CHALMERS

Quality Management at BBAM

Master of Science Thesis
in the Quality and Operations Management Programme

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Gothenburg, Sweden, 2013
Report No. E2013:076

MASTER'S THESIS E2013:076

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Chalmers Reproservice
Gothenburg, Sweden 2013

Abstract

This master thesis has been carried out at Chalmers University of Technology as well as at BBAM during the spring of 2013. BBAM is the fictive name of an actual company that is market leading in Europe and has over 40 sales operations worldwide. Recently, BBAM has reorganized due to the growth of the organization, where improvement potential within the management of quality has been revealed. A consequence of the current Quality Management is the high number of quality flaws of products, discovered both internally and externally in the form of customer complaints.

This master thesis purposes to identify the root-causes of these quality flaws as well as recommend actions in order to improve quality within BBAM. This has been done by a mixed method research, utilizing both a quantitative and qualitative strategy. The data collection for this study is hence mainly a mix between statistics and semi-structured interviews as well as company documents and observations. The utilized theory of this thesis is mostly in the field of Quality Management with emphasis on Total Quality Management. Additional theories utilized in this thesis are within product development and organizational communication.

The empirical data and analysis indicate on several gaps between theory and the quality management of BBAM and it is concluded that there are several causes to the quality issues. These causes are within the areas of corporate strategy, leadership, culture & communication, product development and the practical quality work at BBAM. Two root-causes have been identified - the revenue based strategy and the fact that the organization has been growing too fast, creating a large organization with a small business culture. Both root-causes prevent standardizations and the organizational learning of BBAM, which is essential for successful Quality Management.

The authors of this master thesis recommend BBAM to focus on standardizing processes and communication channels as well as providing time for PDSA cycles and learning. Subsequent recommendations include consistency between strategy and Quality Management, meaning that BBAM should shift strategic focus from revenues to cost and incorporate quality earlier in the value chain.

Keywords: Quality, Culture, Leadership, Standardization

Azarakhsh V. Mirfacihi & Bojan Baric
Chalmers, Gothenburg 2013

Table of contents

1. Introduction

"The intention was never to get this big". These are the words of one of the founders of BBAM[1] (Anderson, 2002). His business legacy is now market leading in Europe at market that is valued to hundreds of billions SEK (BBAM, 2013). However, the existing number of quality flaws generates high costs as well as customer dissatisfaction, threatening their leading position as Europe's largest manufacturer.

[1] BBAM: Fictive organization representing an actual organization.

1.1. Background

Since the foundation in middle of the 20th century, BBAM has been a family owned enterprise, where the ownership is today distributed among children and grandchildren of the founders of the company (Anderson, 2002). Today, BBAM is the market leader in Europe, with sales operations in about 40 countries worldwide. BBAM became the market leader in the fall of 2012 after a number of successful actions, where one large strategic action particularly stands out - the acquiring of the today known BBAM GmbH 2010 and their two trademarks, one of their competitors in Germany. This acquisition has meant an increase in the number of production plants from six (all located in Sweden, where three are under the trademark of BBAM) to eight (BBAM, 2013).

The growing business has, according to the organization of BBAM itself, aroused the need for reorganization, which has been the fact these last years. The reorganization itself has revealed to a greater extent that potential improvement areas across the organization exist. For the Quality department specifically, which has been in its present shape only for almost two years, it has been a dynamic transformation where it has been clarified that changes regarding working mentality are needed. An additional reason is the high number of quality flaws that is existent within BBAM, which exemplifies why the "fire-fighting"-mentality currently used within the department is not efficient enough.

BBAM's concerns with the produced quality flaws are both discovered within the organization of BBAM as internal rejections and by their customers in form of customer complaints. The number of quality flaws is currently a major concern at BBAM and more specifically the Quality department. The costs of customer complaints as well as internal rejections are as high as a couple of percent of the entire turnover (see figure 1). This has been the case until now, when a more cost-efficient approach is being implemented across the entire organization of BBAM.

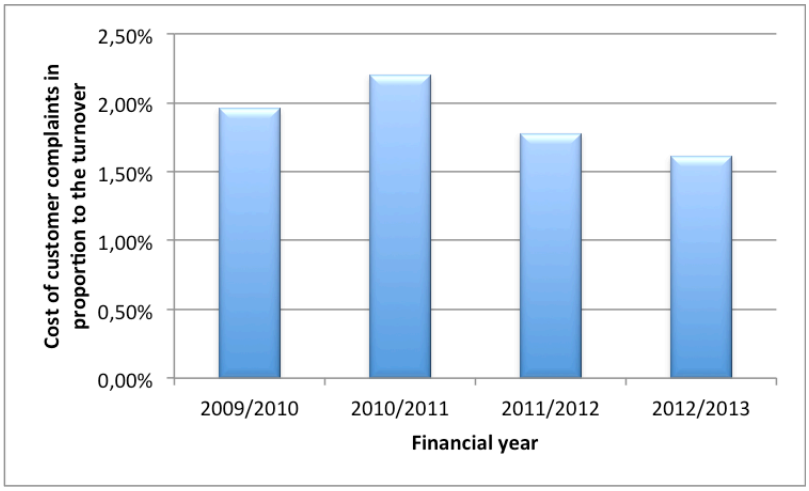

Figure 1. The cost of customer complaints in proportion to the turnover, adapted from BBAM (2013).

The task is not simplified by the general spread of quality flaws across a variety of production processes. BBAM monitors their production processes according to the produced output, where a primary division of eight product groups is made, meaning that similar products are categorized in the same group.

BBAM has therefore acquired external help in order to specifically clarify which quality improvements that are needed. BBAM and the Quality department have also become aware of the need to have a standardized way of working, based on current literature, in order to create company-specific routines applicable throughout the entire organization.

1.2. Problem description

There exist sufficient information about the produced quality flaws within the production processes. The available information is however not transformed into relevant data and utilized to manage and improve quality-flawing areas. Quality analyses are made on faulty premises, where the cost of the produced quality flaws is presented as milder than it according to general theoretical perspective really is. Further, no greater control of the stability of the production processes is existent, since the statistics compiled with regard to the amount of quality flaws in proportion to the successfully produced products is merely used to monitor the costs of the quality flaws. It is therefore needed to initially map the quality issues, since there is no existent data within the organization of this sort.

The produced quality flaws are presumably consequences of more complex causes, which are the actual problematic areas. To exemplify, it is not enough to merely eliminate the symptoms of a disease, since there needs to be an effort towards eliminating the disease itself. Hence, in order to decrease the number of produced quality flaws, the underlying root-causes need to be identified. Therefore, an elaborated investigation of the actual problems occurring within business processes needs to be done in order to find the primary roots of the different quality problems.

In order for BBAM to take actions upon the identified root-causes, there is a need of guidance towards eliminating those issues. It is therefore necessary to find improvement opportunities around those root-causes.

1.3. Purpose and Research questions

The purpose of this master thesis is to identify root-causes for the current quality issues and, with respect to the root-causes, suggest improvements for the quality management at BBAM.

With respect to the problem analysis and purpose, the following research questions need to be answered in order to fulfill the purpose of this master thesis:

- What are the quality issues at BBAM?
- What are the primary root-causes for the quality issues?
- How can the root-causes be reduced/eliminated?

1.4. Scope and delimitations

The business concept at BBAM is to have the responsibility of the entire value chain from order to cash, with the natural exception of some minor supplying activities, which means that they control the entire process from raw material to finished solutions (BBAM, 2013). The complexity and decentralization of the entire process makes it hard, if not impossible with consideration to the set time, to map and analyze the entire chain and its supporting processes. Also, the statistical data implies that it is not necessary to expand the scope beyond operations, since almost all quality costs are originating from operations. The master thesis will therefore be delimited from the sales subsidiaries and will only focus on the actual processing processes within BBAM, which means that only the eight product groups produced by BBAM Production will be considered. The actual contribution from the sales subsidiaries to the quality costs is basically nonexistent, since no actual processing is taking place.

Further, the focus on BBAM means naturally that no consideration will be taken to the sister company of BBAM, since it is not producing under the trademark of BBAM. The sister company is a separate corporate group, which acts on different grounds and values than BBAM.

Additionally, since BBAM GmbH is currently undergoing a restructuring as part of the integration project currently in action, it would be unwise to try to involve the German production plants at the time of present. The acquisition of their German competitor did not take place a long time ago, which is why differences in production are still existent. These differences are of crucial matter, which requires a finished integration across the entire organization before involving data from the production plants in Germany. Since the integration project is based on the premises of adapting the German plants to the Swedish ones, it will not be needed to involve data from BBAM GmbH either. Therefore, the main focus of this master thesis will be on the three production plants in Sweden. To summarize, all organizational and thereby also geographical delimitations are marked red in figure 2, which illustrates the organizational chart.

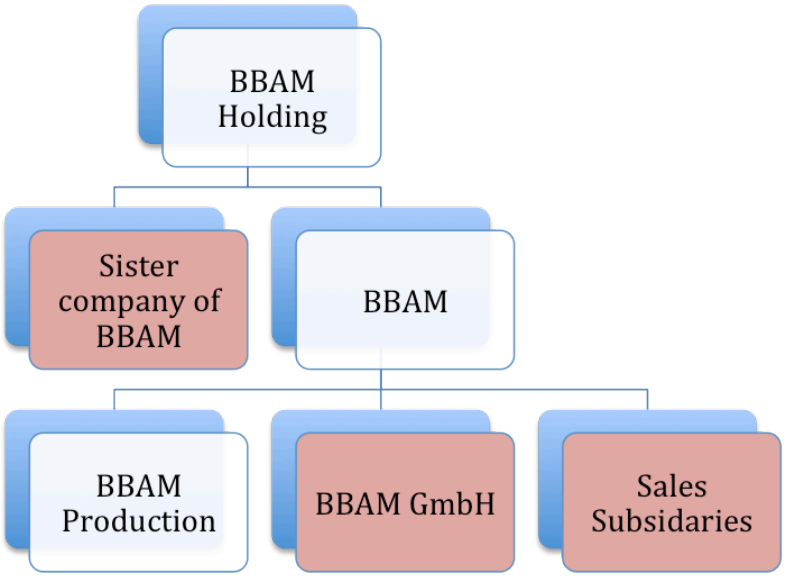

Figure 2. Illustration of the organizational delimitations adapted from BBAM (2013).

The initial emphasis of this master thesis (see subchapter 4.1.) is further merely focused on the customer complaints, where the internal rejections are not taken in consideration. This was purposely done, since customer complaints affect the organization to a greater extent. Due to a limited amount of time, a choice between customer complaints and internal rejections needed to be made, where it was regarded as more suitable to map the actual quality flaws that were distributed to the customers of BBAM. This choice enabled, in the opinion of the authors, a greater understanding of the needed improvements, since the scope of the customer complaints is on a higher hierarchical level than the internal rejections that are specifically managed by manufacturing.

1.5. Outline

The report of the master thesis at hand will be influenced by the actual outline of the practical approach of the master thesis. The three phases of the master thesis, *mapping* - *identifying* - *improving*, are complemented with theoretical research.

The *methodology* of this thesis is presented in chapter 2. The specific approach in collecting and analyzing data for this research is presented, where the strategy as well as the design of this thesis is explained. Further the utilized research methods are described in detail explaining how the data was generated.

The *theoretical framework* is compiled in chapter 3 and consists of major theories and concepts that are fundamental for the master thesis. Additional theories are existent, but due to their minor impact on the master thesis there is no actual need of referring to them as a framework for the master thesis at hand.

The result relevant information collected during the master thesis is presented in chapter 4 as *empirical findings*. Irrelevant and non-representative information was omitted in order to concretize the results and ease the understanding of the master thesis at hand.

The collected data that is presented in the master thesis is then analyzed in chapter 5 as *analysis*. This chapter refers to a comparison of the theoretical framework and the empirical findings in order to identify problems and evaluate improvement areas. This is further on concluded and recommended upon in *conclusion & recommendations* in chapter 6, where more of a holistic perspective is used than in the actual analysis that is chapter 5.

To summarize, the overall outline in correlation with the practical approach is graphically illustrated in figure 3. To clarify, the two phases of theory are not identical, where they aim at intertwining the phases of the practical approach.

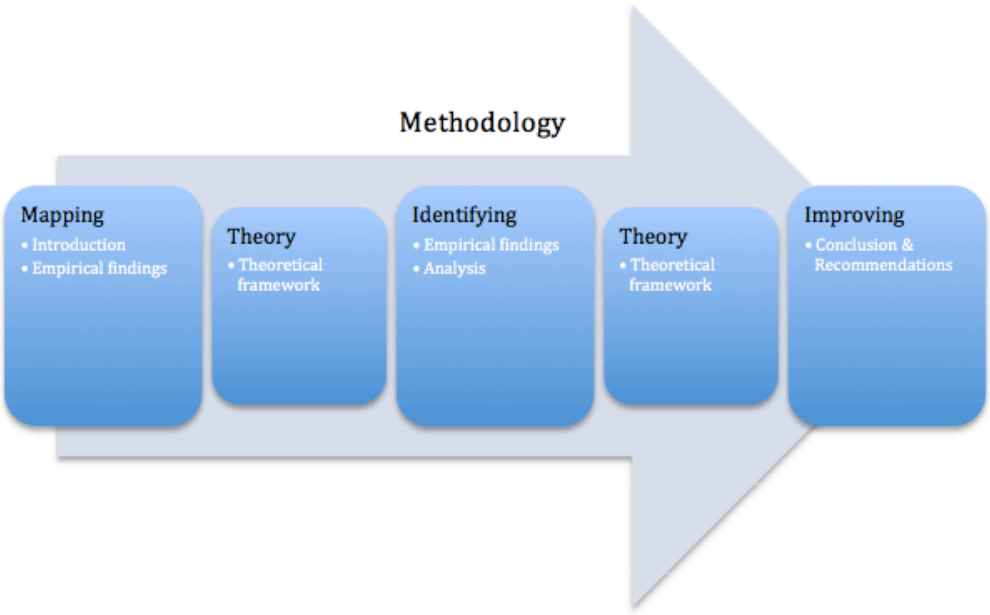

Figure 3. The overall structure of the report, where every chapter is connected to the practical approach of the master thesis.

2. Methodology

This chapter describes the methodology of this master thesis. The utilized strategy of this research is initially presented. It explains why a combination of a qualitative and a quantitative strategy has been utilized and the unique settings of having such a strategy. The chapter continues by explaining the choice of a case study as a research design followed by explaining the applied research methods used to collect data. A discussion of the validity and reliability of this research is further conducted, specifically explaining why external validation is difficult for this research. The chapter ends with presenting the utilized methods of analysis, explaining the use of an Affinity diagram and an Interrelationship diagraph.

2.1. Research Strategy

There are two main perspective of classifying research strategies. Bryman & Bell (2007) categorize these research strategies of having either a quantitative or a qualitative research nature. A quantitative research is characterized as a "*linear series of steps moving from theory to conclusions as well as exhibiting certain preoccupations, the most central which are: measurement, causality, generalization and replication"* (Bryman & Bell, 2007). On the contrary, qualitative research tends to be more open-ended by having an "*...inductive view of the relationship between theory and research, whereby the former generated out of the latter"* (Bryman & Bell, 2007). Qualitative research includes "fieldwork" where the researchers physically go to the investigating area to observe and collect data from its natural setting (Creswell, 1994).

With respect to the research questions, the earlier mentioned practical approach of mapping, identifying and improving was established for this thesis. The purpose of the practical approach was to start by mapping the external symptoms of the quality issues and research backwards in the value chain of BBAM, where an iterative approach was used between the different phases. This was intentionally done in order to gain a deeper as well as a broader perspective of causes and effects of the quality issues.

In order to initially map the quality flaws, a quantitative and deductive strategy was adapted through collection and analysis of numerical data. However, the second and third phase of identifying root-causes of the quality flaws and improving them required a qualitative and inductive approach. There was a need to closely examine and understand the internal world of the organization in order to answer to the last research question. Therefore, a close connection with the people of the organization was necessary and was the most effective way to analyze internal issues. For this purpose the authors of this master thesis were mostly situated at the BBAM office. Considering the approach, this research consists of both a quantitative and qualitative strategy and follows the mixed method research of facilitation (Bryman & Bell, 2007).

2.2. Research Design

The design of this research follows the nature of a single case study, were BBAM as a single organization is examined. The purpose of this design intended to provide an in-depth elucidation of the quality issues at BBAM Production. A case study also enabled an investigation to retain the holistic and meaningful characteristics of organizational and managerial processes (Yin, 1994).

In order to reach to the root-causes, people within the organization needed to actively collaborate and participate in this research. A research approach involving company representatives has therefore been utilized throughout this study, suitable for both qualitative and quantitative methods. Consequently, with some of the research methods, data has been collected in

collaboration with people within the organization and analytical thoughts of these people have been considered for the analysis of this thesis.

2.3. Research Methods

A research method is a systematic technique for collecting data (Bryman & Bell, 2007). This subchapter describes all methods used for this research as well as explains how the techniques were performed.

2.3.1. Literature review

With respect to the field of study and the background of the authors of this thesis within quality sciences, literature with quality perspectives were mainly reviewed. Also considering the problem area, which covers quality research throughout a whole organization, this literature study was much focused on Total Quality Management. However, the initial conditions of this research, referring to establishing the problem area and focusing, contributed to unsure conditions when choosing further fields of literature. Additional literature was therefore iteratively reviewed based on the initial results of this research. As the focus of this thesis became more clear, additional literature were examined in fields of product development, organizational communication and knowledge management. In addition, literature on research methodology was necessary in order to shape this study.

Various sources of information were utilized for collecting data, such as books, articles, journals and internal literature from Chalmers University of Technology. In order to find useful literature, different databases were used and above all databases connected to Chalmers Library. In addition, approved master thesis's within the field of this study was reviewed.

2.3.2. Company documents

Company documents with statistics of customer complaints have been a major source of data in order to map the quality flaws. These statistics have been in forms of Excel sheets generated by the Quality department with data initially reported from the Helpdesk department. These sheets contain data from 2009 until present and had the need to initially being sorted out. This was done through a matrix where error-codes of customer complaints matched each product segment of BBAM (see Appendix B). The matrix cells were then plotted in diagrams in order to visually map the distribution of errors over the different product segments. With the help of the diagrams, the authors could find the main sources of quality flaws and apply further methods within those specific areas in order to identify the root-causes.

In addition, other internal company documents have been a part of the initial data collection phase. These documents consists of useful company information such as structures, information channels, databases, process maps etc., which have been helpful in understanding internal processes, behaviors and cultures of BBAM.

2.3.3. Semi-structured interviews

Semi-structured interviews are a qualitative-data-collection method with open-ended questions. The interviewer has a list of questions only as a guide, as the open-ended questions can generate unexpected data that could change the sequence of the questions. In response to the change in flow, the interviewer may ask for additional or explanatory information that is not initially listed in the guide. The flexibility of this type of interviews enables in-depth understanding of the qualitative nature (Bryman & Bell, 2007).

In order to cover as much reliable data as possible, this thesis conducted a total of 16 semi-structured interviews with people at different levels and positions. The needed number of interviews was determined by the time where new data was no longer received, which occurred after the 12th interview. However, the authors continued with four more interviews just in case and determined that the amount of data collected was sufficient for answering the research questions.

The categorization of the interviews was based on the organizational position of the interviewees (for further description, see Appendix D). Each interview started with the authors explaining the aim and purpose of this thesis for the interviewee, followed by questions (see Appendix C) divided into categories depending on the position and the organizational responsibility of the interviewee. If the interviewee did not understand the questions, deeper explanation of the questions was made followed by sub-questions. The answer of the sub-questions did then answer the original question. As a complementary question, all interviewees were asked to freely speak of whatever he or she thought was worth to mention considering the subject of the questions, which enabled additional input of data that was not considered before the interview.

It is important to pinpoint that classified and sensitive information from BBAM was deliberately not directly presented in the report, with the purpose of not jeopardizing the reputation of the interviewees and the brand of the company, even if all relevant information was to some degree presented in order to ensure the correct foundation for the final recommendations.

