CONTINUOUS IMPROVEMENT AT AE STÅLMONTAGE A/S THROUGH IMPLEMENTATION OF TQM

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Abstract

The desire for an individual to land his/her dream job is a "dream come through", but if this same job turns out to be a burden or hazard due to overburdening of workloads then no one will embrace it with a smile. This research work recognizes the need to lower the degree of overburdening project manager and other core operational problems detected at AE Stål montage A/S.

Implementation of TQM will enable the company to increase productivity, efficiency and provide a platform for continuous improvement in their working environment. Furthermore, by minimizing waste and cost without compromising quality of the final products of the company. Finally result in increased profit margins and healthy standing on the market.
Introduction to the Project Report

Ever changing trends concerning improvements in manufacturing companies have been constantly developing in the last few decades. Looking for ways to optimize work efficiency would subsequently increase the manufacturers’ capability to compete on the existing market and provide the foundation for expansion.

With years, the aims of production philosophies became increasingly more holistic and taking into consideration a lot more than just considerations about quality of a product and efficiency of a manufacturing process. Aims of the philosophies started to be used when “Managers began to realize that the approaches they use to listen to customers and develop long-term relationships, develop strategy, measure performance and analyse data, reward and train employees, design and deliver products and services, and act as leaders in their organizations are the true enablers of quality, customer satisfaction, and business results. In other words, they recognized that the "quality of management" is as important as the "management of quality".” (Lindsay Evans, 12 May, 2010, p. 11). These are the majority of factors that the report will be reviewing as a part of recommendation for the study case project.

However, the aim of this project report is to analyse AE Stålmontage A/S organizational structure, perform analysis and after several weaknesses have been detected, recommend the company to implement certain practices, which will improve the entire organization’s processes. Despite that fact, the research has been delimited for the ones conducting it, due to the fact that the aim of the project report has to remain concrete and clear from the very beginning also due to the Curriculum of the semester and to a limited time frame. Therefore, researchers have decided to go towards the problem area (described in chapter 4) in the meantime excluding a very detailed overlook of such areas as tender process, risk management, construction phase. These delimitations were resulted by limited time resource for conducting the project report, which could have deepen researchers' knowledge about the company and its processes; however it is believed the findings would not be affected.

Researchers will be seeking for the practices, which would improve company’s working efficiency, communication, competitiveness in the market and internal working environment,
also develop flexibility and adaptability to changes and unforeseen events. More importantly, the proposed solution would ideally solve the problems which were identified throughout the process of the project research.
Chapter 1: Introduction

1.1. Project scope/description

Over a decade now, the Danish building industry had foregone a transitional period with the aim of increasing productivity, development of modern technology and re-engineering of an effective system of executing building projects in a very short time possible. This ideal modernization had been made possible due to stronger co-operation and collaboration between research institutions, the authorities and the industries themselves.

In line with the above statement, this project report is a case study on the company AE Stål montage A/S, which students of the Management in the Building Industry (MSc) in Aalborg University will research upon. The researchers seek to investigate and analyse challenges and opportunities within the company tender, planning, production and construction phase for better growth and improvement of products quality within prefabricated steel elements in Danish market.

Moreover, the research work is to develop a module that could enhance better co-operation within the company working environment, “smarter” storage layout plan and manufacturing methods, which can be applied to the building sector.

The broad scope of this project report is the foundation in which this research work was conducted within four months period in a professional manner and the entire methodology’s tools, used for the primary and secondary data collection, would be enlighten in the chapters to come.
1.2. Introduction to the Company

1.2.1. History

AE Stål montage A/S had been established in 1978 as an independent company and later had been changed to A/S in 1989. It also is a member of the Danish Construction Association and is privately owned by Per N. Mortensen and A. Enggaard Holding A/S.

The company has for more than 35 years performed roof and wall constructions all over Denmark. AE Stål montage A/S wide range of experience comprises simple coverings as well as sophisticated designs in specialty/unique products. It consists of a workshop with experienced staff and engineers and building construction-operators with extensive experience in cladding and manufacturing of thin sheet materials.

The Company has been involved in several bigger and smaller projects over the years. The total budget could range up to 48.000.000 kr., for example, when the Musikens Hus in Nordjylland had been constructed. The company’s area of responsibility was execution of facades and roofs, etc.

According to the interviews researchers had conducted with Per Mortensen, the director of the company, during the period of crisis, the company’s net profit was not much affected. This has been further proven, based on the retrieved financial reports of the company from 2005 to 2013. In 2008 and 2010, there had been a fall of the net profit but has maintained the steady rise since (see table 1.1.)

