deeper into the mysteries of the synergies. Is it possible to draw more quantitative conclusions on this area? In this thesis, the model has been applied to three different cases in one company. A large-scale, cross-industrial empirical study has been out of the scope for this work, but could be an interesting approach in further research.

8 References

Literature

Barney J. B. (2005) "Information Technology and the Performance of the Customer Service Process: A Resource-Based Analysis", MIS Quarterly, Vol 29, No 4

Bjerke B. (1981) "Some Comments on Methodology in Management Research, Studies in the Economics and Organization of Action" Department of Business Administration, No 8, Sweden: University of Lund

Braham B. J. (1995) "Crating a Learning Organization – Promoting Excellence Through Education", Crisp Publication Inc

Bryntesson S. & Holmgren-Hjelm Y.& Ingbrand M. (2006) "How Organizational Knowledge can affect the choice of entry mode", Jönköping International Business School, Jönköping University

Buckland M.K. (1991) "Information as a thing", Journal of the American Society for Information Science 42

Coyle J. J & Bardi E.J.& Langley Jr J.C.J (2003) "The Management of Business Logistics – A Supply Chain Perspective", Mason: Thomson

Davenport T. & Prusak L. (1998) "*Working Knowledge How organizations manage what they know",* USA: Harvard Business School Press

Davenport T. (2000) "Working Knowledge", USA: Harvard Business School Press

Gottschalk P. (2006) "Knowledge Management Systems: Value Shop Creation", Idea Group Publishing

Granberg O. & Ohlsson J. (2004) "*Från lärande loopar till lärande organisationer"*, Lund: Studentlitteratur

Grönroos C. (1992) *Service Management*, Göteborg: ISL Förlag

Hartley P. (1999)"Interpersonal Communication", Florence, KY, USA, Routledge, p 27

Hatch M. (2001) *Organisationsteori Moderna, symboliska och postmoderna perspektiv*, Lund: Studentlitteratur

Hult G.T.M. (2001) "Organizational Learning Capacity and Internal Customer Orientation Within Strategic Sourcing", Journal of Quality Management, No 6, p 175

Höglund L. & Persson O. (1985) "Information och kunskap: informationsförsörjning – forskning och policyfrågor", Umeå

Juran J. (2001) "Process Management", Berkeley, CA, USA, MacGraw-Hill

Kuhlthau C. (1996) "Seeking Meaning", Engelwood

Larsson J. (2005), Quality Manual of the company, Revision B, p 8

Lenz R. (2007) "IT support for healthcare processes – premises, challenges, perspectives", Data & Knowledge Engineering 61

Long, D., & Davenport, T (2003) "Better practices for retaining organizational knowledge: Lessons from the leading edge", Employment Relations Today 30(3)

Malmsjö A. (1989) "Informationsanvänding och verksamhet", Akademisk avhandling, Kungliga tekniska högskolan, Stockholm

McElroy M. (2005) "Cutting-edge methods to align KM with company strategy", KM Review, 7(6),4.

McGrath R. G. (2000) "The Entrepreneurial Mindset", Boston, Massachusetts: Harvard Business School Press

McInerney, C. (2002) "Knowledge management and the dynamic nature if knowledge" Journal of the American Society for Information Science & Technology, 53(12), 1009-1018

Miles M. B. (1979) "Qualitative Data as an Attractive Nuisance: The Problem of Analysis", Administrative Science Quarterly, Qualitative Methodology Vol. 24, No. 4

Mohr-Jackson (1991) "Broadening the Market Orientation: An Added Focus On Internal Customers", Human Resource Management, Vol 30, No 4

Morgan G. (1980) "Paradigms, Metaphors, and Puzzle Solving in Organization Theory", Administrative Science Quarterly, Vol 25, No 4

Narver J.C (1990) "The Effects of a Market Orientation on Business Profitability", Journal of Marketing, No 54

Newell S. (2002) "Managing Knowledge Work", Palgrave MacMillan

Porter S. (2007) "Validity, trustworthiness and rigour: reasserting realism in qualitative Research", Journal of Advanced Nursing, vol 60, no 1

Sandars J. (2004) "Knowledge Management: Something old, something new!", Work Based Learning in Primary Care, 2(1), 9-17

Schein E. H. (1986) "Organizational Culture and Leadership", Academy of Management Review, vol 11, no 3, pp 667-680

Schwinn A & Schelp J. (2005) "Design patterns for data integration", Journal of Enterprise Information Management, vol 18, no 4

Scott J.E. & Kaindl L. (2000) "Enhancing functionality in an enterprise software package", Information & Management, 37(3)

Tsoukas H. & Mylonopoulos N. (2004) "Introduction: Knowledge construction and creation in organizations (Special Issue)", British Journal of Management, 15

Ulwick A. (2005) "What Customers Want: Using Outcome-Driven Innovation to Create Breakthrough Products and Services", McGraw-Hill

Yin R. K. (1981) "The Case Study Crisis: Some Answers", Administrative Science Quarterly, Vol. 26, No. 1

Weick, K. (1995) "Sensemaking in organizations" Thousand Oaks: Sage

Wilson P. (2000) "The Learning Organization", Scitech
Wohl M. (2003) "Turning data into usable information", Franchising World, vol 35, no 5