The semi-structured interviews resulted in a large amount of unorganized data, which needed to be organized to enable further analysis of the data. For this purpose, an Affinity diagram[2] was used. The authors conducted the diagram by using visual components in forms of post it-notes. On these notes, data from the semi-structured interviews was written and the notes were then gradually structured from the bottom and up into meaningful categories. These categories became the structure of the empirical findings and the foundation for the analysis. A visual illustration of the results from the Affinity diagram conducted in this thesis is presented in subchapter 4.2 as well in Appendix E in an extended format.

[2] Affinity diagram: Brainstorming tool used to categorize ideas and data into groups, based on their natural relationship (see Appendix E).

2.3.4. Internal benchmarking

Internal benchmarking refers to a local investigation within an organization, comparing similar operations, activities, departments or functions with the purpose to map the homogeneity of the organization. This gives the opportunity to identify improvement areas and best practices within a common environment (Reider, 2000). In this case, the internal benchmarking was realized through meetings and interviews with people at different levels in the hierarchy and people working in different geographical locations (different manufacturing plants). The purpose was to identify improvement opportunities by studying the different perspectives of the same organization with respect to the product development process and the Quality department.

2.4. Analysis method

The analysis of this thesis is based on the collected data from the research, consisting of quantitative data from statistics as well as the qualitative data from semi-structured interviews. First, the quantitative data was screened and analyzed in order to effectively collect and analyze the qualitative data. For this purpose, a univariate analysis has been conducted and is presented in diagrams. The advantages of diagrams are that they are easy to interpret and understand (Bryman & Bell, 2007). A pie chart was specifically utilized as it displays the relative size of the different categories, which was a useful guidance towards the main problem area. The output from the quantitative analysis was then used to form the qualitative research and analysis.

The structure from the Affinity diagram was used for the empirical chapter as well as the analysis chapter. However, the Affinity diagram does not identify any synergies between the data conducted. In order to analyze the data, the relationship between the discovered quality issues needed to be identified. For this purpose, an Interrelationship diagraph[3] was used where the analyzed quality issues from the Affinity diagram were evaluated in correlation with each other in order to identify the root-causes of the problems. The result of this method is illustrated in subchapter 5.6.

2.5. Validity

The definition of validity varies among different authors within research methodology. Bryman & Bell (2007) define validity in two perspectives, where the degree to which findings can be generalized is classed as external validity, and the degree of congruence between the researcher's observations and theoretical ideas is internal validity. Mason (1996) means that validity is whether if you are observing, identifying or measuring what you say you are.

As this research is a case study where the results are based on the organizational environment at BBAM it is difficult to generalize the results, hence external validity could be non-existent.

[3] Interrelationship diagraph: A tool that shows all the different relationships, which makes it easy to isolate the factors that are driving the other symptoms and factors (see figure 18).

However, there are some attributes that can be generalized for other contexts within the BBAM environment. The approach of this research and the utilized methods are adapted to fit other processes of BBAM. Hence, these methods can be transferred to other improvement areas within the organization, which is a transferability that could be considered as internal generalization.

Furthermore, there is a risk of getting affected by the company environment when doing case studies. Bryman & Bell (2007) explain this, as "going native" and that it could be problematic to evaluate the degree of how much the authors have been influenced. In order to prevent this from happening, the authors have taken a professional approach when doing this research. This means that evaluations of the authors' findings have been done in an objective environment in order to not be affected by the BBAM climate.

2.6. Reliability

The reliability of this thesis can be discussed upon the literature base as well as the data collected. Regarding the literature, the authors of this thesis have been searching for multiple sources of information in books and articles in order to find valid facts. Information coming from only one source has hence been regarded as less valid and has not been utilized for the analysis of the collected data in order to not jeopardize with the verifiability.

The internal reliability of this thesis is based upon the data collection and is considered to be high. Interview questions were understandable and all interviews followed similar guides. However, as the interviews were held at three different geographical locations, local factors such as culture and personal networks may have affected the interview outcome. In order to handle this, an "inter-observer consistency" approach have been followed, which refers to the authors' agreeing on what they observe and together evaluate the current situation of the organizational environment.

Finally, as this research is done within a unique organization at a specific period of time it is impossible to generate the same social settings at another time (Le Compte & Goetz, 1982). Hence, the external reliability of this study can be considered as non-existence.

3.Theoretical framework

The theoretical framework consists of two major sections - *Quality Management* and *Product Development* - where Quality Management is the main part with Product Development bringing up complementary theories, due to empirical reasons, needed to include for the analysis.

Within the Quality Management section there is first an introduction of the basic quality management approaches that exist. The introduction leads further on into a detailed description of *Total Quality Management (TQM)* and its cornerstones and finally into a graspable management approach in the form of *Deming's 14 points for Management*. The general Quality Management framework was needed in order to acquire a greater understanding of the current quality issues at BBAM, which further on needed to be specified into a detailed methodology when a focus-area was identified. In order to do a well-detailed and accurate analysis, the detailed methodology needed to address the current underlying issues responsible for the quality issues, where the methodology of TQM was regarded as a good and sufficient match. To additionally be able to create more graspable and action-based suggestions, Deming's 14 points for Management were chosen in order to show and inspire how a success-recipe is built.

3.1. Quality Management

The concept of quality has through history been differently defined by gurus and experts in the field of Quality Management - from Juran's *"Fitness for use"* (Juran & Godfrey, 1999) to Deming's *"Quality should be aimed at the needs of the customer, present and future"* (Deming, 2000). The interrelation between the actual meaning of the word quality and the management of quality is by Juran & Godfrey (1999) described through two alternative paths towards higher quality:

- *Features of products*. The actual meaning of quality is oriented to income, where product features met customer needs and thereby provide customer satisfaction. In this sense, the purpose of such higher quality is to hopefully increase the income through higher customer satisfaction. This alternative however requires continuous investments in order to continuously be able to provide better and more quality. Higher quality means therefore in this sense "higher costs" (Juran & Godfrey, 1999).
- *Freedom from deficiencies.* Quality in the sense of freedom from deficiencies, means the freedom from errors that require rework or errors in customer dissatisfaction, customer claims etc. This alternative towards higher quality emphasizes on costs, where higher quality usually "costs less" (Juran & Godfrey, 1999).

Quality as a concept has changed with consideration to time, which exemplifies the dynamics of the field at hand (Deming, 2000). Bergman & Klefsjö (2010) describe the dynamics of quality as the four phases of quality movement, where an organization's quality working mentality is described through the alternative phases to ensure quality (see figure 4). This illustration is no historically absolute practice of how the perception of quality has changed, but more of a possible development path that is based on the historical development in western countries.

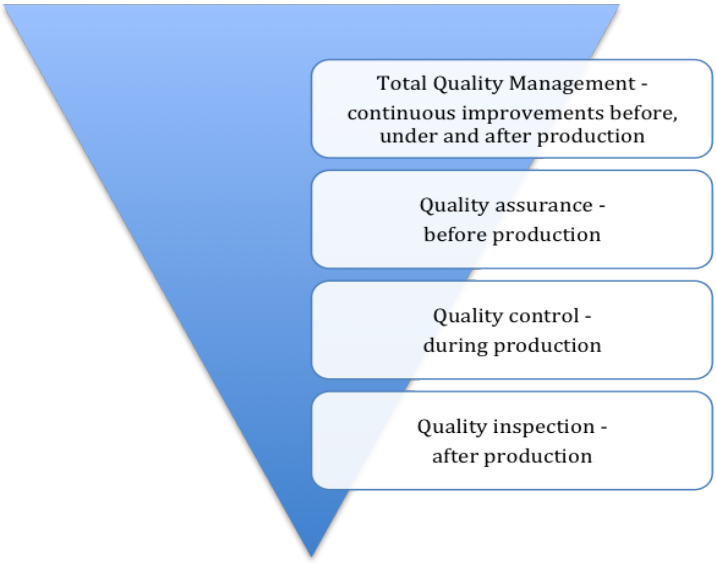

Figure 4. The four phases of quality movement, adapted from Bergman & Klefsjö (2010).

Quality inspection is a compilation of activities that take place after the actual production, where finished products are checked and defective units either scrapped or reworked. *Quality control* on the other hand, focuses primarily on the production process rather than the actual product that is processed. The underlying idea behind quality control is that defects on products originate from specific production processes, which need to be improved in order for the defects to be avoided in the future. Another approach exists, where the actual focus of the approach is on the process before the production itself - *Quality assurance.* Quality assurance is somewhat of a quality management system that primarily focuses on realizing efforts before the actual products are started being produced. This is achieved through the formulation and gathering of routines for how to administer and manage the production in order to secure quality. The so far mentioned phases have different approaches of "managing" the actual manufacturing process, where the process before the actual manufacturing - understanding the needs of the customers - is not a primary focus. The final phase - *Total Quality Management* (TQM) - comprises quality inspection, quality control as well as quality assurance and adds an additional focus on the process of systematically understanding the needs of the customers (Bergman & Klefsjö, 2010).

The four phases of quality movement correlate, in the opinion of the authors, directly to how quality costs increase with consideration of when changes to the design of the product are occurring. Defects that are discovered early on in the production process are less costly than those that are discovered during and after the actual production, which is illustrated in figure 5 (Bergman & Klefsjö, 2010).

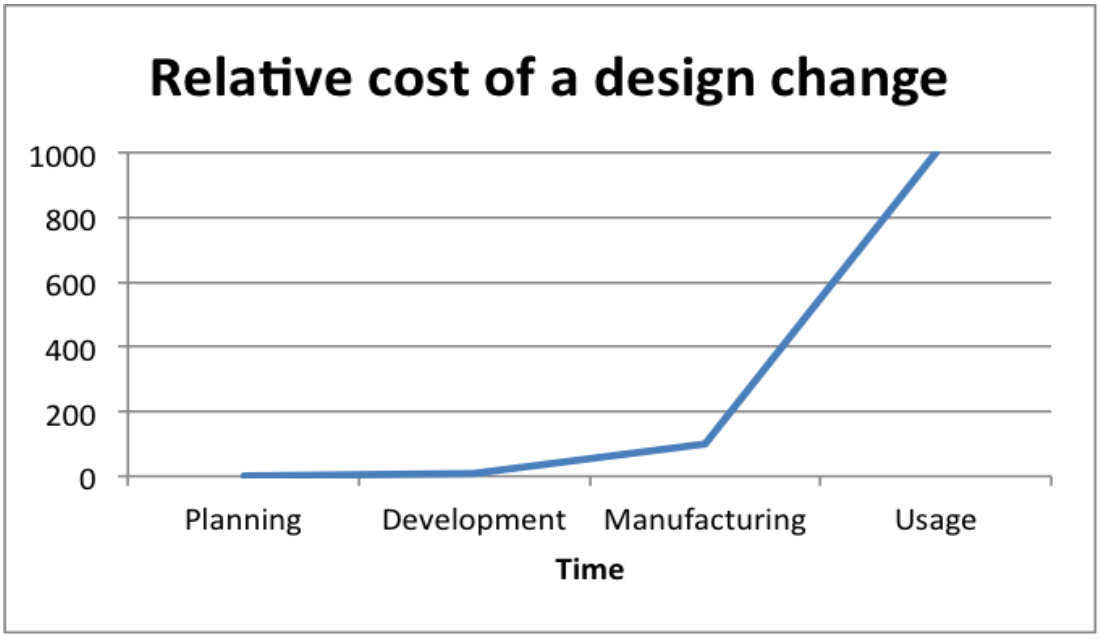

Figure 5. Relative cost of a design change, adapted from Bergman & Klefsjö (2010).

It is therefore wise to secure the quality of the product as early as possible in the production process. Quality is demanded from and eventually created for the customers, as Deming (2000) so cleverly states it in his definition of quality, and should preferable be managed through the organization's entire production process.

3.1.1. Total Quality Management (TQM)

There are, according to Bergman & Klefsjö (2010), many descriptions of the TQM concept, but few definitions. Deming (1994), hailed as one of the inventors of TQM, did himself never use the term TQM. In fact, Deming (1994) described TQM as merely a buzzword that carried no meaning, since it was merely an umbrella concept which all previous quality concepts were gathered under as. Bergman & Klefsjö (2010) define however TQM as *"a constant endeavor to fulfill, and preferably exceed, customer needs and expectations at the lowest cost, by continuous improvement work, to which all involved are committed, focusing on the processes in the organization"*. To concretize, TQM is a management philosophy that aims to continuously improve product or service quality (Ahire et. al, 1995), where an emphasis lays on a combination of values, tools and methodologies to attain higher customer satisfaction with less resource consumption. To succeed with TQM, there needs to be an improvement work that is based on the values illustrated in figure 6, where these values need to be interrelated as well as strive towards a comprehensive goal (Bergman & Klefsjö, 2010). The values, also known as the cornerstones, of TQM are hereby more in detail described:

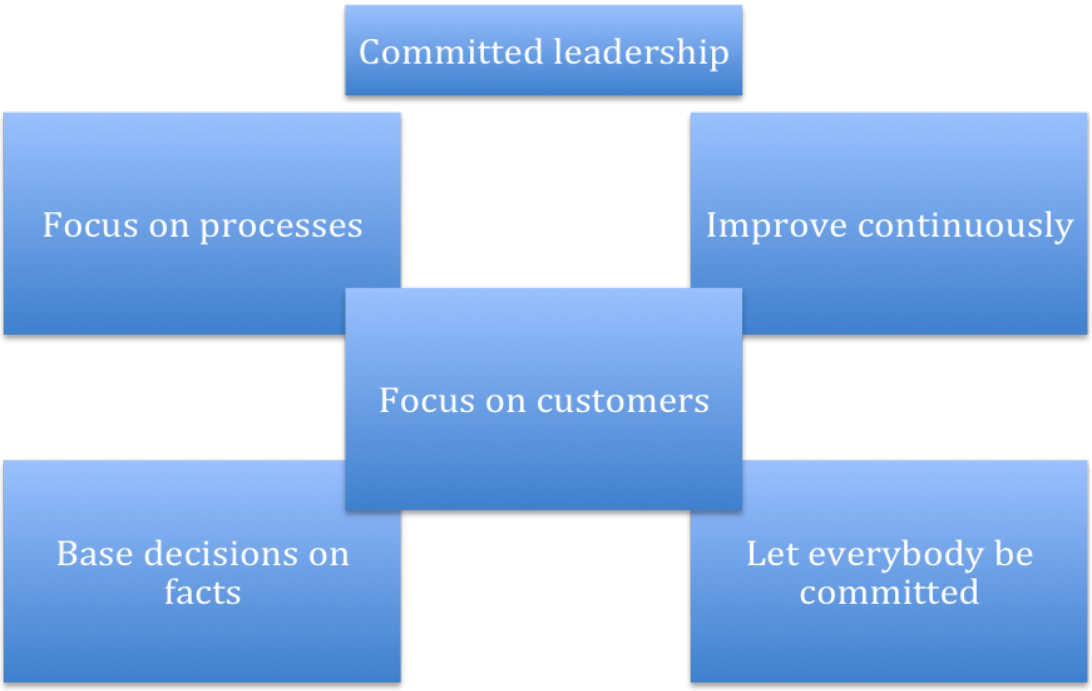

Figure 6. The cornerstones of TQM, adapted from Bergman & Klefsjö (2010).

Focus on customers. Focusing on customers emphasizes on understanding what customers want and need in order to systematically work towards fulfilling these needs and expectations when developing and manufacturing a product. This means as well that efforts are put on understanding customers' subconscious needs, which means that customers' actual needs are targeted and not only the needs the customers think of and try to communicate (Bergman & Klefsjö, 2010). It is important to not forget the dynamics of quality, where the management needs to be able to adapt and respond to changes in needs and expectations from customers (Deming, 2000). It is as well crucial to not forget the internal customers, even if TQM has a strong focus on the external customers. By providing the employees with better opportunities of performing at a good level, both for the organization and the individual, it creates a foundation for satisfying external customers in the long perspective (Bergman & Klefsjö, 2010).

Base decisions on facts. Decisions need to be based on facts and information that is gathered, structured and analyzed, where there is no room for interpretation or random action. This requires knowledge of and the ability to distinguish between "natural" and causable variation (Bergman & Klefsjö, 2010). It is therefore important to have a general understanding of the organization and its processes in order to have the ability of determining what can and cannot be changed. Every decision needs to be based on factual data that, if requested, can be communicated to every stakeholder. The importance of having fact-based decisions means as well that old guidelines and routines need to be continuously reviewed in order for them to always be up to date. New findings or new insights could basically make the old guidelines and routines irrelevant, which could in the long perspective damage the organization if not discovered on time. Traditionally used guidelines and routines need to be compared to new information and new facts in order to examine their sustainability.

Focus on processes. Most activities within an organization can be regarded as processes. Bergman & Klefsjö (2010) describe a process as *"a network of interrelated activities that are repeated in time, whose objective is to create value to external or internal customers"*, which basically means that a certain input, information or material, is transformed into a certain output. The process view increases awareness of how well specific operations satisfy the needs of the customers. It additionally regards issues and problems not as unique, but instead regards them as information of how stable a process is (Bergman & Klefsjö, 2010). Indications of how stable and how well a process is performing is crucial in order to have fact-based foundation of areas that need to be improved.

Improve continuously. Deming (2000) describes the dynamic nature of quality, where expectations and needs of customers change over time. This pressures organizations and challenges their ability to adapt to new circumstances. It is therefore crucial to continuously work with quality, which is justifiable from a cost perspective as well (Bergman & Klefsjö, 2010). Higher quality can be achieved through cost-efficiency, which Juran & Godfrey (1999) as well state. The basic rule of continuous improvements is that *"there is always a way to get*

improved quality using less resources" (Bergman & Klefsjö, 2010). Further, a continuous evaluation of one's performances, both good and bad, needs to be existent (Garvin, 1993). Mistakes occur, but organizations that manage to turn them into assets outperform competitors who do not. A competitive advantage is created if one's quality is continuously evaluated and, when needed, improved.

A suitable and often used tool of continuous improvement work is the PDSA cycle - *Plan, Do, Study, Act* (see figure 7). The PDSA cycle is usable both as a proactive and a reactive tool, where its usability is applicable to developments of processes as well as to processes in need of improvement (Bergman & Klefsjö, 2010).

Figure 7. The PDSA cycle, adapted from Bergman & Klefsjö (2010).

Let everybody be committed. To create the impression of the employees being a vital part of the organization, there needs to be an environment where opportunities for active participation in decision-making and improvement work exists (Bergman & Klefsjö, 2010). Carlzon (1987) pinpoints three major elements to stimulate participation - communication, delegation and training. This is exemplified, according to Carlzon (1987), through an anecdote where two stonemasons, with exactly the same work task, were asked about what they were doing. While one answered that he was squaring granite blocks, the other one answered that he was helping to build a cathedral. A sense of professional and personal pride needs to exist with one's work in order for the employee to feel committed and as a vital individual for the organization. This requires that information is communicated to the employees as well as that responsibilities are delegated to them. Otherwise, an individual that does not have the needed information or authority cannot on personal initiative take responsibility (Carlzon, 1987). Bergman & Klefsjö (2010) describe the two possible scenarios - a vicious and a good circle - to exemplify the difference between a committed and uncommitted workforce, which is illustrated in figure 8.

Figure 8. A vicious (to the left) and a good (to the right) circle with commitment management, adapted from Bergman & Klefsjö (2010).

Committed leadership. It cannot be emphasized enough how important it is to have a committed leadership, practiced at all levels of the organization, that strives towards a unifying goal that everybody within the organization can relate to (Bergman & Klefsjö, 2010). Spenley (1995) describes committed leadership as an absolute necessity when adopting quality improvement processes, where the quality of management directly affects the quality of the business (see figure 9). It is essential that the leadership radiates confidence and trust towards one's organization and employees in order to inspire the employees to perform well and strive for more, something that figure 8 as well illustrates (Bergman & Klefsjö, 2010).

Figure 9. Illustration of the importance of a committed leadership, adapted from Spenley (1995).