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<tr>
<td>Profit</td>
<td>947,000kr</td>
<td>1,736,000kr</td>
<td>2,864,000kr</td>
<td>1,640,000kr</td>
<td>3,777,000kr</td>
<td>808,843kr</td>
<td>2,176,110kr</td>
<td>2,534,408kr</td>
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Table 1.1: Net profit of AE Stål montage A/S from year to year (according to data from financial reports of the company – Annexes 1.1. – 1.5. – financial reports between 2009 and 2013)

Furthermore, based on these reports, the number of employees has been fluctuating but currently there are 50 employees, which is the highest for past 8 years.
1.2.2. Branding

AE Stål montage A/S is the only company in Denmark that specializes in external cladding not only on the production scale but as well on design and assembly on site. Company has a couple of competitors but none of them is manufacturing, designing and assembling the product themselves. This particular reason makes AE Stål montage A/S unique on Danish market. Since 1978, when the company had been established, experienced number of people in both production and assembly were gathered. During those years high quality and attention to detailed work has been perfected. As a result, AE Stål montage A/S had become a stable and reliable partner for many clients around Denmark, Faroe Islands and Greenland. Many of architects and contractors, after working together with AE Stål montage A/S, are coming back due to its wide range of experience, expertise and work performed on high level of quality, which proves that cooperation with the company is beneficial for all parties. (Profil, Produkter)

1.2.3. Vision

AE Stål montage A/S does not have an official vision in writing. However, during the interview taken with Per Mortensen, he clearly stated that company has a mission and future goals to be reached. One of the main aims of the company is to become a leading manufacturer of external metal cladding in Denmark. The company would also prefer to be mostly preferred contractor for building envelopes in metal cladding. Another goal that had been mentioned by the CEO – the company would like to give architects, engineers and clients exactly what is needed at the time and be always technically ahead in comparison with the competitors. To do so, the company must take part in prestigious projects. One more and the most fundamental goal of the company is to make 3-5% profit from turnover after taxes. Finally, the goal is to expand and open-up a branch of the company in Copenhagen due to the current distance between location of the factory and the capital city of Denmark. That solution would make more easy access for potential future clients and it will shorten distances site managers must travel during projects in Sjælland (appendix 1.1 – transcript from the 2nd meeting in the company).
Chapter 2: Methodology

This Chapter highlights the various preliminary considerations, tools deployed to collect and analyse the research questions. Furthermore, it is to outline the research design, data collection and the ethical concerns parameters in which this research work has been conducted. In the field of research work, mostly the three paradigm strategy tools had been used on project research as presented in the table 2.1.

<table>
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<th>Mixed Methods</th>
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<td>Non – experimental</td>
<td>Grounded theory studies</td>
<td>Concurrent</td>
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<td>designs, such as surveys.</td>
<td>Phenomenological research</td>
<td>Transformative</td>
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<td></td>
<td>Narrative research</td>
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<td>Ethnographies</td>
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Table 2.1: Preliminary considerations for conducting a research (Creswell, 2014, s. 12)

However, having studied and analysed the parameters in which this research work needed to be conducted and the particular type of information needed to be gathered from AE Stål montage A/S for this report. The researchers have come to the conclusion of using the qualitative approach. The reasons are that, this research work could be identified itself in the five dimension of qualitative research;

**Case studies** – is a method of conducting a research which provides the means of exploring a company’s structure, someone’s personality or scope of work etc. in detail during an extensive period of time. This type of research usually provides more steady findings (Stake, 1995). (Creswell, 2014, s. 13)

**Grounded theory** – Is a method where the research group seeks the general viewpoints of participants on a given case study and then summarize the relevant information. This information is further place in priorities, in relation to the theory under investigation. (Charmaz, 2006; Strauss and Corbin, 1990, 1998). (Creswell, 2014, s. 13)
Phenomenological research – is a strategy of conducting a research of narrow focus areas. This type of research is based upon individual experiences is searching for the common principles, relevant factors between them. It is typically involving quit broad commitment (Moustakas, 1994). (Creswell, 2014, s. 13)

Narrative research – Is a method which the research group investigate persons and group of people stories or events in order to analysis on a research questions. This information can be stored digital for future research work. (Clandinin & Connelly, 2000) (Creswell, 2014, s. 13)

Ethnography – In this process of studying natural surroundings and activities of cultural categories within a given period of time frame primary data is collated by means of observations and interviews. The conduct of the research is flexible and is based on the day-to-day experiences. (LeCompte & Schensul, 1999) (Creswell, 2014, s. 13)

Since this project research is qualitative approach, the research group findings would be in subjective perspective according to the theory behind quantitative and qualitative research methods. In addition to this, the source of primary data collection would be interviews, questionnaires and photo/video observation. Secondary data collection consists of the books, journals and web-based soft data literatures.