Internet

1. Company website /corporate/company/aboutus/mission, 2008-04-10

2. Company website /GeographicalSites/Default.htm, 2008-04-10

3. Company inernal website /HowWeWork/Organization/Default.htm, 2008-04-10

4. http://www.systems-thinking.org/dikw/dikw.htm 2008-05-07

5. http://www-personal.si.umich.edu/~nsharma/dikw_origin.htm 2008-05-07

6. http://www.isixsigma.com/library/content/c010527a.asp 2008-05-06

7. http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42180 2008-05-06

8. http://www.issco.unige.ch/projects/ewg96/node14.html#SECTION00311000000000000000 2008-05-06

9. Company webite /corporate/company/aboutus/profile, 2008-04-01

10. Company internal website /product business unit/HowWeWork/Projects/Default.htm, 2008-04-01

Intranet

1. Functional Description Customer Services - 2008-01-29

2. Fucntional Description Quality Management within Customer Services, 2008-04-02

3. Organizational Chart, Improvement Department, 2008-01-29

Interviews

Employee, Product Office, 2008-01-31

Engineer, ID, 2008-04-28

Field Quality Manager, QD, 2008-01-11

Field Quality Manager, QD, 2008-02-22

Field Quality Manager, QD and Head of QD, 2008-01-24

Head of CS, 2008-04-23

Head of ID, 2008-02-01

Head of ID, 2008-04-14

Head of ID, 2008-04-28

Head of QD, 2008-01-14

Head of QD, 2008-01-30

Lecturer, Electrical and Information Technology, University of Lund, 2008-04-30

Product Integration Responsible and two RCA Team Leaders, 2008-02-04

Statistics and Data Analyst, 2008-01-29

Senior Staff Engineer, 2008-01-30

Two QD Managers, 2008-02-04

Two Senior Staff Engineers, 2008-02-12

Appendix 1 - Abbreviations

ASD   - Crash Log Analysis
CDC   - Creative Design Centre
CAD   - Computer-Aided Design
CC   - Call Centre
CS   - Customer Services department
CTO   - Chief Technical Officer
DIK   - Data, Information, Knowledge
DU   - Development Unit
FCC   - Field Competence Centre
GCS   - Global Customer Services department
HW   - Hardware
IT   - Information Technology
KM   - Knowledge Management
LSM   - Launch Support & Management
MAE   - Market Acceptance Evaluation
MC   - Mechanical Concept
MMS   - Multimedia Messaging Service
MS   - Milestone
NTF   - No Trouble Found
PBU   - Product Business Unit
PIR   - Product Integration Responsible
PM   - Project Manager
PPP   - Product Portfolio Planning
PQM   - Project Quality Manager
QD   - Quality department
RCA   - Root Cause Analysis
R&D   - Research and Development department
RR   - Return Rate
SW   - Software
TTM   - Time To Market
WCMS   - Warranty Claim Management System

Appendix 2 – Quick analysis guide

formal organization form and social structure affect:
- Degree of centralization, complexity, and formalization.
- hierarchy, coordination, and work division,

- Do the information sender and information receiver share common operational goals?
- Do managers' messages concerning visions, strategic goals, and key business objectives support each other?

- How does the three levels of culture (subconscious assumptions, values and norms, artefacts) affect similarities and dissimilarities in sub cultures?
- Do the cultures of the data/information sender and receiver facilitate transformation and spreading of information and knowledge?

- Is the receiver in focus, and is the sender flexible concerning satisfying the receiver's needs?
- Is there focus on understanding the receiver's problems, goals, needs, and demands?
- Does the sender makes sure that delivered data or information is of high quality; i.e. is it relevant for the receiver?

Organizational Structure

Strategy and Goals

Culture

Service Orientation

Communication

Process Orientation

Hard Structure

Soft Structure

- Do messages sent contain relevant data or information seen from the receiver's point of view?
- Does the sender make sure that the receiver understands the message?
- Can the sender proof the accuracy of the message?
- Are made promises fulfilled by the data/information sender?

Data   Information   Knowledge

Image

- Are there grasping guidelines and standards for how to approach and use data about malfunctioning products?
- Are there site-specific organizational processes connecting different departments in the specific work of turning data about malfunctioning products into information input in R&D?
- Are the guidelines and standards concerning the process of turning data into information formalized within the organization so that it is understood by all?
- Are there site-specific pathways describing the process of turning data into information, i.e. roles and responsibilities?
- Is it possible to monitor the work of the process of turning data into information?

- How is the sender perceived by the receiver?
- How does the image perceived by the receiver affect the process of turning data into information?

Tools

Information Technology

- Quality in software can be divided into the following dimensions:
    1. Functionality
    2. Reliability
    3. Usability
    4. Efficiency
    5. Maintainability
    6. Portability

- Can data in the IT systems be found on the basis of its completeness, timeliness, and relevance connected to a certain issue?
- Does the interface provide coherent data, clearly displaying abnormal parameters?
- Is the IT system aligned with the overall organizational change management process?
- The language in the IT system must be understood by everybody working with it, thus a common vocabulary is needed.