Golhar & Kiella (1997) mean that leadership starts with sharing the vision of the corporate business. It is essential to maintain homogeneous individual and organization goals at all operational levels. This phenomenon is illustrated in figure 10, which explains that top management is clearly unified with the corporate vision and further down in management levels the less understanding and commitment there will be of the corporate vision. A critical management concern is hence identifying the factors on each level that will align clarity and commitment at unity for all employees at all operational levels.

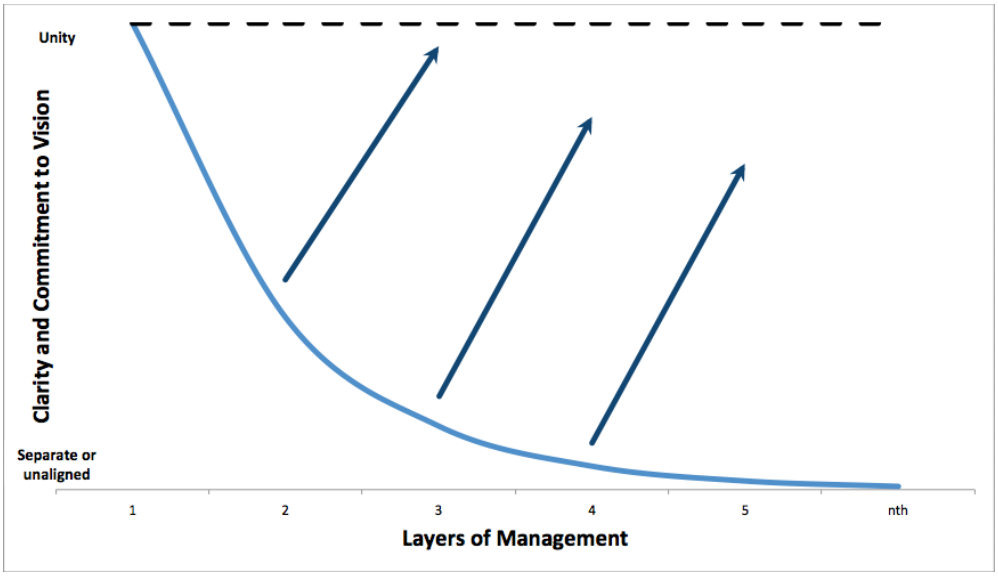

Figure 10. Illustration of the diversified clarity and commitment to vision depending on the layer of management, adapted from Golhar & Kiella (1997).

3.1.2. Deming's 14 points for Management

Most of the central ideas of TQM originate from the first edition of Deming's book "Out of the crisis" (1986), which deals with the transformation the US industry needed to go through to handle the fierce global competition in the 1980s (Deming, 2000). Deming (2000) revolutionized quality management by primarily emphasizing on the people within the organization instead of the products in order to create/assure quality. This is summarized as Deming's 14 points for management, which is, in the opinion of the authors, a more graspable and action based form of TQM (Deming, 2000):

1. Create constancy of purpose for improvement of product and service. A short-term profitability focus and too much concentration on day-to-day problems are two of the biggest obstacles to succeed in the long perspective from the view of quality and profitability. Investments for the future in product and process development need to exist in order to secure for the future. The organization will otherwise head towards severe problems, even if the short-term requirements for profitability will easily be met (Bergman & Klefsjö, 2010).

2. Adopt the new philosophy. The view on quality needs to change from a reactive "fire-fighting"-mentality of work to a proactive concept built on systematic planning and continuous improvement of all processes (Bergman & Klefsjö, 2010).

3. Cease dependence on inspection to achieve quality. Eliminate the need for quality by building quality into the product in the first place (Deming, 2000). Only by performing inspections, the organization creates expectations of that quality problems could occur (Bergman & Klefsjö, 2010).

4. End the practice of awarding business on the basis of price tag alone. Instead, minimize total cost by working with a single supplier. Too often today, the Purchasing department of an organization makes the suppliers compete on price, where the selected supplier is the one who matched the requirements at the lowest price. However, this kind of selection is contradicting to the requirements of quality and dependability of today. The actual purchasing cost could be far exceeded by the total cost resulting from inferior goods from the supplier with the lowest price. Therefore is it favorable to build long-term relationships with single suppliers for every item, where a cross-organizational effectiveness could be achieved (Bergman & Klefsjö, 2010).

5. Improve constantly and forever every process for planning, production and service. The importance of continuous improvements cannot be emphasized enough in order to manage the dynamic nature of quality (Deming, 2000).

6. Institute training on the job. The possibility of mistakes occurring increases naturally with ignorance, which strongly should be worked against. If people within an organization are aware of what is expected and the outcome of actions, then mistakes could be avoided (Bergman & Klefsjö, 2010).

7. Adopt and institute leadership. The significance of leadership is unquestionably one of the most important parts of a successful transformation (Deming, 2000).

8. Drive out fear. An employee that fears that his employment is jeopardized, if he asks questions or pinpoints improvement areas, is a non-wanted employee since he is probably not doing a good job. Fear cripples improvement potential, since people do not want to take initiative due to fear of managers, colleagues etc. This leads to opportunities that are missed for the organization to utilize the know-how[4] within the organization (Deming, 2000).

9. Break down barriers between functions. Many of the occurring quality defects of today are due to lack of communication within an organization, where no thorough identification of the

[4] Know-how: Knowledge and skills that are part of the human capital and are useful for the organization.

internal customers has been made (Deming, 2000). The process view however has the ability to prevent this happening, if it is properly utilized and used. To exemplify, a product is always developed to primarily meet the requirements of the external customers, which could be problematic for the actual manufacturing process if the needs of the internal customers are not as well taken in consideration. Different functions often strive to primarily optimize their own work, which could be contradicting to the comprehensive goal. Therefore is it crucial to have an open and encouraged communication across all functions of the organization, where the primary goal of is the overall and comprehensive goal (Bergman & Klefsjö, 2010).

10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Bergman & Klefsjö (2010) describe it literally as *"less talk and more shop"*. Ambitiously planned campaigns with pep talk and slogans are effective only for a short time, which rapidly changes when an obstacle occurs. Quality defects are mostly the cause of inferior processes and lacking systems, not employee's lack of performing well at the job. It is therefore ineffective to try and boost the employees' satisfaction through vague and too general slogans (Bergman & Klefsjö, 2010).

11. Eliminate numerical quotas for the work force and numerical goals for management. Numerical quotas and goals decrease productivity, since it only creates anxiety and pressures the employees. The actual measuring and controlling should be on the various processes within the organization and not on the employees (Bergman & Klefsjö, 2010).

12. Remove barriers that rob people of their right to pride of workmanship. It is the management's role to create a work situation, where people are encouraged to take own initiative for continuous improvement and development. This requires that people are aware of the overall requirements from the customers, in order to understand one's influence, and that own reflections of owns performance are encouraged (Bergman & Klefsjö, 2010).

13. Institute a vigorous program of education and self-improvement. Continuous improvements are needed, where room for personal development needs to always exist. Utilization of the know-how within the organization needs to be existent, but this means as well that the organization needs to create possibilities for individuals to advance on a personal level in order for the organization to continuously be able to develop internally (Bergman & Klefsjö, 2010).

14. Put everybody in the company to work to accomplish the transformation. An organizational culture can be a legacy that by tradition has become a synonym with the organization itself. This needs to be changed, where the management has to take vigorous steps to encourage work on changing the culture. To accomplish this there needs to be an overall organizational involvement and commitment that strives for change (Bergman & Klefsjö, 2010).

3.1.3. Learning Organization

Another key point in TQM is for the organization to have a systematic way of learning. According to Golhar & Kiella (1997), learning is a process that requires actions to be analyzed and interpreted with respect to outcomes in order to synthesize appropriate and suitable response strategies. Garvin (1993) agrees and defines a learning organization as skilled at creating, acquiring and transferring knowledge as well as modifying its behavior with respect to new knowledge and insights. Garvin (1993) further on identified five characteristics of a learning organization:

- Systematic problem solving
- Experimentation with new approaches and ideas
- Learning from a company's own experience and past history
- Learning from experiences and best practices of others
- Transferring knowledge quickly and efficiently throughout the organization

In order to create a learning organization, leaders must not only be teachers, but also designers and stewards. Hence, top management has a crucial role in creating an organizational environment that enables learning (Senge, 1990). Garvin (1993) suggests some initial steps in order to create such an environment, emphasizing on providing time for the purpose. He means that learning is difficult when in a rush as it tends to be driven out by the pressure of the moment. Only if top management explicitly liberates time for employees to reflect and analyze upon experiences, organizational learning will occur on a frequency. Garvin (1993) continuous by explaining how internal boundaries prevents communication and consequently precludes learning. Top management should therefore put efforts in opening up boundaries in order to reinforce organizational learning. Once top management has created a more supportive and open environment, they can continue by creating learning forums. These forums are programs or events that can take different forms, but all intend to explicit learning:

- *Strategic reviews*. Examining the change in competitive environment as well as the product portfolio, technology and market positioning.
- *Systems audits*. Review the efficiency and health of cross-functional processes and delivery systems.
- *Internal benchmarking reports*. Identifying and compare best practices within the organization.
- *Study missions*. Examining leading organizations around the world in order to better understand market performance and distinctive skills.
- *Jamborees or symposiums*. Bringing together customers, suppliers, external experts and internal groups with the purpose to share ideas and learn from different collaborations.

All these activities foster learning by having employees battle with new knowledge and consider its implications.

3.2. Product development

This section refers to the understanding of what the Product Development Process (PDP) is, explaining its components and the way it works. It covers theories of problems within product development and consequences of not having an efficient PDP as well as the benefits of having one. Further on, it is essential for this thesis to understand the integration of TQM with the PDP and the benefits of such integration. The initial section of chapter 4 explains the importance and relevance of this section.

3.2.1. The Product Development Process

Many authors and authors have defined the PDP and despite the differences in their explanation of PDP, the essence of PDP is universal. However, it is important to initially separate product development with the process of product development, as they mean different things. Product development refers to the activities that begins with the perception of a market opportunity and ends in production, sales and delivery of a product, whilst the PDP refers to the utilized activities in order to conceptualize, design and commercialize a product (Ulrich & Eppinger, 2000). Morgan & Liker (2006) further describes PDP as a *knowledge work job shop* that have to deal with an integrated network of queues, multiple centers and constraints.

Ulrich and Eppinger (2000) continue by describing a way of the PDP, which they call the *Generic Development Process*. The six phases within this process give a good general overview of the PDP:

0. Planning. This phase precedes the project approval and launch of the PDP. The phase begins with corporate strategy and further includes assessment of technology development as well as market objectives.

1. Concept Development. The needs of the target market are identified in this phase, alternative product concepts are generated and assessed and finally one or several concepts are chosen for further development.

2. System-level design. This phase includes the definition of the product architecture as well as the decomposition of the product into components and subsystems. A final assembly plan for manufacturing should be defined as well.

3. Detail design. The detail design phase refers to the complete specification of the product physics (geometry, materials) as the tolerances of all the unique parts in the product as well as the identification of all the standard parts that needs to be purchase from suppliers. Hence, drawings and process plan shall be established as *control documentation* for the product.

4. Testing and refinement. This phase involves the construction and assessment of multiple reproduction versions of the product.

5. Production ramp-up. In this phase, the product is made using the intended production system. The purpose is to train the employees and to work out any remaining issues in the production processes.

3.2.2. Benefits of an efficient PDP

The different phases of a PDP creates the base for the detailed activities that occurs in each phase. It is therefore very important to have a well-defined development process. Ulrich & Eppinger (2000) argues for such a PDP for the following reasons:

- *Quality assurance.* A PDP specifies the gates each project should pass in order to continue in the next phase. It is therefore important that these gates are chosen and specified very wisely as actually following the requirements of the PDP is a way of assuring the quality of the end product.
- *Coordination.* A well-defined PDP defines the roles of everyone involved. It articulates when they are needed in the process throughout all functions and what contributions will be needed.
- *Planning.* A PDP contains of natural milestones defining the completion of each phase. The timing of these milestones anchors the time schedule of the development projects.
- *Management.* A well-defined PDP enables managers to compare defined events to the ongoing process with purpose to identify possible issue areas.
- *Improvement.* Careful documentation of the PDP helps identifying opportunities for improvement.

Morgan and Liker (2006) have a different view, meaning that a great PDP is becoming more of a strategic differentiator rather than excellent manufacturing capabilities. The opportunities for a competitive advantage in product development are hence more than anywhere else within a manufacturing company. Others say that customers needs gets more complex and competition increases, which is why an efficient PDP should be a crucial core competence in order to meet the needs and beat competition (Fiore, 2005). Hence, an efficient PDP is essential for the successes of any company. The success could be generated from the main benefits from an efficient PDP presented by Clausing (1994) together with Wheelwright & Clark (1992):

- Enhanced variety and flexibility
- Reducing time-to-market
- Decreased costs
- Increased customer satisfaction
- Overall organizational efficiency and satisfaction
- Early mover advantage in the market

3.2.3. Issues within the PDP

Due to many issues that could arise during a development projects, a large majority of projects have a gap between the designed product and the generated output. In order to identify these issues and find opportunities for improvements it is crucial to investigate different problems in the PDP.
Wheelwright & Clark (1992), Clausing (1994) and Fiore (2005) identifies the following problems as the main ones:

- Deficient attention to customer needs
- Company resources and employee workloads are not efficiently managed
- Process control and synchronization are inefficient
- Lack of cooperation and communication between design, marketing, suppliers and manufacturing departments
- Lack of explicitness in continuous improvements
- The development of achieving robust functionality is weak

A prerequisite of preventing these issues is by connecting the corporate goals and visions with the purpose of the PDP. Product development managers have to develop mental models defined by the corporate vision and assist product development teams in clarifying and maintaining focus on the desired product outcome. Without this fundamental unity, the PDP are simply disconnected from the corporate vision and many of the above issues are to arise (Golhar & Kiella, 1997).

The unity follows by top management committing them throughout the PDP. In order to tailor a qualitative and efficient PDP, focused management is required to define the nature of the product development environment and be committed to maximize the utility and the structure of the PDP (Shapiro & White, 1994). This requires making decisions on based on factual data and not based on the gut-feel. Top management need to be patient and not strive for short-term gains, which means that they cannot apply short-term financial measures in order to measure the efficiency of the PDP (Golhar & Kiella, 1997). Processes set in motion to produce a desired result on short terms will not only create a desired outcome but will also create a secondary side-effect that will slow down the growth of product development (Senge, 1994).

3.2.4. Lean Product Development

Another concept that emphasizes on efficiency within PDP is Lean product development. Instead of identifying and solving specific problem areas within product development, Lean Product Development (LPD) refers to eliminating overall waste. Waste is defined as a process or activity that consumes resources without adding any value for the customer (Morgan & Liker, 2006). According to Ohno (1988), there are seven kinds of activities that is considered as the original wastes:

- Transport - moving around products that do not add any value to the process
- Inventory - components within the process and in inventory not being processed
- Motion - people walking or equipment moving more than required by the process
- Overproduction - producing ahead of demand (push instead of pull)
- Over processing - consequence of poor tool or product design
- Defects - the energy and time wasted in inspecting and fixing defects

However, these wastes have not been defined based on the PDP, but rather upon achieving excellence in manufacturing processes. Mascitelli (2006) have elaborated on these original wastes within different product development experiences. Consequently, he has developed a list of wastes specifically within LPD that follows this specific order of impact:

- Chaotic work environment (interruptions)
- Lack of available resources (bottlenecks of resources)
- Lack of clear prioritization of tasks/activities/projects
- Lack of communication across functions
- Badly defined requirements of product/disruptive changes to product requirement
- Poor early considerations of manufacturability
- Over designing, analysis paralysis and gold-plating
- To many meetings
- E-mail overload

3.3. Organizational communication

Having function cooperation within the PDP is fundamental for TQM to work. Wheelwright & Clark (1992) state that the R&D function and the manufacturing function are often not completely integrated within product development projects. The design of the product and the process are therefore accomplished in isolation, which makes the overall development of a completed design and manufacturing process slow and often require a great deal of rework and significant resources. In addition, it causes a mismatch between the requirements of the design and the capabilities and availability of the suppliers. In order to prevent this separation, design choices of product need to get in contact with process capabilities, and process capabilities into contact with design requirements early in the initial planning phase of the PDP. This way, the two functions can influence and shape one another in an efficient way.

However, it is not only the integration of manufacturing and R&D that matters, there is often a distance between marketing and R&D as well. The research of Griffin & Hauser (1996) emphasizes on this isolation, showing that there is a large correlation between the integration of marketing and R&D and the success of the company. Organizational obstacles, titled barriers,

often prevent the integration and cooperation of functions. Rieger (2011) states that barriers originate from five causes:

- *Fear*. Fear can create walls between functions, if functions' are differently addressed where a struggle for attention needs to exist. This causes functions to focus on local goals and processes, in order to secure their own excellence, which could be contradicting to the organization as a whole.
- *Information flow*. There exists two types of information flow barriers - transmission and assimilation - which both address the importance of information management. Information should not be blocked (transmission) or overwhelming (assimilation), which could create issues of information management and hence conflicts and eventually barriers.
- *Short-term thinking*. There are two barriers originating from short-term thinking - sins of omission and sins of commission. Sins of omission occurs when decisions are made without consultation with the ones who have to live with the consequences of the decision being made, where sins of commission occurs when long term concerns are known about, but neglected and not acted upon.
- *Misalignment*. Misalignment barriers exist when unity is not created, where an overall understanding of the actions does not exist. Most commonly misalignment barriers occur when functions' goals are in direct opposition.
- *Money*. Barriers of money can be either personal or departmental. The personal money barriers are results of a manipulative bonus system that differs individuals on base of money. The departmental money barriers are similar to the personal ones, but more general where the focus is to secure one's share of the budget.

The actual barriers are illustrated differently within organizations, where Griffin & Hauser (1996) name the following factors as differentiators:

- *Personality*. Often within a function there are a majority of people with the same personality, which often differs from the personalities of other functions. This causes barriers of stereotypes, which causes distance between the functions.
- *Culture*. Marketing staff often has humanistic backgrounds while R&D staff comes from a scientific background, which gives them different worldviews. This difference in organizational routines is reinforced in the cultures of a company's functional departments.
- *Language*. As separate thought worlds develop, language barriers also arise. The two functions uses their own technical term where marketing speaks in words of product benefits and perceptual positions while R&D speak use a more quantitative language such as performance and specifications. When a misunderstanding occurs, customer needs and design solutions disconnect even if each function thinks they are talking about the same thing.

- *Organizational responsibilities*. Different functions have different tasks and responsibilities, e.g. market share versus number of patents, and hence prioritizes differently.
- *Physical barriers*. Functions' having headquarters on different geographical sites create huge barriers to communication and hence prevents integration of the functions.

As the TQM philosophy provides a structure that allows both top-down and bottom up processes, it requires full organizational integration from CEO down to the bottom levels of management (Shepatuk, 1991). Hence, a total integration of all functions within organizations is fundamental for the TQM to work for the PDP. With the generic PDP, Ulrich & Eppinger (2000) show a way of integrating all functions within the PDP by demonstrating all tasks and responsibilities of every function within each phase as shown in figure 11.

In order to enable these activities, all barriers to communication and cooperation have to be eliminated. Griffin & Hauser (1996) have through their research generated methods in order to remove these barriers and achieve functional integration:

- Relocation and physical facilities design
- Personnel movement
- Informal social systems
- Organizational structure
- Incentives and rewards
- Formal integrative management systems

	Planning	Concept Development	System-Level Design	Detail Design	Testing and Refinement	Production Ramp-Up
Marketing	• Articulate market opportunity • Define market segments	• Collect customer needs • Identify lead users • Identify competitive products	• Develop plan for product options and extended product family	• Develop marketing plan	• Develop promotion and launch materials • Facilitate field testing	• Place early production with key customers
Design	• Consider product platform and architecture • Assess new technologies	• Investigate feasibility of product concepts • Develop industrial design concepts • Build and test experimental prototypes	• Generate alternative product architectures • Define major sub-systems and interfaces • Refine industrial design	• Define part geometry • Choose materials • Assign tolerances • Complete industrial design control documentation	• Reliability testing • Life testing • Performance testing • Obtain regulatory approvals • Implement design changes	• Evaluate early production output
Manufacturing	• Identify production constrains • Set supply chain strategy	• Estimate manufacturing costs • Asses production feasibility	• Identify suppliers for key components. • Perform make-buy analysis • Define final assembly scheme	• Define piece-part production processes • Design tooling • Define quality assurance processes • Begin procurement of long-lead tooling	• Facilitate supplier ramp-up • Refine fabrication and assembly processes • Train work force • Refine quality assurance processes	• Begin operation of entire production system
Other Functions	• *Finance:* Provide planning goals • *Management:* Allocate project resources	• *Finance:* Facilitate economic analysis • *Legal:* Investigate patent issues	• *Finance:* Facilitate make-buy analysis • *Service:* Identify service issues		• *Sales:* Develop sales plan	

Figure 11. Illustration of functional involvement in a generic PDP, adapted from Ulrich & Eppinger (2000).