2.1. Research Structure

The research structure (see figure 2.1.) is the graphical feature that shows the path of the project report. It also illustrates the details within the given chapters in this research work. Firstly, the pre-analysis of the company seeks to establish the company operations and create a basic foundation to investigate the research questions. The data collection section describes the primary and secondary data materials, in the form of interviews with the company staff and the literatures used to analysis the research work. More so, the proposal and solution section describe the various management tools analysis to solve the research problem. The next in line is the implementation, where the outcome of the research findings solution is put to practices to improve the effectiveness and efficiency within the company. Finally, the conclusion reviews the
results gathered based on collected data and which the researchers analyse for the good of the project report.

![Graphical path of the project report structure](image)

**Figure 2.1:** Graphical path of the project report structure

### 2.2. Research Design

The research design gives a clear overview and the best overall strategy on how the research problems would be analysed and what will be the desired outcome for the project research work. Firstly, a literature reviews would be conducted on the research problems and this will ensure better understanding of the mentioned problems and provide a solid background for the purpose of solving the outlined challenges.

The highlighted problems are interlocking each other and it hinders productivity, effectiveness and efficiency of the company's operational system. The aim of this study is to analyse how new knowledge and technological "know-how" could be used to contribute positively on the growth of
the company. The tool that facilitates the outcome of the research question is shown in figure 2.2. The circular part of the graph contains the listed problems, which had been discovered in the company operations, and will serve as the research focus area. The procedures for analysing and interpreting the collected data, whether it is a part of primary or secondary source of information, will be discussed in detailed in the chapters to come in the project report. The explanation on the researchers’ findings will enable the group to draw conclusion on the research question.

Figure 2.2.: A tool used to analyse research questions (Berrin Denizhan, Supplier Leverage Model - SLM, July, 2009)

2.3. Data Collection

In relation to the concept of data collection, which will be used to analyse and evaluate the information gathered on the research questions, the reasons for the choice of qualitative analysis on this focal area is to understand how AE Stål montage A/S executes its operations and how the researchers could outcome with new ideas which could increase productivity for the company in the prefabricated steel cladding industry in Denmark.

In the interest of primary and secondary data collection, the following toolkits such as interviews, observation through picture and/or videos, analysis of handed out documentation and hard/soft copies of data literatures will be used on this research work.
2.3.1. Interviews

Several interviews have been conducted for retrieving empirical data, providing first-hand information and accuracy, therefore this method is considered as one of the best tools. This primary source of data collection is critical to the research materials.

The company had admitted having challenges when performing daily operations regarding the research questions. The intention of the researchers’ is to dive into these focal areas to obtain the relevant information from the interviews in order to test the underlying motives and take a decision upon the research questions.

The research group was able to interview some key management members of the company such as the director (CEO), the project manager, the production and the site managers etc. and their output of information was great. The research group used semi-structured interview style by keeping it open and creating a calm atmosphere for the interviewees to freely express their points of view. This style of the interviews contributes more to the natural flow by functioning as a discussion rather question-answer type of the conversation. Additionally, when a question is being asked it does not “tie interviewees to a corner” giving them a feeling that a specific type of answer is expected. In that case there is a high risk of them giving speculative answers because this situation forces them to think very carefully on their answers. The best question formulation which the researchers had created was on how and what questions. This style of questions always encourages the interviewees to talk spontaneously and explain more on the research questions. In this case the questions are formulated in a broader way, not giving a chance for an interviewee to only answer “yes” or “no”. Quit often a follow-up question comes afterwards just to clarify the answers from the interviewees, which sometimes is a new beginning of an unplanned discussion.