4. Empirical findings

The empirical findings are divided with consideration to the practical approach of the master thesis at hand - *mapping* and *identifying* - where data was differently collected depending on phase. The mapping phase consisted of a quantitative data collection, where the purpose was to be guided towards specific quality causes. To achieve this, data was collected through a qualitative investigation where dictums from the interviewees were combined and compared with the goal to find common denominators in order to qualitatively set the base to find the roots of the causes. However, additional causes aroused during the qualitative data collection, whose interrelation with the mapped quality issues further needed to be analyzed. All statements within this chapter are statements from the interviewees.

Consequently, the structure of the chapter initially begins with the mapping of the specific quality causes. The findings of the mapping phase are further on examined in the identifying phase, where additional causes are as well identified.

4.1. Mapping

The received data of the customer complaints is statistically conducted at BBAM with regard to cost instead of amount. Hence, new statistical data was conducted from the same initial database, in order to determine the stability of the processes. Further, to manage the diversified nature of the different quality flaws, there is an error-code manual at BBAM that is used to categorize all quality flaws. The error-code manual compiles all hypothetically possible quality flaws that could occur from order to cash, which can be visualized in Appendix A.

The available amount of information at BBAM dated back to the financial year of 2010, where all customer complaints from that specific year until the month of January 2013 were used in order to determine the amount of specific error-codes as well as the total amount of error-codes within a specific group of products. The choice of using two variable specific paths was deliberately chosen in order to determine if some synergies could be found in the intersections of the different error-codes and product groups.

Further, the total amount of specific error-codes was proportioned to the total number of customer complaints in order to determine the percentage share of every specific error-code. The results can be visualized in figure 12, where the nine most contributing error-codes are presented together with a total percentage share of the other error-codes (Others).

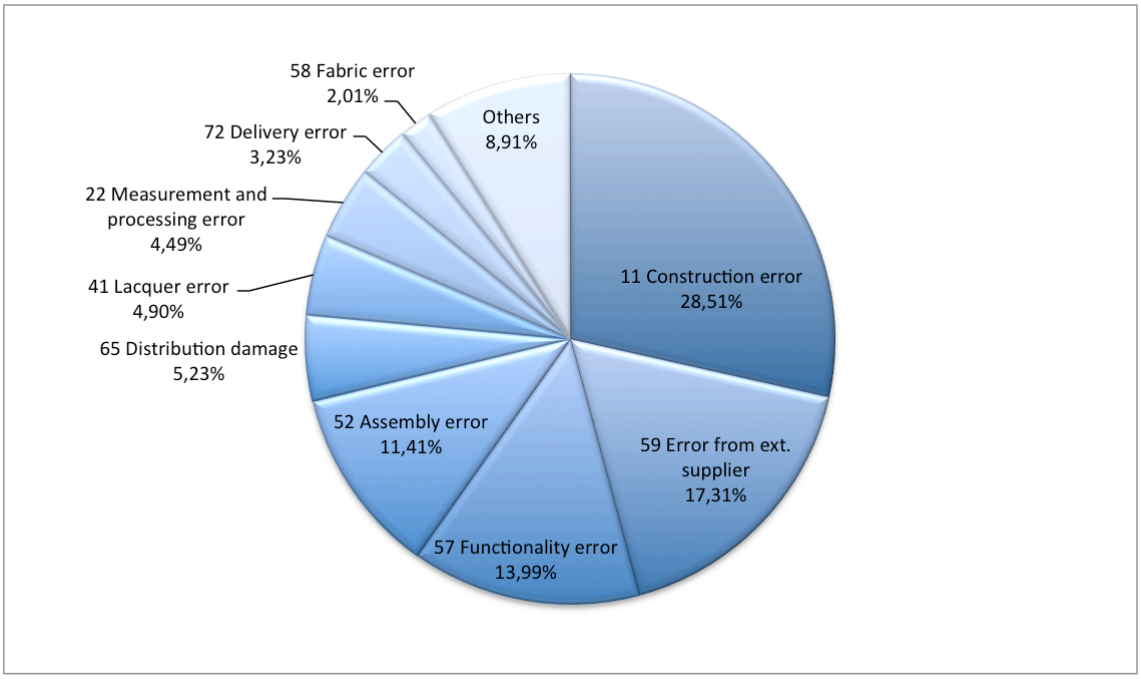

Figure 12. Illustration of the distribution among the most contributing error-codes in descending order.

A similar but more detailed approach was used with the product groups, in order to verify the findings in figure 12. Every product groups' contribution to the total amount of customer complaints was calculated in percent. Additional compilations were however needed. Statistics

of the total production amount of the different product groups was used, where data from the financial year of 2011 until January 2013 was used in order to determine the different product groups' percentage share of the total production amount. These two calculations were then compared in proportion to each other in order to determine the stability of the processes of the respective product groups. Product groups with results higher than one indicated these specific product groups were more unstable and thereby more alarming than others. This ratio clarifies which product groups' processes are the most alarming ones by comparing them to the other product groups'. The results can be visualized in figure 13, where the process stability indicator of one is positioned at 50 % since the chosen chart type distributes the ratio in that matter between every product groups' percentage of customer complaints and the percentage share of the total production amount. If the intersection of the distributions is on the upper side of the stability indicator, then clear indications exist of that specific product group's processes being more unstable than others. For example, as can bee seen in figure 13, the product group that is the most alarming one is *no. 4*, since its contribution to the customer complaints is the highest one with consideration to its contribution to the total production quantity. Product group *no. 8* is actually more alarming than product group *no. 4*, but its inferior contribution to the total production quantity implies that it is more relevant to regard *no. 4* as the most alarming one. On the other hand, *no. 5* has the most stable processes compared to the other product groups, since its customer complaints contribution is the lowest one with consideration to its contribution to the total production quantity.

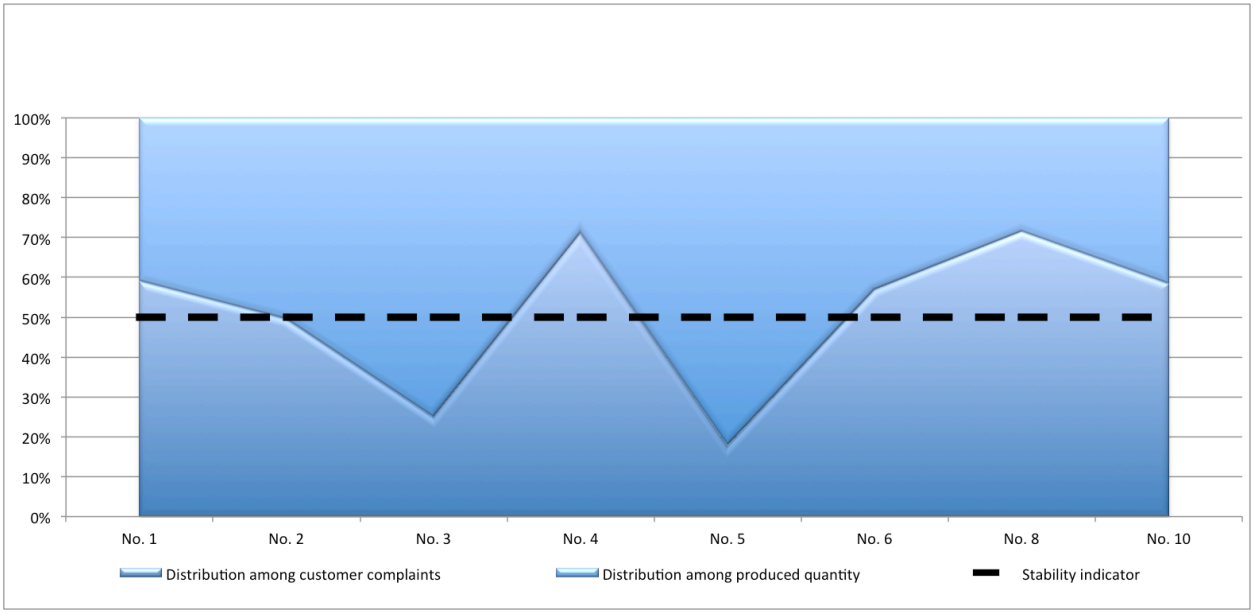

Figure 13. Process stability indicator, where every product group is presented separately.

The combination of the results in figure 12 and figure 13 out crystallized the most contributing factor to the high number of quality flaws, since the most occurring error-code is actually the most occurring error-code in the most alarming product group (see Appendix B). That specific

factor - construction error[5] - generated 28,51 % of the total amount of customer complaints and was therefore regarded and chosen as a guide towards identifying the quality issues.

4.2. Identifying

In order to confirm the results from the quantitative research in the initial phase, a general opinion of the construction errors was created according to the interviewees' statements. There is a general agreement of it being a consequence of a number of causes, but additional causes were as well highlighted as plausible interrelated effects or roots to the mapped causes. It was therefore important to further on describe all plausible causes in order to create valid foundation for the analysis.

The categorization of the plausible causes, that were qualitatively conducted, was analytically selected with the help of the Affinity Diagram (see figure 14). The labels of the categories were the common denominators of the empirical data categorized in that specific group. It involves categories focusing on a broader organizational perspective - *Corporate Strategy*, *Leadership*, *and Culture & Communication* - as well as more detailed areas, such as the newly established *Product Development Process* and *Quality in practice*.

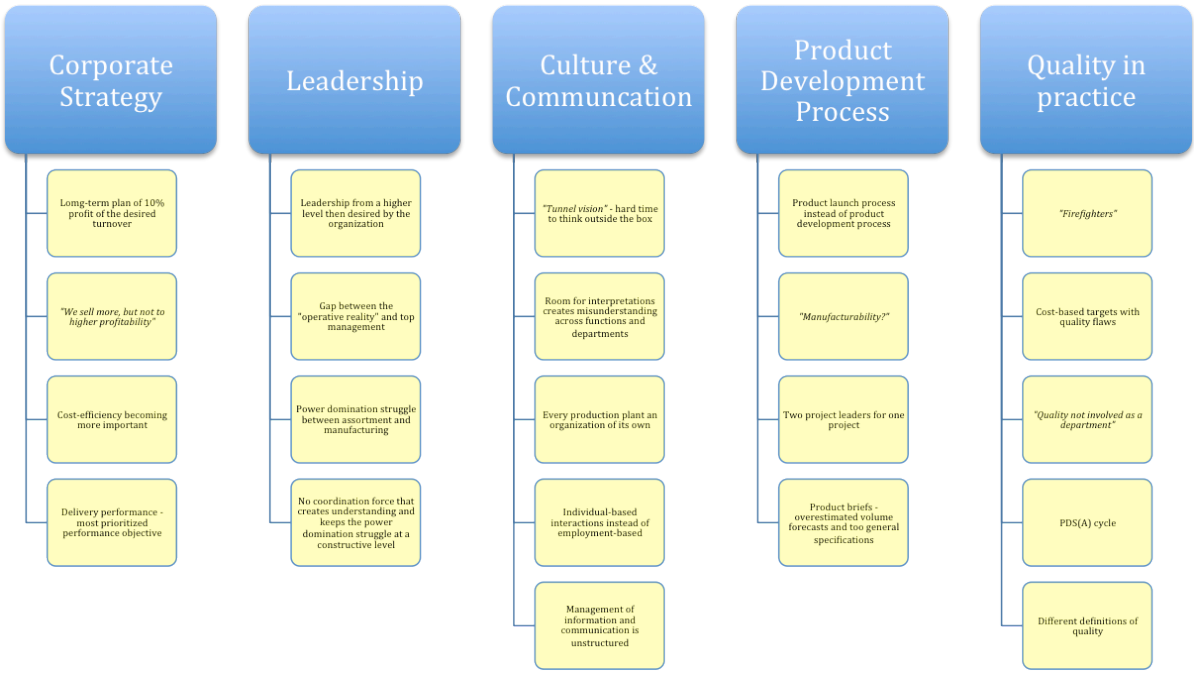

Figure 14. Illustration of the Affinity Diagram, where a more extended and readable version is visual in Appendix E.

4.2.1. Corporate Strategy

Cost-efficiency is becoming more of a prioritized performance objective at BBAM, which is a consequence of the unsatisfied yearly results the last couple of years. There is however a clear

[5] Construction error: Error originating from Product Development (BBAM, 2013).

strategy of having delivery performance as the most important performance objective at BBAM, which is why quality is sometimes down prioritized if delivery performance is jeopardized. As customers order entire solutions, they expect complete deliveries at the agreed upon time. It is therefore, and due to logistical smoothness, a rule at BBAM not to send out finished products if the actual order is not completed. This is however sometimes hard to maintain at a sufficient level, and a not so desired decision needs to be taken - the choice between delivery performance and the possibility of flawing quality. The order is thereby hastened to delivery with the known possibility of some products of the order being returned and complained about, which BBAM due to their five-year guarantee is basically forced to accept. This has not been a significantly affecting issue at BBAM, since revenues increased more than costs where it was beneficial in the long run to accept the costs of rework in order to increase the customer satisfaction and consequently the profit.

Delivery performance has however been proven as a competitive advantage for BBAM, together with their environmental focus, the closeness to their suppliers and the total combination of the offer of product and service. These values are the cornerstones of their main strategy, where BBAM today primarily focuses on changing the assortment and emphasizing on the design. Historically, BBAM' products have been perceived as kind of "boring", which is explained by many as why there is such a focus on design today. The results of this are higher volume sales, but to the expense of lower profitability, even if there is an outspoken prioritization order between projects where projects with the highest volumes and the highest profits are prioritized. This is contradicting to the long-term plan from the parent company of having a profit that is 10 % of the desired turnover, which is not where BBAM is today.

"We sell more, but not to higher profitability"

4.2.2. Leadership

The mentioned aspects of the corporate strategy set the frame within which the top management can act and consequently lead the organization. There is however a general opinion of the top management adopting more of a distanced management approach than desired, where their presence within operations is unnoticeable. There is a gap between the "operative reality" of the organization and the individuals on the group executive board, since the top management has taken upon them to lead from a higher level than desired within the organization. The consequences of this management approach are that managers on a lower level are not guided enough, since there is no guidance from the top management emphasizing the importance of communication and clarified responsibility areas. Managers lower in the hierarchy tend to overcompensate this by taking decisions on economic grounds that requires the knowledge of managers higher up in the hierarchy.

One aspect that was frequently brought up was the clear division in the organizational chain between assortment and manufacturing, which was often exemplified through a power

domination struggle between these two functions. Many however as well desire this, since conflicts contribute to organizational and general development if kept on a constructive level. The current situation is perceived as a power domination struggle where assortment is currently favored by top management on the behalf of manufacturing. It is explained as a consequence of the previous product range being "boring", where design was not as prioritized as today. However, the issue is not the focus on design itself, but more of an organizational issue of assortment and manufacturing understanding each other. The two functions are too far away from each other, where manufacturing is too far away from the customers and assortment is too far away from the manufacturing itself. This is an example of the distanced managerial approach that the top management has chosen, since no coordinating force is existent that works towards keeping this power domination struggle at a constructive level.

4.2.3. Culture & Communication

There is, to exemplify the mentioned power domination struggle within the organization, a cultural disagreement of what quality should be defined as between the two major functions - assortment and manufacturing. This is an interpretation issue, which BBAM apparently have many of, since room has been created for actions based on interpretations. Actions taken by other functions and other individuals, at all levels and within all functions, are thereby often confusing to the single function, department or individual, which obstructs the overall communication of the organization and creates an inhomogeneous atmosphere where nobody understands no one. An underlying reason for the easiness to create room for interpretation is the unspecified distribution of responsibilities, which is an inherited effect of the previous leading structure. Previously, it was common for the members of the founding family to be involved in major decisions across the organization, since their know-how was invaluable for the development of the organization. Recently, the family members have taken upon themselves more of a lean-backed approach, where their impact possibilities end with the responsibilities of their respective employments. This has created confusion, where lack of clarity of one's responsibilities exists across the entire organization.

A visual consequence of the interpretation-based culture is the individual-based, instead of the employment-based, interactions that are standard for BBAM. Individuals tend to primarily interact with individuals that they have experience of working with instead of addressing individuals that are currently working with the needed information.

"If information about materials is needed, then George at purchasing is called instead of the responsible constructor" (George is a fictive person)

This approach could from case to case be both an advantage as well as a disadvantage, but it sends out the wrong signals of how to manage information. It has gone so far that it is perceived as something natural and as one of many shortcuts at BBAM that are available and taken by many in order to get things done.

The management of information could as mentioned be better, where there is an opinion of people searching for too much information. This is a plausible consequence of meetings primarily existing to deal with issues instead of sharing information. As previously mentioned, people want to be involved even if they maybe do not need to, but this creates however an unstructured nature of dealing with tasks. Information is often demanded from bottom and up in the hierarchy instead of being spread from the top management downwards in the organizational hierarchy, which, according to some, is crippling the development of the organization and the actual speed of the development. The impression of that information needs to be managed more carefully in the organization has been brought up, since it is presumed as being one of the main reasons for the mentioned issues concerning the culture and communication of the organization. Another plausible reason is the overall impression of communication not being an iterative process, where, in contrast to the experienced information processing, communication is processed downwards, but little communication is actually processed upwards in the process or organizational hierarchy.

There is clearly an imprinted culture and communication practice that is presumably hard to try to affect/change for a new employee at BBAM. The organization's not existing inclination to change does not ease the task. New employees are further on basically forced to by themselves find out which values that are the cornerstones of BBAM, since there is no existing welcome program where the employee is informed about the values of BBAM. A factor that additionally complicates the overall understanding of the organization is the differences between the production plants, where every production plant has through history basically been an organization of its own. It is therefore hard for employees at the different production plants to envision the size of the organization as a whole.

Historically, BBAM has acquired their different production plants through previous collaborations with suppliers, which were then merged into the organization of BBAM. Every production plant is thereby specialized and responsible for the production of specific products/components, where collaboration across production plants is, depending on the product, needed to various extents. Something that all the production plants have in common however is the in general loyal workforce, which is presumably to some degree due to the experienced possibility of advancing within the organization. Loyalty has though come with an experienced downside at BBAM, where there is an opinion of individuals having a hard time thinking outside of the box that is BBAM. It is no wonder then that individuals' experience that decisions are often made on faulty premises, since people tend to have a hard time of distancing themselves from their own experience and their own work. By having a decision-making approach where emotions overrule facts, it additionally complicates the understanding of each other's actions and clarifies the overall need for structure, systematics and standardization.

4.2.4. Product Development Process

People are in general agreeing that product development projects in the past were unstructured and poorly specified. Some describe it as being a consequence of too early product releases, which backfire in forms of high numbers of customer complaints. A general agreement on it being a resource and time issue exists, but some have pinpointed the lacking time planning as the main cause of the high number of construction errors. To exemplify, a specific product development project was mentioned in the interviews were a new type of task chair was hastened to launch. This specific product was supposed to be part of the largest product launch ever at BBAM, which is why it was forced to the great extent that testing and validating were neglected.

The consequences are costly, where continuous construction modifications in the amount of millions SEK are needed every year. Mostly there is a need for a construction modification because of a deficient analysis of the actual manufacturability of the product or because of an insufficient compatibility between product and process. Sometimes it is even because of a trivial cause, such as correct drawings or follow-up documents not existing.

Meanwhile, BBAM has tried to solve the previously unstructured PDP internally, by creating and implementing a standardized process (see figure 15) applicable to all projects.

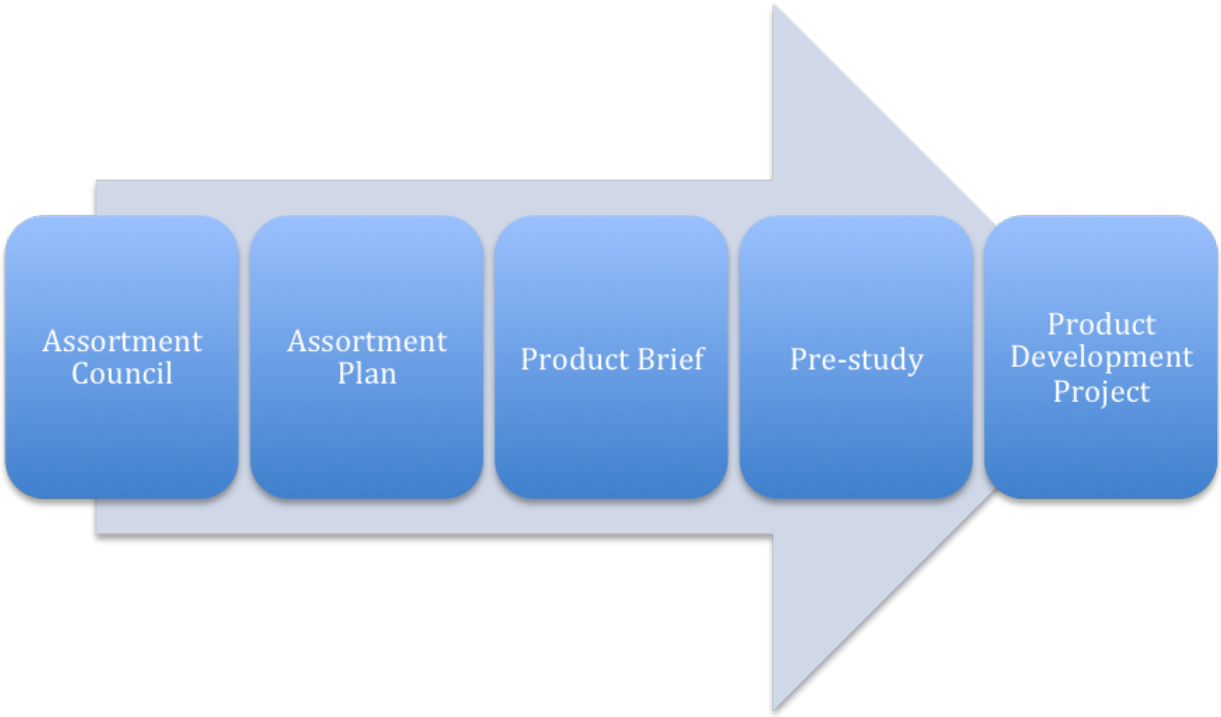

Figure 15. General overview of the PDP process at BBAM, recognized within BBAM as a launch process.

The process is explicitly defined as a launch process, which was additionally confirmed by some as an important thing to keep in mind, where the actual product development is one of the phases in the process itself. The details of the process have not yet been fully out crystallized, since it is

still in the initial phases of its launch. The core phases and gates are however set since December 2012. In general, people agree on the launch process being a step in the right direction. Even if some however are skeptical and cautious and need to be persuaded about the launch process being more than just a graphically appealing illustration of how it should be from now on.

"It looks very good on paper, but will we follow it?"

The initial phase of the project is *Assortment Council*, which is a group of individuals from the eight national focus markets[6] of BBAM coming from the Brand/Range/Design function, focuses on analyzing the market in order to determine what is needed and wanted by the customers. The requirements and needs of the customers that can be met are then specified as concept[7] or product ideas, which are compiled as a five-year assortment plan. The *Assortment Plan* is first approved by the Assortment Council and then yearly approved by the Assortment management, which are responsible for the compilation in the first place. The actual concretization of the concept or product ideas occurs in the *Product Brief* phase, where a number of parameters need to be determined for a specific product. A product brief consists of analysis and determinations of the following parameters:

- Market needs
- Market segment
- Target group
- Competitors
- Contextualization
- Relation to other products in assortment
- Project size
- Lifecycle of product
- Substitutes which products
- Functionality
- Price

The one responsible for the actual compilation of the product brief is the affected product manager. The brief is then evaluated in the following phase *Pre-study*, where a more sustainable approach is used in order to define the concrete possibilities and limitations with the product at hand. A project group manages the pre-study phase with a stated project leader that reports to the responsible product manager. It is somewhere in the end of the product brief that involvement from production and more specifically from the departments of Purchasing, Product Development and Production Engineering is explicitly determined. These departments are then supposed to be represented in the project group that is responsible for the pre-study itself. There

[6] Eight national focus markets: BBAM focuses on eight national markets in Europe, who are the foundation for the organization's market analyses (BBAM, 2013).
[7] Concept: A group of products, developed as a product family (BBAM, 2013).

has however been mentioned that some specific departments are, even with the explicit clarification of their needed involvement, purposely neglected in the Pre-study phase, since their working approach is more time-consuming than desired. The product brief is in the pre-study updated and further complemented with additional parameters, which are the following:

- Market analysis with volumes
- Pre-calculation for production
- Budget
- Risk analysis (FMEA light)
- Prototype sketch
- 3D model

The approval of the specialized and final product brief is done by the product manager and afterwards handed over to product development, which is officially named Technical Design at BBAM. The product briefs are often, according to some interviews, not accurate enough when finalized. Especially two aspects have been mentioned as problematic, namely the written volumes and the lacking information of the different variations with the product. The written volumes are often overestimated, which creates additional problems and costs in the future since BBAM agrees upon the estimated volumes with their suppliers. The variation issue is due to the missing clarifying information of how many different variations of the product as well how many different colors that will be available.

The pre-study is somewhat the initial phase of the stage-gate process that is used within product development with the new launch process in order to secure enough information and quality before the project is taken to the next stage. As mentioned, the *Product Development Project* phase starts when the product manager hands over the finalized product brief to the product development, where a new project group is established with a new project leader from product development. This establishment of the new project group occurs in the *Start-up* stage, which is the first of five stages (see figure 16), where the same departments from the pre-study phase are involved and represented in the project group. Additional tasks that need to be completed in this stage are a detailed start-up of the engineering needed as well as a unanimously agreed time schedule with milestones and a launch plan.

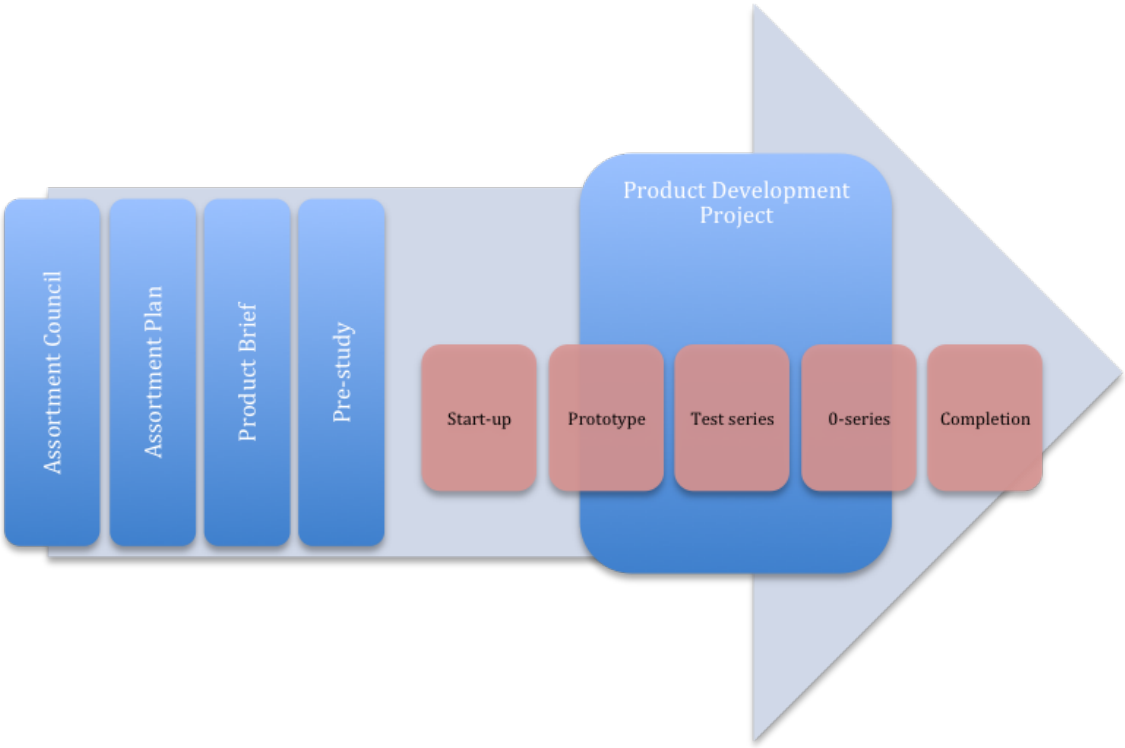

Figure 16. The launch process, where the five stages within the fifth phase are highlighted.

If the project is with the help of the stage-gate checklist evaluated as final for the Start-up stage, the project goes in to the stage *Prototype* where the actual construction of a prototype is built, tested and approved. Other main activities during this stage are the finalization of a FMEA for the product, the clarification of a process map and the choice of suppliers, which Purchasing is responsible for.

The actual prototype is then tested in the next stage *Test series* where the product-FMEA is supposed to be evaluated with respect to the FMEA for the process that is finalized in the Test series stage. There have however been some indications of the FMEA-s not being good and not being worthy of its name, where no accurate evaluation is done. This makes it hard to accurately examine the fit between product and process. This is further complicated by the fact that many projects are developing products with regard to not-yet-existing processes, where the actual manufacturability of a product is only forecasted and often in retrospect regarded as inaccurate. The mentioned scenario is experienced as more of a rule than exception, where the inaccurate definition of one product's manufacturability and sustainability forces the design of the process to be continuously reworked.

After the product is tested, approved and finally validated, the project is taken to the next stage *0-series*, where the 0-series is built, tested, approved and validated. The organization is informed and prepared for the actual manufacturing of the product, where even the customer can for the first time examine and evaluate the product at exhibitions where the product is presented. The

project is then finalized in the final stage *Completion*, where the initial boot problems are corrected. The project is evaluated according to the initial goals targeted in the product brief as well as financially in order to determine the total cost and of the project.

The Product Development department is with the implementation of the mentioned PDP going through a transformation in project management. The previously unstructured and shortcut-approving way of working is trying to be eliminated with the implementation of a standardized project systematics. There do however already exist cases of individuals trying to create modified gates in order to press through projects, where some departments have purposely been neglected even if the actual task is the specific department's responsibility. It is addressed as a consequence of the PDP, and the stage-gates specifically, not being accurately time managed. Currently there is only the launch date as a milestone for the projects, where no specific time is set to the different stages. It has however also been mentioned by some that there is a common desire to deal with this issue by not explicitly communicating an absolute launch date in order to secure the quality of the product and its manufacturability and sustainability. The previously common approach of merely delaying or in worst cases pressuring through the projects is regarded as part of the past.

To further facilitate a successful implementation of the PDP, there has been a reorganization of the Product Development department, where a more centralized process is set for the different projects. The previous approach of having constructors at all three plants where projects were geographically independent has been changed to having all constructors at two locations, where projects are managed with more of a centralized approach. This action is regarded as an effort to deal with the coordination of projects that comes due to geographical barriers and differences. It is as well presumably an effort to emphasize the importance of product development, which according to some has not been the case in the past. New product launches are rarely occurring these last years, where some constructors are working full-time on construction modifications instead of new product development projects.

4.2.6. Quality in practice

As previously mentioned, the Quality department has only been in its present shape for approximately two years. There still exists a definition issue of the department's responsibilities and aims, which is not simplified by the high number of customer complaints. The department works towards its target levels of customer complaints, which are inherited from the previous quality division. There is however no further explanation of the set target level of 1 % of the turnover for the customer complaints. A cost-based target level has always been used within BBAM when trying to determine how much of the turnover that is suitable to be sacrificed for both internally as well as externally discovered quality flaws. Some efforts have previously been put in implementing "x defected parts per million produced", but it was never acknowledged enough to become a standard.

Within the organization of BBAM the department is somewhat unnoticeable, where no possibility has been created for the department to have more of an impact. The people within the Quality department are regarded as firefighters that are only called upon when there is a manufacturing related problem that needs a quick fix. Even if their responsibilities include the departments of product development, logistics as well as manufacturing, they are almost exclusively working with quality issues concerning manufacturing. There is however a general opinion of acceptance towards the department's capabilities, where it is believed that the Quality department would not have to inspect to the great extent that they are currently doing if the PDP is properly done in the first place.

A plausible reason for the current shortcomings is the general opinion of the department being short-staffed, where the current number of eleven persons is not enough to succeed with all tasks/issues that the department is responsible for. To acquire more resources however, the department needs to be able to prove the actual need. This can only be achieved by the need being measurable as well as documented, something that is not the case today. It is important to mention that this is trying to be solved with the planned implementation of a case management system for the Quality department. There is currently however no follow-up documentation of all the quality issues that the department solves, which makes it hard for the top management to secure resources since there is no accurate data existing of how much work the department actually has. A possible solution would additionally be to address more attention to the Quality department by directly attaching the reporting to the COO instead of to the Production Directors. The department is by its nature forced to work in an unorthodox way, compared to the other departments, by its involvement in all other functions, which could be more noticed and responded upon if it is directly addressed from the top management. Why not explicitly state the department's matrix-organization-nature?

The documentation issue is something that has been pinpointed as one of the main issues that needs to be solved, where a more standardized way of working within the department is desired. The aim is to create "roadmaps" of how the department should handle different work tasks and issues in order to create standardization instead of relying on one's interpretation of what is needed. Something that additionally complicates the documentation issue is that it is equally neglected within other departments as within the Quality department. The drawing issue has been continuously addressed as the best example of the current insufficiency with the management of information, where various examples of one component's drawing could exist at the same time. Components of products are manufactured, both within the organization at BBAM and by suppliers, according to incorrect drawings, since no tolerance limits exist or due to inadequate assurance of the quality of the drawings.

There is a general impression of the improvement work being shortcoming. The PDSA cycle is used as a standard, but it is not used according to the definition of the cycle. There is no actual learning or "acting" on the gained results, where the cycle is merely used as a simple planning

tool for improvements. Historically, BBAM has always in the end solved all issues to the expense of an unilluminated cost, which exemplifies the down-prioritization of cost-efficiency.

"We have known that we can fix it in the end"

The profit-related issues that have been present these last years have however increased the awareness of that a change regarding how quality is managed is needed, since there is no spare income available to spend on quality-related quick fixes. It is believed that the department of Quality needs to be more involved within the PDP in order to manage the quality better. Even if there is some kind of cross-functionality within the PDP, there is however no further involvement from the Quality department itself.

Opinions differ in how the department should be more involved, even if there is a general agreement of it being necessary for the department to start working more proactive instead of reactive. There needs to be a standardized way of handling tasks/issues in order to secure the quality of the work, which is not the case today. This would as well reduce the amount of time that is needed when handling quality inspection issues, which would indirectly free up more time for proactive work. Then no real obstacles would exist of the department being involved in the PDP. People are agreeing that the Quality department needs to work more towards the Product Development department, where they should be given the responsibility to review before Product Development has handed over the product development plan to the Purchasing department. Their involvement in the PDP, according to the checklist of the stage-gates, is today basically delimited to FMEA and basic evaluating and testing. There is today further no plan of involving the department during the product brief and pre-study in the PDP, where the Production Engineering department has been given the role as the connecting link between Product Development and the Quality department. This approach is however evaluated as a non-sustainable one, since Production Engineering acts on different values than the Quality department strives for.

5. Analysis

The analysis of this thesis follows a qualitative structure, where empirical findings are compared with current literature in order to identify root-causes and evaluate further improvement opportunities. The chapter is however not categorized according to the Affinity Diagram, as the conducted Affinity Diagram purposes to categorize and illustrate the main empirical findings and does not naturally point out the causes of the quality issues. Therefore, the points of the conducted Affinity Diagram have been transformed into common causes, which have been analyzed cause by cause. The transformation has been done by examining the interrelationship between the points within the different categories in order to find the common causes in those specific categories. When an interrelationship was found, the empirical findings were compared with current literature in order to label the interrelationship as a specific cause at BBAM.

In order for BBAM to manage the causes in the right order, the analyzed causes need to be put in relation with each other in order to identify the synergies between them. All causes are therefore finally interrelated with the aim of identifying root-causes (subchapter 5.6.), which the actual suggested improvements will be based upon.

5.1. Corporate Strategy

BBAM has a long-term goal of 10 % profit of the desired turnover. The revenues are at a sufficient level of reaching the long-term plan, where however the planned profit of 10 % is somewhat unreachable with the current strategy. The quotation *"We sell more, but to lower profitability"* clearly implies that the currently used strategy needs to address cost-efficiency to a greater extent (Juran & Godfrey, 1999). Hence, the current strategic focus on revenues is analyzed as a cause - *revenue-based strategy*.

The organization of BBAM is further dependent of its most prioritized performance objective - delivery performance - in reaching the mentioned goals and aims. There is however an opinion of delivery performance is being compromised by quality, which illustrates the misunderstanding of the performance objectives' definitions. Hence, the *lack of understanding of performance objectives* is analyzed as an additional cause.

5.1.1 Revenue-based strategy

The last years' not good-enough results have aroused awareness within the organization of BBAM that change regarding the organization's corporate strategy needs to occur. Customers are highly valued, where customer-demanded rework is basically always accepted in order to maintain a high level of customer satisfaction. This is however achieved to the expense of the own organization's profit. It is not sustainable to sacrifice profit in order to secure customer satisfaction, especially since there is no actual need of having such a radical approach. This approach has historically worked as a charm for BBAM, since profits were at such high levels that a part of the profit could be sacrificed for higher customer satisfaction. The organization had profit levels that made it possible to cover up the inferior quality and still make enough profit. Today however there is the issue of profits not being as high as needed to preserve this profit-consuming approach. As illustrated in the cost-benefit analysis[8] in figure 17, revenues are increasing but not to a higher profit, as costs are increasing faster.

[8] Cost-benefit analysis: Analysis tool that compares the benefits and costs of an alternative.

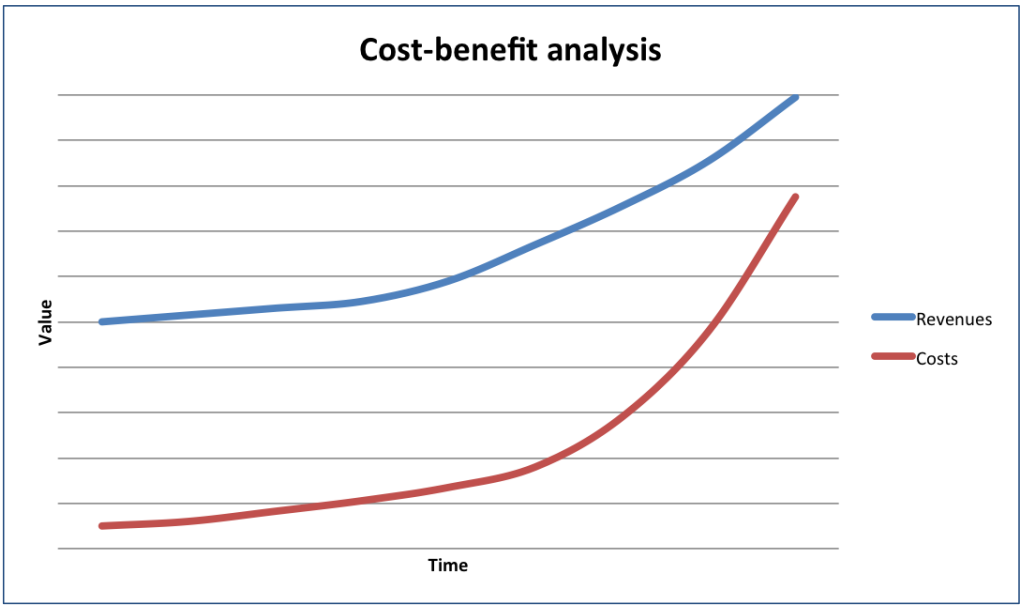

Figure 17. Cost-benefit analysis.