Generally, the benefit of the semi-structured interviews allows new ideas to come-up and gives maximum freedom for the interviewers to tailor their questions in line with the research questions and also explore their research work in the future.
2.3.2. Documents Analysis

Literature review is an essential part of data collection and it has existed in the research environment for many years. In this research work, the group analyses and makes a decent use of some of previous project reports, journals, articles, documentation from the company and soft data information from the internet on their project report. The idea of developing better research findings on previous research work is a health culture that is welcomed in the academics’ fields but the respect for one intellectual property is always considered strongly. This research work is not exceptional; the researchers used all available project materials for their advantage in regards to ways of solving or coming-up with better ideas in order to answer the research question.

2.3.3. Photo and video observation

The use of pictures or videos for description on project report is a part and parcel of qualitative sampling of any given research work. These mediums enable the researchers to recollect and reflect critical information received at the company and during the building site meetings. Since there were several meetings organized in respect to data collection, the pictures and videos has been a great source of intellectual empowerment on the success of this project report.

2.4. Ethical Concerns

In sports, fair play is paramount so it is in research work. This research was conducted in civil and professional manner where the researchers explained the importance of their work to the company in question. The research group went further to sign the agreement of confidentiality in order to established full trust and for the protection of the company’s essential information. The viewpoints of individual, who participated in the sampling of the research data, was respected and protected to avoid causing any harm. The idea of treating people fairly is one of our key indicators. In view of that, the group did not allow any personal views to affect the collective effort on the subject under scrutiny.
Chapter 3: Pre-analysis

The aim of the pre-analysis chapter is to identify the company in the market: who they are, what the company aims for and etc. It includes an overall look into the organizational structure of the company explaining who owns shares of the company, how does the organization function and, who is a part of the steering committee and other groups. Moreover, the chapter gives an overview of a Danish market in the industry of producing metal façade and roofing elements, determines which companies are considered the biggest competitors by AE Stålmontage A/S. In addition to that, what type of projects the company is aiming for (as defined by the CEO) by size, type and other criteria.

These factors are affecting the number of projects the company is winning tender processes for, which influences the amount of work and the market share of the company in Denmark. It will provide a brief impression of the company’s activities and contribute to performance of SWOT analysis assessing the strengths, weaknesses and other areas – all of the weaker areas will be worked on further on in the project report.

3.1. Organization structure

An organization structure of AE Stålmontage A/S defines the relationship of the Investors (Engaard A/S) to that of the CEO and the network of operations within the different departments in the company. AE Stålmontage A/S organization chart is showed in figure 3.1.
Asger and Jørgen Engaard hold two thirds of AE Stålmonstage A/S (66.6 %) while the rest belongs to Per Mortensen (see figure 3.2.). According to the director of the company the stakeholders holding the majority do not influence in any way the process of the company. The company is taking care of the projects itself and that works fine with the Board as long as the shareholders get their dividends at the end of the year. Twice a year the Board has arranged meetings where they look into the results of the company and its future investments. The Board comprises of Per Mortensen, Asger Engaard, Jørgen Engaard, a person from their Economy
department, and Ejvind E. Sørensen who was the managing director of the company up to 2010. He was also a founder together with Asger Engaard back in 1978.

The company has a steering group (an internal Board – term was provided by the director P. Mortensen) comprising of Per Mortensen, one employee from the finance department on top of that – Production manager, Technical manager and one Project manager who together decide in which way the company is heading also discuss upon investment and their future plans.

The Finance department handles all aspects concerning payments, wages, and invoices coming in and out of the company, which, according to Per Mortensen, requires a lot of work. They also take care of human resources within AE Stålmontage A/S.

According to Per Mortensen, even though the company has a linear organization, it works on a flat level, meaning that all the communication between departments is successfully carried out with no restrictions.

3.2. Market research

Regarding the history and profile of AE Stålmontage A/S, described in sub-chapter 1.2, and its profile from the official web page of the company (http://ae-staalmontage.dk/), primary market research¹ has been performed and assessed.

The first company visit meeting at AE Stålmontage A/S together with director Per Mortensen had been a great deal for briefly covering most of the major subjects and revealing a lot of useful information regarding different sectors of the company: its management system, supply for the market, company’s specialty and many others.

To begin with, AE Stålmontage A/S is rather small sized company, which mainly focuses on the design and production of custom made products – metal façade and roof cladding. Therefore,

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¹ Market research – The process of gathering, analyzing and interpreting information about a market, about a product or service to be offered for sale in that market, and about the past, present and potential customers for the product or service (Entrepreneur Media, 2014)
each project, every single time the company is working on, is different regarding design, types of metal, colours, sizes and profiling. However, the company is an authorized reseller of one standard product, which is actually supplied from German company Kalzip – metal roofing cladding. Though, products and services that company has to offer in Danish market have not changed during those 36 years of the company’s existence, the quality has raised rapidly due to its long-term experience (Profil, Produkter).