A more cost-efficient approach needs to be chosen, which means that there needs to be an organizational strive towards incorporating quality in the products from the first place. It could with Juran & Godfrey's (1999) two alternative paths towards higher quality - *features of products* or *freedom from deficiencies* - be explained as a need for change within BBAM from features of products to freedom from deficiencies. It would seem as more costly this way, but figure 5 *Relative cost of a design change* from Bergman & Klefsjö (2010) clearly implies that it is more cost-efficient to incorporate quality as early as possible instead of jeopardizing with quality and thereby risking of needing to do customer-demanded rework to an unilluminated and higher cost. For instance, people at BBAM act currently often according to their "gut-feeling", where products are pushed through the PDP in order to be fast to market and initiate revenue streams as soon as possible. This strategy has a few times shown to be very costly, as new product development projects have not been evaluated and tested enough. Consequently, costly design changes were needed due to insufficient quality. If more emphasis is put on incorporating quality early in the PDP, some early revenue streams might be lost but the major quality costs due to rework would be non-existent (Deming, 2000).

It is simple mathematics, really. Profit is generated from the subtraction between revenues and costs, and can be increased either by increasing the revenues or by decreasing the costs. The mentioned needed change of path, according to Juran & Godfrey (1999), is a simple strategy change from focusing on increasing the revenues to decreasing the costs. This needed change is further on indirectly confirmed by BBAM as well, since the current turnover is close to the desired level of BBAM in their long-term plan. The profit level is however far from the desired target, which means that costs within the organization need to heavily be decreased in order to achieve the long-term plans of the company.

5.1.2. Lack of understanding of performance objectives

It is no secret that delivery performance - on time deliveries with the right amount of products - is the most important performance objective for BBAM. The current distribution system has created a situation at BBAM where delivery performance cannot be jeopardized with, since customers are expecting full deliveries at specific times. This is further on valued by the customers and explicitly stated as a competitive advantage by BBAM as well. Unfortunately, it is a commonality to sacrifice quality if there exist a possibility of it jeopardizing delivery performance.

The current distribution system does not allow minor quality improvements due to the strict delivery policy, where products are sometimes deliberately delivered to customers with a high risk of the products returning as customer complaints due to quality flaws. By making the distribution system more flexible in terms of prolonging the delivery to the customer, the time for quality inspections would increase where quality flaws could be fixed. Quality by inspection is however the most basic and ineffective way of Quality Management, as illustrated by Bergman & Klefsjö (2010) in figure 4, and the value gained with this strategy would not compensate for the loss in delivery performance. Additionally, the increased quality inspections would, according to the vicious circle illustrated by Bergman & Klefsjö (2010) in figure 8, decrease the motivation among the employees and thereby directly decrease their performance. In a short-term perspective, quality by inspection may appear as an improvement, but in the long-term perspective it is not a sustainable way of assuring quality. There is thereby no further need of changing the distribution system in order to increase the quality, especially if it is to the cost of the competitive advantage that is delivery performance.

Quality and delivery performance are however not each other's opposites. In fact, quality and delivery performance are basically striving towards the same targets as quality nurtures delivery performance. The distribution system is evaluated as more than good, where the emphasis on delivery performance should instead be a strong and an additional reason for why quality needs to a greater extent be incorporated in the corporate strategy. Smith & Whitehall (1997) describes delivery performance and quality being a combined effort in an organization’s strive to reach dependability, defining dependability as the degree to which a product will deliver all promised features for a specified period of time assuming proper conditions of use. Since BBAM is already guaranteeing their customers a period of usability of five years, it would be wise to take their focus on delivery performance to the next level. This means that emphasis should be on transforming the organizational target of a high delivery performance into targeting an increased dependability, which incorporates delivery performance and quality into one target. BBAM is practically already ensuring their customers that internal emphasis is on dependability, with the high level of delivery performance and the five-year guarantee time. BBAM existing choice between quality and delivery performance should hence not be a question of prioritization, but rather combination.

5.2. Leadership

The general opinion within the organization that closer collaboration between hierarchical levels is desired is contradicting to the currently distanced management approach from top management. There is believed to be a gap between "the operative reality" and top management, where coordination and delegation needs to come from the highest level of the organizational hierarchy. The organization risks otherwise of jeopardizing the overall quality (Spenley, 1995), which is why the *distanced leadership* is analyzed as a cause.

The coordination issue is further exemplified by the non-existent coordination in the internal power domination struggle between assortment and manufacturing, where leadership is needed for keeping the power domination struggle at a constructive level. There is however a general opinion of leadership, at all levels, being inconsistent, which creates an undesired situation of misunderstanding and resistance. The *inconsistent leadership* is therefore analyzed as an additional cause.

5.2.1. Distanced leadership

Many of the interviewed people stated that the top management is using more of a distanced leading approach than what is desired by the organization, which gives a detached impression throughout the organization. The lack of presence experienced by the employees creates a gap between top management and operational management[9]. According to figure 8 this lack of leadership decreases motivation of hierarchically lower segments within the organization, which directly affects the performance of the entire organization. Organizational performance starts with committed leadership, where the lack of it creates a vicious circle of inefficiency and inferior results. That is why committed leadership, according to the TQM methodology, is one of the core values for achieving an efficient organization. Spenley (1995) clearly emphasizes the importance of committed leadership by describing it as an absolute necessity for an organization to create quality with its business.

The mentioned leadership issues within BBAM could be a plausible reason for why the set profit goals, in contrast to the sufficient revenue streams, are not achieved. That is because such data clearly states that there is sufficient focus on external customers as the desired revenue streams are achieved, but the high costs are preventing BBAM of achieving the set profit goals. The experienced gap between top management and the hierarchically lower segments clearly indicates a lack of focus on the internal customers, which can be stated as one of the main issues generating the high costs. Lack of internal-customer-nurturing generates, as mentioned above, unmotivated employees and consequently, inefficient process that are very costly. Hence, even if

[9] Operational management: Operative managers that have specific responsibilities within specific areas.

revenue streams are aligned with corporate target goals, inefficient processes affect negatively on profitability.

The situation could be further confirmed by one of the cornerstones of TQM - *focus on customers* - which states that it is in the long perspective necessary to have satisfied internal customers in order to have satisfied external customers. This means that it is the internal customers - the functions, the departments, and the employees - that create the value delivered to the external customers. Resnick (2013) describes it as a 1:1 relationship between employee satisfaction and customer satisfaction. Lack of focus on internal customers hence generates unmotivated people, creating inefficient processes and consequently, poor value to the external customers (Bergman & Klefsjö, 2010).

5.2.2. Inconsistent leadership

The lack of understanding between functions is an effect of the function-specific leadership that is present at BBAM, for instance the power domination struggle between assortment and operations. Functions are striving towards function-specific goals, where one function's optimization could have a negative effect on another. This additionally aggravates the relationships between functions, since no regard is taken to the effects that one function's actions could have on another function (Rieger, 2011). The ones who are responsible for communicating the overall goals are the actual managers of the different functions, and there needs to exist a collective strive towards these set goals. It is more of a rule than exception to have functions that are striving towards colliding goals, but it is the managers' responsibility to coordinate the function-specific goals according to the overall goals of the organization (Golhar & Kiella, 1997).

Consistency in leadership needs to be existent in order to create understanding across the organization, where one function's actions should not come as a surprise and negatively affect another one. It is a matter of clarity, where inconsistency creates an undesirable situation that is characterized of suspiciousness towards one's co-workers and a sense of needed battles with other functions. Inconsistency creates barriers within the organization (Rieger, 2011), which are according to Deming (2000) a root-cause of quality flaws since barriers block the process of communication and collaboration.

Consequently, it is an absolute necessity to create overall goals that are actually communicated across the entire organization in order to achieve a qualitative level of business (Spenley, 1995). It is the management's responsibility to define the visions and goals and communicate them downwards in the organizational hierarchy in order to achieve a unanimous aim towards the same goals (Golhar & Kiella, 1997). Further, consistent leadership needs to pervade through the entire organization, where interactions upward and downward in the organizational hierarchy should equally be addressed at all segments. Upwards, expectations need to be clarified and agreements on priorities need to be made. It is additionally important to provide feedback in order to eliminate the possibility of one's actions coming as a surprise to one's manager.

Downwards, clear and measurable expectations need to be set, where feedback needs to be provided of one's employee's performance (Resnick, 2010).

5.3. Culture & Communication

The culture and the people within heavily influence the organization of BBAM. There is a general impression of people having a hard time thinking outside of the box, which in relationship to change creates new conditions characterized at BBAM by interpretations. The understanding of the culture is further aggravated by the complexity of the organization. Every production plant is basically an organization of its own, which exemplifies the small-business culture that is pervading BBAM. It is a matter of adaption between culture and organization, where the current mismatch is unsustainable. Hence, the experienced cultural issue of a large organization with a small-business culture is analyzed as a cause.

Additionally, influences of the small-business culture are visualized in the communication channels of the organization, where it is common to interact on an individual instead of an employment basis. Information is communicated through informal channels as praxis, crippling the organization's ability of being systematic, which is why the *unstructured communication channels* are regarded as a cause.

5.3.1. Large organization with a small-business culture

The customs and norms within BBAM has basically maintained the same for decades, where no adaptation to the size of the organization has been made. There still exists an overall family feeling at BBAM, strongly influenced by the founding family and the loyal workforce. However, there is an experienced disadvantage with the family feeling at BBAM, especially as it is at BBAM characterized by a non-existing inclination to change, since people tend to have a hard time adapting to new conditions. The growth of the organization is by definition a matter of change and should culturally be adapted to and addressed as a change. Jones, Aquirre & Calderone (2004) emphasize further that it is needed to assess the cultural landscape in order to succeed with a change in general. However, there is no existing assessment of the cultural landscape, where there are a number of examples of the small-business culture that is pervading the large organization of BBAM.

To exemplify, the leadership style has changed over time at BBAM, where the previously strong involvement from the founding family has become more structured. The organization has however not adapted to the new conditions, where room for interpretation has been created. There is no one left in the organization that is strongly influencing decisions and choices, since there has been no clarified distribution of the responsibilities previously managed by the founding family. Even if people's work responsibilities involve these kinds of decisions and choices, there is apparently an overall impression of people interpreting instead of knowing. This interpretation-based way of business is both unstructured and non-qualitative, since it is based on

contradicting values to systematics and standardization. It enables individuals to take shortcuts and therefore jeopardize the quality instead of securing the quality of processes, which, according to the TQM methodology, setbacks the organization's ability to assure quality. Interpretations further cripple the organization's ability to successfully and cost-efficiently change and adapt to new conditions, since people as a rule tend to resist change and the resistance is especially emphasized if the reasons for change cannot be systematically analyzed and communicated (Jones, Aquirre & Calderone, 2004).

An additional example of the small-business culture is the experienced differences between the production plants, where every production plant is like an organization of its own. It is expressed as hard for an employee at a specific production plant of BBAM to grasp the size of the organization and to understand the overall goals. It is perceived, with consideration to Carlzon's (1987) three major elements of stimulating participation, as an insufficient effort of communicating, delegating as well as training. Employees cannot envision the organization from an overall perspective (Carlzon, 1987), since relevant information is not communicated and too specific work responsibilities are delegated to them. A plausible reason for the mentioned shortcomings is the non-existent welcome program for the new employees, where BBAM from the start does not provide sufficient information about the values and vision of BBAM. In order to create a sense of professional and personal pride with one's work, there needs to be an overall understanding of the expectations and the outcome of actions (Carlzon, 1987). Bergman & Klefsjö (2010) elaborate further about the needed overall understanding as a matter of avoiding mistakes that occur due to ignorance and misunderstanding.

Hence, there needs to be an adaption of the culture to the size and growth of the organization. Otherwise, there is the risk of the culture being the ceiling that prevents BBAM from achieving greater success (Resnick, 2007). It is further a matter of updating the internal customers, where Resnick (2013) emphasizes the importance of one's employees as a 1:1 relationship between customer satisfaction and employee satisfaction. Therefore, a unanimous strive towards letting everybody feel committed, in line with the TQM methodology, needs to be existent, which can be achieved by fulfilling the three major elements of stimulating participation (Carlzon, 1987) - training, delegation and communication.

It is necessary for BBAM to incorporate training from the start (Deming, 2000), where employees are familiarized with the overall vision and values of the organization. Further, it is a matter of preventing mistakes and creating understanding of the actual business. Carlzon (1987) exemplifies it through the anecdote with the two stonemasons, which clarifies peoples' need of having a sense of pride with one's work. This can only be achieved if possibilities for individuals to advance on a personal level are created (Deming, 2000) as well as if enough challenging work responsibilities are delegated to them (Carlzon, 1987). Delegation is however analyzed as restricted at BBAM, since the small-business culture is heavily dependent of the centralized leadership. BBAM needs to however drive out fear among their employees (Deming, 2000) in

order to be able to utilize on the know-how of the employees through delegation. The third and final major element of stimulating participation, according to (Carlzon, 1987), - communication - is separately analyzed since its impact is defined as a cause of the quality issues existent at BBAM.

5.3.2. Unstructured communication channels

Communication is heavily influenced by the small-business culture, where people in general try to solve issues by communicating with already known individuals, even if these individuals have changed work responsibilities within the organization. The mentioned issues with information management, where individuals search for more information than needed, are plausibly an effect of these individual-based interactions.

Individual-based interactions are unstructured and thereby, according to the grapevine[10] definition, part of the informal communication channels within the organization, which, if used as a rule instead of as an exception, can with time be regarded as a standardized communication channel. However, informal communication channels are only supposed to be supplements to the formal channels (Mishra, 1990). There are of course advantages with informal communication channels, but could, if used to a greater extent than the formal channels, be an obstacle or problem instead of a benefit due to the grapevine's unstructured and undocumented nature. Since no clear path is existent of where information should be communicated (Mishra, 1990), it gives the impression, to the ones not getting the information, of that information needs to be gathered. This need is further confirmed at BBAM by meetings mostly existing to solve instead of inform.

A plausible symptom of the unstructured communication channels is the mentioned drawing issue, where different examples of the same drawing exist. This issue is however not only internal, as it is not uncommon that suppliers to BBAM sometimes have inaccurate versions of component drawings. As can be seen in Appendix B, the second most occurring error-code is error from external supplier, which to a large extent is believed to be a consequence of the inaccurate versions of component drawings. When BBAM receive customer complaints regarding components that are not manufactured by BBAM themselves, they automatically categorize the complaints as errors from external suppliers. It could therefore be argued if it really is a wrongly manufactured product or if the supplier has manufactured correctly, but from an inaccurate drawing. It is therefore believed that the amount of quality issues from external suppliers could be reduced if a more systematic and continuously updated channel of communication existed, preventing suppliers and BBAM of having different drawings.

What is needed from BBAM is to structure the communication channels by formalizing them. This does not mean that informal communication channels should be controlled, which is an impossible action (Mishra, 1990), but instead managed. It is a matter of creating an overall

[10] Grapevine: Informal transmission of information, rumor, or gossip from person to person.

understanding of the organization and the people within it, in order to, according to Griffin & Hauser (1996), enlighten the existing barriers within the organization. Barriers block the process of communication, which, at BBAM, is obviously already envisioned by the mentioned issues with the inconsistent leadership and the different goals from function to function. To avoid the needed compromises with the involvement of additional functions, shortcuts are taken to different extent (Rieger, 2011) where informal communication channels are chosen ahead of the formal ones since they are more suited. Consequently, it hardens the barriers between functions in a repetitive vicious circle, where an organization's internal battle jeopardizes the competitive ability (Deming, 2000). It is therefore a necessary pre-step to remove barriers across the organization in order to formalize the communication channels, since barriers limit the possibilities of communication (Griffin & Hauser, 1996). To successfully remove the existing barriers, BBAM needs to analyze the underlying cause and impact of barriers in order to prioritize among them, based on their influence and the difficulty of removing them (Rieger, 2011).

5.4. Product Development Process

The newly established product development process is within BBAM more regarded as a product launch process than a specific PDP, since collaboration between functions is mainly emphasized on in the end of the product launch process. The involvement and competence of other functions, such as manufacturing, is thereby only utilized in the later phases of the PDP, which jeopardizes the actual manufacturability of the product. Hence, the *late cross-functional involvement* is analyzed as a cause of the existing quality issues at BBAM.

Additionally, The shifting project leaders within the PDP process, where two project leaders are in different phases responsible for one specific project, is experienced as unsustainable, since it creates room for misinterpretation and conflicts. The PDP process needs to be driven with clarity as its cornerstone, where there is no room for overestimations and lacking detail specifications. The *dispersed responsibility* is thereby regarded as an additional cause of the quality issues.

5.4.1. Late cross-functional involvement

BBAM history of having failed product development projects may have many causes. Some fail due to costly investments and some due to the PDP not being structured enough. However, many times these problems are discovered very late and require a step back in the process, which is very costly with respect to both time and money.

Mascitelli (2006) connects this kind of issues as a consequence of poor early considerations of manufacturability and lack of communication across functions, which is the case with BBAM current launch process illustrated in figure 15. The current launch process does not involve manufacturing within the process until the pre-study, which is right before the physical design of the product. At this stage, the market analysis is done and the initial industrial and 3D-designs

are already established before involving manufacturing within the project. This way of integrating functions is what Wheelwright & Clark (1992) defines as a serial mode of interaction, where functions do not start working until the previous tasks are done by another function. It illustrates a one-shot transmission of information, which is very risky and inefficient. As manufacturing have not been involved earlier in the process of BBAM PDP, there is the risk of the product designs not being compatible with the current manufacturing capabilities. The mentioned product development project with the new type of task chair, that was hastened to launch, was basically launched without any consideration to the manufacturability. Hence, the design needed to be changed in order for it to fit manufacturing capabilities, which is both costly and time consuming. Manufacturing could consider acquiring technologies that are compatible with the design, which takes time and delays product launch. Or, one comes to realize that the incapable manufacturability will be too costly either way and the project is deleted.

In order to prevent the costs of such miscommunication, it is necessary to involve all functions within each task that shapes the next task, which means decisions that will directly affect the input of the next task. This would mean an integrating problem solving communication, where decisions are made on data and correct analysis, preventing future drawbacks like the described examples. Ulrich & Eppinger (2000) state that manufacturing should be involved as early as in the planning phase, which means that BBAM need to involve manufacturing right after the Assortment Plan is made. Manufacturing could in this early phase already identify possible productions constraints and set a supply chain strategy, even if the actual design of the product is not yet done (see figure 11). In this way, the project gets an early indication of the product's manufacturability, which eliminates some risk for future development. Within the next phase of creating a product brief, manufacturing could already start to estimate the manufacturing costs and assess further production feasibility. This way of integrating manufacturing is much more efficient than the way BBAM are integrating them today. In todays BBAM, manufacturing is not involved until the pre-study, which unfortunately is what causes delays, redesigns and high costs.

As elaborated previously, communication barriers exist within the organization of BBAM. These barriers must be eliminated within the PDP in order to achieve a full cross-functional integration. An efficient first step towards such integration is what Griffin & Hauser (1996) call coordinating groups. Such a group consists of people with balanced perspectives within different functions, which enables them to work effectively with several specialist groups over a long period of time to both facilitate and monitor processes. They can contribute to less political power dominations due to their objective view, which improves the speed of conflict solving and decision-making. The difference in organizational responsibilities is mediated between different functions by the established group, which avoids confusion, and they further helps the people of the different functions to get insight into other peoples responsibility, hence increasing understanding for the whole business and the consequences of actions. Such co-ordination groups could manage a cross-functional flow of new-product development and achieving higher market success and profitability. However, such co-ordination groups require people that are responsible for the

project through the whole PDP. This is an issue in within BBAM today, as the responsibility of the product development project is spread on two project managers.

5.4.2. Dispersed responsibility

Within the PDP at BBAM, there currently exist a project leader for the initial phases, where all the market research, initial designs and planning is done. However, within the last step of the PDP, the product development project phase, the project leader hands over the responsibility to another project leader that takes it through the activities regarding prototyping and test-series. The case presented in the earlier chapter is an example of that consistent leadership is a prerequisite for a full cross-functional integration within BBAM, which is not provided by having such shared responsibility for processes. Although, one can argue for many reasons of why it is problematic to have two leaders for one single project and why these needs to be reduced to one.

First of all, having two people leading a project creates the earlier analyzed issue of inconsistent leadership, which has been further evaluated as causing distance between people causing an inefficient process. The inconsistency further creates barriers between people, which in this case divides the project into two "teams". People within the "first phase" of the project respond to the first project leader, and people for within the "second phase" respond to the second project leader. This evolves to a power domination struggle within one single project, which is existent within the PDP at BBAM today, causing all issues elaborated on in chapter 5.2.2. Inconsistent leadership.

Second of all, the project leaders themselves only work towards their individual goals, not taking responsibility for the whole project. Therefore the first project leader only makes sure to make his or hers tasks right and when handing over the project, he or she do not take responsibility for further processes and blaming further errors on the second project manager. Further the second project manager only takes responsibility for his or her tasks, blaming all errors within the process on bad previous leadership from the first project leader. There is hence a lack of clear prioritization of activities and tasks, where the two project leaders chose to do what fulfills their own responsibilities instead of considering the best for the project in a whole (Mascitelli, 2006).

In addition, this is the case with product managers from assortment as well, as they are involved within the PDP only until the pre-study. Product managers are responsible for approving the product-brief, containing among other sales volume of the products, before the project continues into pre-study. However, the lack of correct information within these product briefs and the often-optimistic sales volumes causes problems for BBAM. High forecasted sales increase the chance of the project to be funded, which is obviously what one want as a product manager. As there is a lack of consistent leadership and shared responsibility, these analysis is often made in order to get the projects through, on the expense of later stages of the supply chain, manufacturing & sales. That is because according to the forecast BBAM buy inventory in order

to fund the manufacturing, but when the sales are not as high as they should be, BBAM is left with costly inventories. This is one of the seven major wastes presented by Ohno (1998), which consumes resources without adding any value for the customer (Morgan & Liker, 2006). This cost of capital is unnecessary and contributes to inefficient operations and hence low total quality, all due to dispersed responsibility within the PDP.

Lastly, there is an issue of losing information when such a switch in leadership is made. The second project leader obviously does not have the same base of information regarding the market analysis and planning of the project. No matter how well you document all steps within the PDP, there is still a gap of tacit knowledge[11] that is not transferable. There is hence a risk of the output not being as initial planned as the second project leader do not possess enough information to correctly transform market requirements into physical products, which causes deficient attention to customer needs and hence bad product quality (Wheelwright & Clark, 1992). This is a clear illustration of the issue of inefficient process control and synchronization described by Wheelwright & Clark (1992) as well as by Clausing (1994) and Fiore (2005), which is costly both with respect to time, money and project output.

All these issues are consequences that are current at BBAM, where products delay within the PDP due to the lack of dispersed leadership and information flow causing redesigning, non-manufacturability and faulty analysis. Milestones are hence pushed forward and product launches are delayed, and the causing variable is considered to be the dispersed responsibility within the PDP projects. It is hence a necessity to only have one project leader for each project, who is responsible for all activities, making it impossible to blame errors on others. Consequently, the project leader will work more efficient and the product development team will follow the example and create an efficient PDP, which is a prerequisite for a TQM organization.

5.5. Quality in practice

Quality is managed in practice through a reactive approach, where the individuals within the department of Quality are regarded as *"firefighters"*. The applied approach is hindering the department from being more involved, since their competence is merely utilized when problematic areas need to be managed. To succeed the transformation of being proactive, a review of one's work approach needs to exist. The currently used standards and systems need to be reevaluated, where the current cost-based targets of quality flaws need to be changed to being more suitable for the actual management of processes. Hence, the used work approach that is *quality by inspection* is analyzed as a cause of the quality issues.

Additionally, to succeed with one's desires of being more systematic and standardized, there need to exist a foundation within the organization that is based on learning. This requires that

[11] Tacit knowledge: Implicit knowledge that is subliminal.

time is utilized to learn from one's improvement work, where the PDSA cycle needs to be used to its full potential. It is a matter of definition, where standards need to be defined in order to create a homogenous understanding of how to deal with issues. For quality in general it is not sustainable to have different definitions of what quality is, which is why the *lack of standardization and learning* is analyzed as a cause of the quality issues.

5.5.1. Quality by inspection

The current approach used within the Quality department and BBAM could with the help of Bergman & Klefsjö's (2010) definitions (see figure 4) be defined quality inspection, since value-adding quality actions are only made after the actual production of products. Problematic areas are dealt with when they are regarded as alarming, but no post evaluation is made and there is no real learning from previous mistakes. The knowledge within the Quality department is only used when quick fixes are needed, which is contradicting to Deming's (2000) 14 points of management where a strive towards ceasing the dependence of quality inspections is necessary. It is a matter of expectations, where expected quality issues actually create quality issues (Bergman & Klefsjö, 2010), which as well is confirmed by the vicious circle in figure 8.

For BBAM, which are striving towards being more cost-efficient, it is a requirement to change the management of quality. As figure 5 illustrates, it is more costly to reactively manage quality instead of initially incorporating quality. Quality by inspection is an ineffective management approach (Bergman & Klefsjö, 2010) in one's strive towards generating profit from cost reduction, since a systematic and preventing approach needs to be used in order to be able to continuously improve and reduce cost (Juran & Godfrey, 1999). Therefore, an advance in efficiency of BBAM management of quality is required, where an overall strive towards an implementation of TQM is suggested.

A needed change at BBAM in succeeding with the implementation of TQM is the overall understanding of one's current goals and targets with quality. The set target levels with customer complaints are based on cost, where data is compiled merely with respect to how much it will cost BBAM. It is a direct contradiction to the methodology of TQM, since there is no clear focus on processes with the compiled data merely being used to monitor the costs. By having a cost-based target with quality flaws across the entire organization, there is an increased possibility of acknowledging alarming processes later than necessary. The most alarming processes are not pinpointed by this approach, since a more costly product could create more costs than a cheaper product that is produced within a more unstable process. For the Quality department at a company as BBAM, where products differ heavily in cost, it is a surreal view of one's processes, since no accurate evaluation can systematically be made (Bergman & Klefsjö, 2010).

Resnick (2010) describes it as an issue of understanding expectations between hierarchical levels, where the Quality department has simplified the task by using target levels that are easily understood by all individuals within the organization. However, there is currently no

understanding of the variation within processes, which blocks the organization's ability to continuously improve processes since there is no compilation of data that indicates needed improvements (Bergman & Klefsjö, 2010). The Quality department cannot thereby be anything else than reactive, since the only existing indications of needed improvements are the direct flaws in and after production.

Hence, an analysis needs to be done by the Quality department in order to secure the foundation for implementing a systematic and standardized approach as TQM, where the cost-based target levels are translated into amount-based target levels. It is basically a matter of explicitly stating the stability of processes (Bergman & Klefsjö, 2010), which is impossible to envision with the current approach. It is further a matter of understanding that cost-based target levels are more suited to be used by management higher up in the hierarchy, where the Quality department needs to complement the cost-based target levels with measurable target levels that are useful for the management of processes (Bergman & Klefsjö, 2010).

The set target levels need to further on be based on factual data, which means quantitatively conducted target levels that are continuously reviewed according to the prescribed circumstances. At BBAM however, the set target levels of approximately 1 % of the turnover for customer complaints are invariant and set with no further explanation. To be able to improve one's management of quality, there needs to be an understanding of the dynamics of quality (Deming, 2000). If a certain level of quality is achieved, then, as Bergman & Klefsjö (2010) describe it, *"there is always a way to get improved quality using less resources"*. To succeed with this, a continuous review of one's target levels needs to be existent, where the set target levels are lowered when the current set target levels are met. Thereby, the emphasis will be on a continuous strive towards being better (Deming, 2000), which in correlation to Juran & Godfrey's (1999) teachings, enables an organization to higher profits even with invariant revenues.

5.5.2. Lack of standardization and learning

According to Garvin's (1993) five characteristics of a learning organization, BBAM is experienced as an organization that does not utilize its potential. The organization's ability to learn is somewhat lacking, where, due to the reactive approach of the organization, time is not set aside for actual learning and follow-up.

To exemplify, the PDSA cycle is not fully utilized at BBAM, since the organization uses it merely to plan improvements. In general, The PDSA cycle goes through the initial three phases - *Plan*, *Do*, *Study* - but does not actually reach the *Act*-phase. The purpose of the PDSA cycle is to be more than a simple planning tool, since it purposes of creating awareness of further improvements in a continuously circling motion[12] (Bergman & Klefsjö, 2010). At BBAM

[12] Continuously circling motion: The PDSA cycle does not stop in the Act-phase, but continuous into a new PDSA cycle and specifically a new Plan-phase.

however, merely problems are addressed as in need of improvements, where no further emphasis is put on improving the flawing processes that are causing the problems in the first place. It is a matter of *creating constancy of purpose for improvement of product and service* as Deming (2000) states it. Hence, the PDSA cycle should be utilized to a greater extent at BBAM, which could be an initial step towards being more focused on continuous improvements.

A necessary pre-step for improving continuously is to secure the ability of the organization to learn, both from the experience of the organization, good or bad, and the best practices of others (Garvin, 1993). Since positive experiences are always easier to remember and learn from, additional emphasis should be on the actual learning from one's negative experiences. Garvin (1993) characterizes a learning organization as systematic and standardized in its problem solving approach, which does not describe the current approach used at BBAM. Time and resources are merely invested in solving a problem as fast as possible, where no desire of discovering why the mistake occurred in the first place exists. Thereby, an overall strive towards standardization should exist at BBAM, which means that processes in general should be evaluated and standardized. It is matter of creating definitions, where it is not sustainable to have different definitions of quality within a single organization. The results of an overall succeeded standardization would, as can be seen in figure 18, create an overall understanding of the needed actions towards raising the level of the management of quality at BBAM.

5.6. Root-cause analysis

The analyzed causes within the earlier subchapters of the Analysis are all separately seen as causes of the quality issues within BBAM. It is however hard to envision how to manage the mentioned causes, since they are analyzed in isolation and can hence be seen as independent of each other. The purpose with this section is hence to clarify what causes are the root-causes that trigger other issues within the organization by identifying the interrelationships between the analyzed causes, which are illustrated in figure 18.

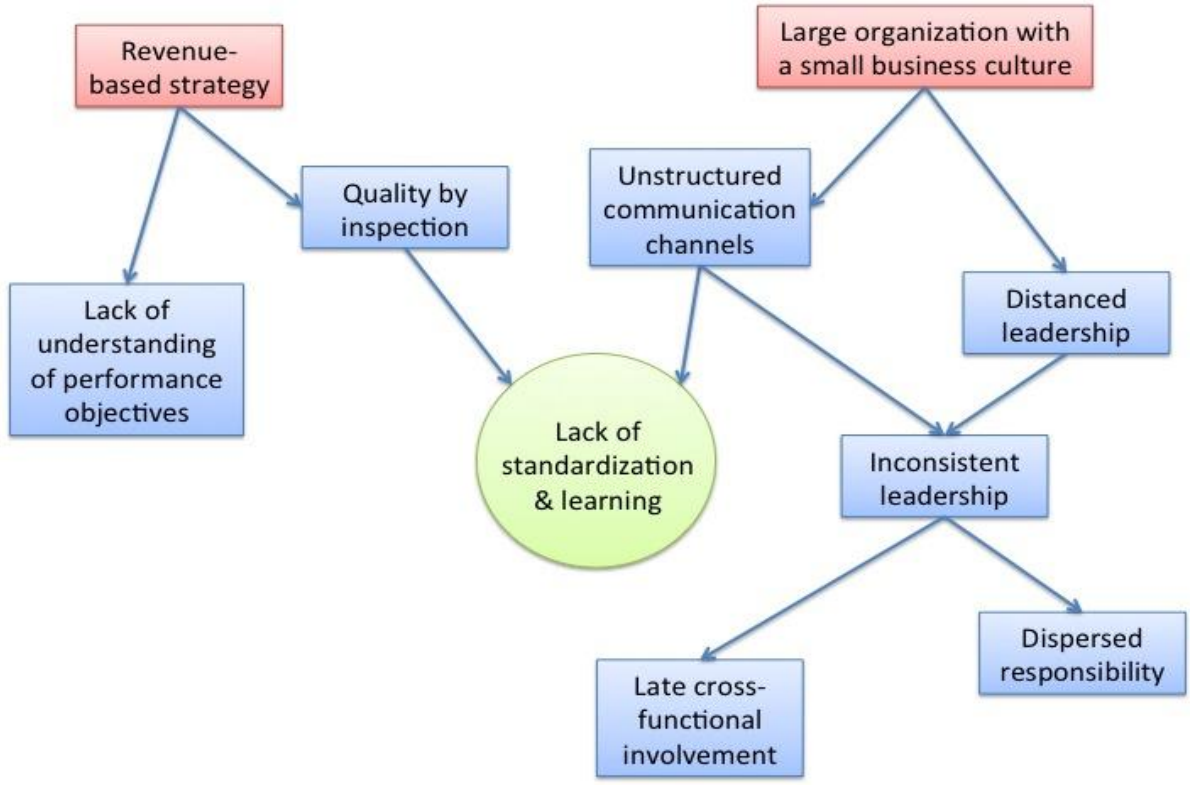

Figure 18. Root-cause analysis.

The ten causes analyzed in this thesis have differential impact degrees on the overall business, where some are more specific and others more general. To exemplify, the issues within the PDP process may be considered as process specific causes, but as shown in section 5.4, these issues are causing much of the customer complaints due to faulty products. However, the PDP issues of *late cross-functional involvement* and *dispersed leadership* are managerial issues that origin from *inconsistent leadership*. If BBAM would structure and define the responsibilities among all functions, they would be half way of solving the issues within the PDP. Hence, the issues of late cross-functional involvement within the PDP and the dispersed responsibility in having two project leaders are not considered as root-causes of the quality issues.

The issue of inconsistent leadership is causing problems within the PDP as well as other parts of the organization. There is a general need of understanding the overall goals of the organization, where it is the management's responsibility to communicate these specific goals and adapt to them. The leadership being inconsistent is however an issue of unstructured communication and lack of clarification. Therefore, the issue of inconsistent leadership is generated by two other analyzed causes - *unstructured communication channels* and *distanced leadership*. The gap between the new top management and middle management causes ambiguous messages, which enables decision-making based on interpretations. In combination with the identified barriers and

unstructured communication channels, which also contributes to the variation in information, this causes the inconsistency that is existent. Hence, the inconsistent leadership is regarded as a symptom rather than a root-cause.

When the founding family left the role as primary leader and decision maker, they automatically left a challenge for the new formal organization. The challenge was to fill the space in giving clear guidance and actively manage every process of the organization. This requires a large amount of reorganization, where the primary challenge is to change the mentality and culture within the organization, and move from a single ruled owner to an organization managed in unity. As this situation is still relatively current, the reorganization has not yet reached the lower segments of the organization. This has caused a situation where a large organization still has a small business culture throughout the lower levels of hierarchy. This creates a gap between top management and the organization, a gap that is analyzed as distanced leadership, causing inconsistent leadership and in turn causes issues within the PDP. This also causes the informal communication channels that are existent within the company, where divisions and functions are still considering themselves as self-operating organizations. Hence, a root-cause identified among the ten causes analyzed is the old small business mentality that is existent within the now large and developed organization (*large organization with a small-business culture*).

It could be argued for the old culture existent at BBAM also contributing to the second root-cause of the quality issues - *revenue-based strategy*. That is because such a strategy is common in small business in order to increase in value, but when scaling into continuous revenue flows, focus is commonly shifted into increasing profit by decreasing costs. One could think that this path is also the case for the now large and growing organization of BBAM, but it is not, as the revenue-based strategy is still operating. This root-cause brings on the cause - *lack of understanding of performance objectives*. As the focus is on revenues, products are shipped to customer with the aim to keep revenue streams, even if it would mean costly customer complaints. This strategy also causes the low prioritization of quality, which is illustrated by the quality-work approach of *quality by inspection.* If the strategic focus would shift to saving costs, the emphasis would be much more on incorporating quality earlier in the product cycle instead of inspecting poor quality in the end of the cycle. There would hence be a need of a standardized way of working with quality in order to increase quality and save costs. The above leads to a *lack of standardization and learning*, which is also hold back by the barriers in the unstructured ways of communicating. This cause is a symptom of both the root-causes, and should hence be focused on when reaching a qualitative organization.

6. Conclusion & Recommendations

This chapter is divided into two subchapters – conclusions and recommendations. The conclusions purposes to answer the research questions of this master thesis and are structured according to them. As the third and final research question needed to be complemented with an action plan in the form of recommendations, it will be answered more in detail in the second subchapter as recommendations. The overall recommendation is an implementation of TQM, since the methodology of TQM emphasizes on areas that BBAM needs to improve. With consideration to the overall recommendation, the cause-specific suggestions are categorized according to the cornerstones of TQM.

6.1. Conclusions

The aim of improving the quality management at BBAM is hereby concluded, by directly answering the research questions of the master thesis at hand.

What are the quality issues at BBAM?
The quality issues at BBAM are mostly titled as construction errors and errors from external supplier, were approximately 45 % of all customer complaints are addressed as either an error of construction or error from external supplier. It is important however to keep in mind that the quantitative findings were merely a method of guidance towards overall quality causes within the organization, where the qualitative findings brought deeper insight towards identifying the actual root-causes. Since the practical approach of the master thesis was to start from the external symptoms and research backwards in the value chain of BBAM, additional causes aroused during the qualitative research. These were further highlighted as plausible interrelated effects or roots to the mapped causes.

What are the primary root-causes for the quality issues?
In total, ten causes were identified for the quality issues within BBAM, which with respect to their origin were organized into five categories - corporate strategy, leadership, culture & communication, PDP and quality in practice. Two of these causes are considered as root-causes that procreate the other eight - the fact that BBAM has a revenue-based strategy and the undeveloped small business culture that is existent in the now very large organization.

The revenue based strategy makes the organization blind for costs, which is the reason of why quality management is only on the basis of inspecting final products. There are no standardized quality assuring processes and hence no way for learning from experiences. This is also a consequence of the gap between the small-business culture and the large organization, which contributes to unstructured communication channels as well as distanced and inconsistent leadership, causing issues in the PDP process as well as throughout the entire organization.

How can the root-causes be reduced/eliminated?
In the opinion of the authors, there is a need of an overall strive towards implementing TQM in order for BBAM to successfully manage the impact of the root-causes. As figure 18 illustrates, it is primarily a matter of need for standardization and learning, which the methodology of TQM emphasizes on. This requires that the cornerstones of TQM are incorporated in the Quality Management of BBAM. The actual implementation of the TQM methodology is out of the scope of this master thesis, but it is in the opinion of the authors believed that potential within BBAM exists of succeeding with one's desire of being proactive. In order to succeed, Deming's 14 points for Management are suitable path towards TQM, where BBAM could gain great organizational knowledge by grasping the teachings of Deming. Since it is a matter of change and advancement in Quality Management, there is also a need for Change Management. The 10 principles of Change Management by Jones, Aquirre & Calderone (2004) are for this purpose worthy of consideration for the organization of BBAM. However, the emphasized causes need to be resolved in order to ease the actual implementation of TQM and the actual change from being reactive to being proactive.

6.2 Recommendations

As can be seen in the figure 18 describing the root-cause analysis, the focus of BBAM should be on standardization and learning. There is a need for change in order for BBAM to create a sufficient foundation for a more advanced systematic-based management approach of quality then currently used. To ease the visualization and concretize the recommendations, the cornerstones of TQM will be used as a framework to categorize the suggestions.

Focus on customers
To succeed with one's desire of being customer-oriented, it is not sustainable to maintain sacrificing profit in order to modify customers' flawing products. Customer satisfaction should instead be gained by creating quality from the first place. It is therefore recommended for BBAM to advance in one's prioritization of performance objective from delivery assurance to dependability, which targets a high level of delivery assurance as well as a high level of quality. Thereby, the organization will practically be forced to strive towards a more systematic and standardized management of quality.

"Create instead of inspect quality"

Base decisions on facts
A cost-based strategy should be incorporated, where the primary emphasis should be on decreasing costs instead of increasing revenues. This is further confirmed by the strategic long-term plan of the ten percent profit level, which clearly indicates that a more cost-efficient approach needs to be incorporated within the organization of BBAM.

"Gain profit by reducing costs"

Focus on processes
Instead of focusing on deficiencies of single products, emphasis should be on managing processes. In order to secure the organization's ability to manage the existing processes, quantitative target levels need to be set. The current cost-based quality target levels are merely controls of deficiencies, where no indication of the stability of the processes exists. Instead amount-based quality target levels need to be used when evaluating and managing one's processes.

"Manage the processes instead of control the deficiencies"

Improve continuously
In order for BBAM to create the necessary foundation for improving continuously, used tools such as the PDSA cycle, need to be utilized to its full potential. The purpose of the PDSA cycle is not merely to plan improvements, but primarily to initiate further improvements through the current ones. It is therefore important to set aside the necessary time to complete the whole cycle, as the benefits from doing so are much greater than what is currently believed at BBAM.

"Improve continuously by utilizing the entire PDSA cycle"

Let everybody be committed
In order to create a sense of organizational commitment, organizational barriers need to be eliminated. To achieve this, BBAM needs to analyze the underlying cause and impact of barriers in order to prioritize among them. This should be done based on their influence and the difficulty of removing them. It is a matter of formalizing the communication channels, which are purposely avoided due to mentioned barriers within the organization.

A necessary action towards removing mentioned barriers is by creating an overall understanding of the entire value chain within the entire organization. This means that collaboration across functions needs to be encouraged and deliberately chosen by any function in any given situation. To simplify, this means that manufacturing needs to be involved earlier in the PDP, preferably after assortment council has approved the assortment plan. Manufacturability would thereby be more emphasized and non-constructive conflicts could be avoided if projects were stopped in time. It would also be more efficient from a cost perspective (see figure 5).

In order for employees to feel committed, it is necessary for the organization of BBAM to create opportunities for personal development. A necessity of achieving this is by initiating a welcome program for new employees, where one's responsibilities are clarified from a holistic and a detailed perspective as well. Employees need to understand what impact their actions will have on the organization as well understand the expectations that exist on an employee of BBAM. Such training would make the employee feel more important and hence increase their motivation to work.

"Strive unanimously towards the overall goal of the organization"

Committed leadership
Management in general needs to be evaluated and clearly defined. This is required in order to guarantee consistent leadership across the entire organization. It is not possible to implement a more advanced management of quality, such as TQM, without committed and clarified leadership. Within the organizational hierarchy, the expectations on people need to be more clarified and measurable responsibilities need to be set both downwards and upwards in the organization.

It is a matter of definition, where room for misinterpretations need to be eliminated. To achieve this, the mentioned shifting leadership within the PDP needs to be changed to one coordinating group or one single leader being responsible for every specific project. This would create constancy and less political power dominations and increase the speed of the decision-making.

"Lead responsibly by example and presence"

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[13] Anderson: Fictive source of reference that is representing an actual source.
[14] BBAM: Fictive source of reference that is representing an actual source.

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Appendix A. The error-code manual

- Table A.1.

The error-code manual with the exception of error-codes originating from the sales subsidiaries.

11 Construction error
12 Construction change
13 Ending article
21 Sorted production
22 Measurement and processing error
23 Veneer release
24 Veneer missing
25 Veneer crack
26 Edge spline error straight edge
27 Glue error
28 Polish error
29 Drill error
30 Color and structure error
31 Broken chipboard
32 Massive timber crack
33 Edge spline error figurative edge
34 Broken frame
35 Cut error
36 First production example
37 Weld error
38 Sewing error
39 Place error
40 Optimization error
41 Lacquer error
42 Bad finish
43 Edge injection error
44 Laminate error
45 Edge spline error lacquering
46 Edge spline error supplier
51 Dressing error
52 Assembly error
53 Rasp
54 Bad paring
56 Wrong kind of wood
57 Functionality error
58 Fabric error
59 Error from ext. supplier
60 Rejection primary detail
61 Handling damage
62 Press mark
63 Scratch
64 Sun mark
65 Distribution damage
66 Moisture damage
68 Rework due to BBAM
72 Delivery error

Appendix B. Quantitative data of customer complaints

- Table B.1.

The total amount of all customer complaints, compiled with consideration to product group and error-code.

Product group / Error-code	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 8	No. 10	Total
11	4559	3304	573	31302	6525	1338	2022	13494	63117
12	4	1	0	0	0	0	50	0	55
13	13	0	0	1	0	0	0	0	14
21	0	0	0	0	0	0	0	0	0
22	140	250	123	3779	84	7	30	5521	9934
23	73	74	0	4	48	13	0	5	217
24	58	31	0	12	2	0	0	5	108
25	57	34	0	30	721	22	0	9	873
26	272	49	0	0	0	0	0	12	333
27	44	12	34	0	2	0	0	8	100
28	21	3	1	0	0	0	0	9	34
29	39	130	0	15	23	4	1	608	820
30	217	103	0	5	4	144	2	10	485
31	5	23	0	0	0	0	57	6	91
32	7	4	0	6	19	12	1	20	69
33	266	3	1	0	0	0	0	7	277
34	34	203	1	110	491	212	32	293	1376
35	0	0	0	1	1	4	0	0	6
36	0	0	0	0	0	0	0	0	0
37	594	13	12	180	520	236	71	841	2467
38	0	0	0	492	158	77	41	59	827
39	0	0	1	202	17	1	0	1	222
40	40	0	0	0	0	0	0	0	40
41	9138	925	49	4	105	20	221	382	10844
42	31	12	0	6	13	1	0	13	76
43	0	0	0	0	0	0	0	0	0
44	2390	4	0	0	59	0	0	52	2505
45	4	0	0	0	0	0	0	0	4
46	5	0	0	0	0	0	0	0	5
51	39	121	224	774	661	198	85	764	2866
52	2928	4182	711	1329	820	106	-105	15292	25263
53	0	0	0	30	38	45	20	11	144
54	39	7	0	0	0	0	0	0	46
56	565	217	63	0	13	5	10	164	1037
57	1199	1213	291	6254	845	151	375	20644	30972
58	0	0	48	706	3553	62	17	66	4452
59	13864	1161	245	12403	1575	130	302	8635	38315
60	0	0	0	0	0	0	0	0	0
61	1	0	0	0	0	3	0	0	4
62	633	214	33	20	18	3	64	42	1027
63	1399	731	55	82	99	11	174	138	2689
64	0	0	185	0	0	0	0	0	185
65	2969	3621	406	1383	887	287	603	1421	11577
66	291	213	53	101	26	19	1	20	724
68	0	0	0	2	0	0	0	0	2
72	2334	795	1631	481	441	53	31	1383	7149
Total	44272	17653	4740	59714	17768	3164	4105	69935	**221351**

- Table B.2.

The total amount of customer complaints, compiled with consideration to year and error-code. The customer complaints were then in percentage distributed to the specific error-codes.

Year	**2010**	**2011**	**2012**	**2013**		
Error-code					**Total**	**Distribution**
11 Construction error	15873	20518	20282	6444	63117	**28,51 %**
12 Construction change	54	0	1	0	55	**0,02 %**
13 Ending article	13	0	1	0	14	**0,01 %**
21 Sorted production	0	0	0	0	0	**0,00 %**
22 Measurement and processing error	406	5183	3937	408	9934	**4,49 %**
23 Veneer release	70	77	54	16	217	**0,10 %**
24 Veneer missing	49	33	14	12	108	**0,05 %**
25 Veneer crack	154	58	643	18	873	**0,39 %**
26 Edge spline error straight edge	121	114	60	38	333	**0,15 %**
27 Glue error	64	26	7	3	100	**0,05 %**
28 Polish error	8	12	10	4	34	**0,02 %**
29 Drill error	720	56	23	21	820	**0,37 %**
30 Color and structure error	106	205	131	43	485	**0,22 %**
31 Broken chipboard	65	11	9	6	91	**0,04 %**
32 Massive timber crack	39	9	15	6	69	**0,03 %**
33 Edge spline error figurative edge	108	71	68	30	277	**0,13 %**
34 Broken frame	437	491	353	95	1376	**0,62 %**
35 Cut error	2	0	4	0	6	**0,00 %**
36 First production example	0	0	0	0	0	**0,00 %**
37 Weld error	432	378	1292	365	2467	**1,11 %**
38 Sewing error	269	260	203	95	827	**0,37 %**
39 Place error	1	0	201	20	222	**0,10 %**
40 Optimization error	40	0	0	0	40	**0,02 %**
41 Lacquer error	2168	3715	4454	507	10844	**4,90 %**
42 Bad finish	36	6	25	9	76	**0,03 %**
43 Edge injection error	0	0	0	0	0	**0,00 %**
44 Laminate error	142	209	1391	763	2505	**1,13 %**
45 Edge spline error lacquering	3	0	1	0	4	**0,00 %**
46 Edge spline error supplier	5	0	0	0	5	**0,00 %**
51 Dressing error	737	673	801	655	2866	**1,29 %**
52 Assembly error	3307	5072	12763	4121	25263	**11,41 %**
53 Rasp	62	56	5	21	144	**0,07 %**
54 Bad paring	6	15	17	8	46	**0,02 %**
56 Wrong kind of wood	280	443	248	66	1037	**0,47 %**
57 Functionality error	6967	10323	7569	6113	30972	**13,99 %**
58 Fabric error	334	576	2865	677	4452	**2,01 %**
59 Error from ext. supplier	12088	11254	10481	4492	38315	**17,31 %**
60 Rejection primary detail	0	0	0	0	0	**0,00 %**
61 Handling damage	2	2	0	0	4	**0,00 %**
62 Press mark	353	332	246	96	1027	**0,46 %**
63 Scratch	977	799	616	297	2689	**1,21 %**
64 Sun mark	0	185	0	0	185	**0,08 %**
65 Distribution damage	3475	3159	3679	1264	11577	**5,23 %**
66 Moisture damage	169	201	221	133	724	**0,33 %**
68 Rework due to BBAM	1	0	1	0	2	**0,00 %**
72 Delivery error	2261	2473	1798	617	7149	**3,23 %**
Total	52404	66995	74489	27463	**221351**	

- Table B.3.

The distribution of customer complaints to every specific error-code in descending order.

Error-code	Distribution (Descending sorting)
11 Construction error	**28,51 %**
59 Error from ext. supplier	**17,31 %**
57 Functionality error	**13,99 %**
52 Assembly error	**11,41 %**
65 Distribution damage	**5,23 %**
41 Lacquer error	**4,90 %**
22 Measurement and processing error	**4,49 %**
72 Delivery error	**3,23 %**
58 Fabric error	**2,01 %**
51 Dressing error	**1,29 %**
63 Scratch	**1,21 %**
44 Laminate error	**1,13 %**
37 Weld error	**1,11 %**
34 Broken frame	**0,62 %**
56 Wrong kind of wood	**0,47 %**
62 Press mark	**0,46 %**
25 Veneer crack	**0,39 %**
38 Sewing error	**0,37 %**
29 Drill error	**0,37 %**
66 Moisture damage	**0,33 %**
30 Color and structure error	**0,22 %**
26 Edge spline error straight edge	**0,15 %**
33 Edge spline error figurative edge	**0,13 %**
39 Place error	**0,10 %**
23 Veneer release	**0,10 %**
64 Sun mark	**0,08 %**
53 Rasp	**0,07 %**
24 Veneer missing	**0,05 %**
27 Glue error	**0,05 %**
31 Broken chipboard	**0,04 %**
42 Bad finish	**0,03 %**
32 Massive timber crack	**0,03 %**
12 Construction change	**0,02 %**
54 Bad paring	**0,02 %**
40 Optimization error	**0,02 %**
28 Polish error	**0,02 %**
13 Ending article	**0,01 %**
35 Cut error	**0,00 %**
46 Edge spline error supplier	**0,00 %**
45 Edge spline error lacquering	**0,00 %**
61 Handling damage	**0,00 %**
68 Rework due to BBAM	**0,00 %**
21 Sorted production	**0,00 %**
36 First production example	**0,00 %**
43 Edge injection error	**0,00 %**
60 Rejection primary detail	**0,00 %**

- Table B.4.

The total amount of customer complaints, compiled with consideration to year and product group. The customer complaints were then in percentage distributed to the specific product groups.

Year / **Product group**	**2010**	**2011**	**2012**	**2013**	**Total**	**Distribution**
No. 1	10826	13643	15327	4476	44272	**20,00 %**
No. 2	4323	5408	5664	2258	17653	**7,98 %**
No. 3	1370	1687	1350	333	4740	**2,14 %**
No. 4	16706	19648	17336	6024	59714	**26,98 %**
No. 5	3312	4084	8090	2282	17768	**8,03 %**
No. 6	659	1309	837	359	3164	**1,43 %**
No. 8	1053	533	1961	558	4105	**1,85 %**
No. 10	14155	20683	23924	11173	69935	**31,59 %**
Total	52404	66995	74489	27463	**221351**	

- Table B.5.

The process stability ratio, compiled with consideration to the distribution among customer complaints and the distribution among produced quantity. The ratio is calculated by division of the distribution among customer complaints and distribution among produced quantity, for example 20,00/13,86 = 1,44 for product group 1 Desks & Tables.

Year / **Product group**	**Distribution among customer complaints**	**Distribution among produced quantity**	**Ratio**
No. 1	**20,00 %**	**13,86 %**	**1,44**
No. 2	**7,98 %**	**8,16 %**	**0,98**
No. 3	**2,14 %**	**6,41 %**	**0,33**
No. 4	**26,98 %**	**11,00 %**	**2,45**
No. 5	**8,03 %**	**36,88 %**	**0,22**
No. 6	**1,43 %**	**1,09 %**	**1,31**
No. 8	**1,85 %**	**0,74 %**	**2,50**
No. 10	**31,59 %**	**22,60 %**	**1,40**
Total			

Appendix C. Interview template

1. What is your strategy?
    a. Where do you see BBAM in 5 years?

2. How do you believe the communication works between the functions?
    a. How well do you think R&D and manufacturing are integrated?
    b. What happens/What do you do if a project requires integration of more than one manufacturing plants?

3. How well do you think product development works at BBAM?
    a. What do you do if a product development project is considered “bad”?
    b. When in the product development process do you plan for manufacturing?
    c. What are your thoughts about the new stage-gate-process?
    d. What do you think about the available resources for product development?
    e. What role does the power of politics play in product development?

4. How do you define Quality?
    a. Do you believe people have the same perception of quality throughout the organization?
    b. Why do you have quality issues?

5. What role does the quality department have today?
    a. How would you like to work with quality in the future?
    b. How do you think the integration of the quality department has worked?

6. What do you think about the leadership from top management?

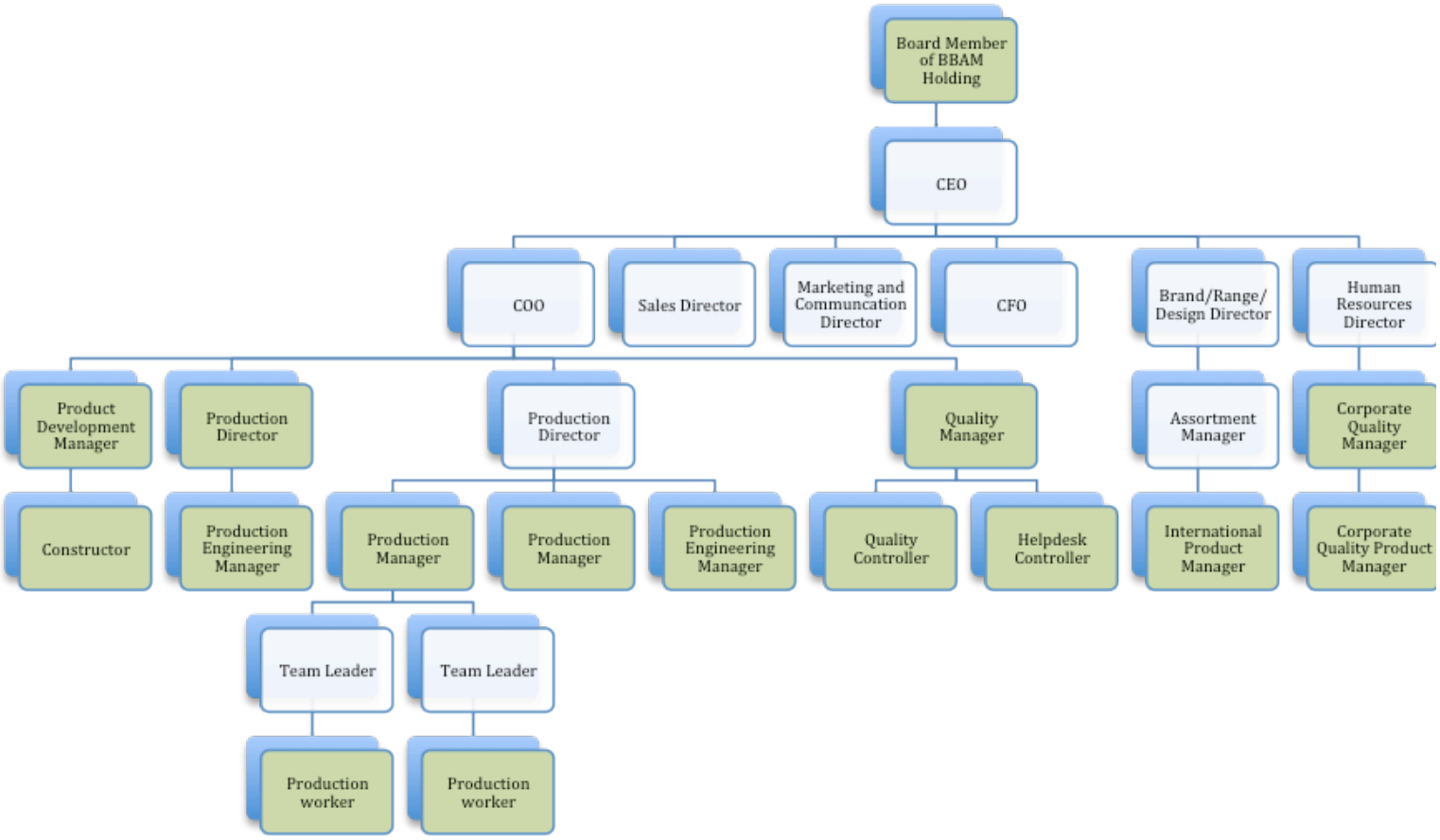
7. How does BBAM handle organizational change?
    a. What are your thoughts about responsibility?

8. How do you communicate within and between functions?
    a. How accessible is information?

Appendix D. Organizational description of the interviewees

- Figure C.1.

The interviewees are differently positioned in the organization of BBAM, which is in the opinion of the authors important to graphically illustrate. The hierarchal order starts with the board members of the parent company and continues on with the top management, consisting of the CEO and the chief officers of the different functions. These functions further consist of many departments, which are all not illustrated in the figure except those whose manager or deputy manager was one of the interviewees. The interviewees are marked with green.



Appendix E. Affinity Diagram

- Figure D.1.

Differences in opinions existed, where the most affecting ones are illustrated in the Affinity Diagram. The information illustrated in the Affinity Diagram is a collection of most common opinions in the form of quotations and generalized opinions.