3.2.1. Competitors in the market

The existing companies, regarding the production of metal cladding, as the biggest competitors according to Per Mortensen, in Danish market are Norisol, Kai Andersen, Fjelsø. These companies are quiet voluminous. All of these companies have established branches in Denmark. However, Norisol also has several offices in Sweden and Norway too. These 3 companies have also existed in the market for a quiet long time, offering different types of products: from roofing and façade cladding elements, to renovation and decoration of buildings etc.

Nevertheless, AE Stål montage A/S is the only one company in Denmark, which carries out the entire process of manufacturing their products – from the beginning to the end. It functions within all of the design phases: designing, planning and management – production and manufacturing – assembly and building on site. These three phases are the steps company follows when producing various custom-made metal products.

3.2.2. Potential project target

Since the company keeps its main focus on custom-made products, AE Stål montage A/S is searching for the upcoming projects on its own. At the beginning Per Mortensen (the director of the company) is the one, who does the job by checking the market, media and other sources of information about the upcoming projects in the country. Once the research is performed and company decided to bid, drawings, documentation and other paper work is being taken care of by employees.
More importantly, is how the company chooses which projects to bid for; Per Mortensen has pointed-out three main characteristics:

- Public projects;
- Projects for which the company can use mostly its own production department;
- Price estimation over 500,000 kr.

Taking a part in public projects brings fewer troubles regarding customer’s demands, Per Mortensen explains. The client’s wishes for the public projects are clearer and more concrete rather than for private projects. Other than that, AE Stål montage A/S wishes to get involved as much as possible of its own production due to the use of their own machinery, their own employees, which makes it more profitable for the company as well as easier to work with their own people.

Despite the fact that the company can never be certain of how many projects they are going to win the tender process for, according to statistics, provided by the CEO, approximately 24% (taken as an average of 2012-2013) of all the projects the company had bid for had been won. Anyhow, the company always keeps looking for new projects.

### 3.3. Recent tendering history of the company

The CEO of AE Stål montage A/S had said “the company had been doing quite stable so far”, assumingly due to its specialty of manufacturing custom-made, unique elements and ability to overtake any sort of projects, despite of their complexity, which there are always customers interested in. Per Mortensen had also said that, for instance, in 2012 AE Stål montage A/S had participated in 75 tender competitions and have been awarded for 20 of them (26.6 %). However, each year the number of the tender competitions that the company participates, varies, but not that much. For example, in year 2013 the company had participated in 65 and has been awarded for 14 projects (21.5 %). In addition to that, AE Stål montage A/S holds 5-10% share in Danish market.
3.4. SWOT analysis

In connection with the review of the company in the market, SWOT analysis was performed in order to identify its positive and negative internal as well as external factors regarding 4 divisions: strengths, weaknesses, opportunities and threats (see figure 3.3.). For instance, the company seems to have quite few issues regarding time management such as no project planning system, poor stock control etc.

![Image of SWOT analysis diagram]

Figure 3.3: SWOT analysis of AE Stål montage A/S (information based on the interviews in the company – appendices 1.1. and 3.1.)
According to the SWOT analysis, incorporation of standard products (which results to an opening of an online store), instruction of employees on how to use and benefit from project planning and digitalization of stock materials could certainly be a good start for the improvement of the company. Production manager John together with Per Mortensen agree on the necessity of change and are willing to invest and truly put an effort in order to reach the goal.

**Summary**

The pre-analysis that was performed set a basis for the initial problem area and an actual problem formulation. Regarding figure 3.3, most of the weaknesses have been located in the company internally; therefore, in chapter 5 the entire process (from getting an order and moving on to other phases until the project delivery) is going to be reviewed in detail. It will lead to finding a suitable proposal of implementation for the company in order to solve the root of the problem while also covering and potentially solving the majority of internal weaknesses that the company has.
Chapter 4: Problem definition

4.1. Problem sources

As described in chapter 4, the research group is aiming at analysing problems within the Project management area of AE Stål montage A/S.

The problems that AE Stål montage A/S is currently facing (see figure 4.1.) can be traced back mostly to the overburdening of the Project manager, inflexibility to unforeseen events and the delays in material supply. As shown in the problem tree the lack of a project planning system can be traced back to some problems found within the analysis of the company and agreed upon together with the director of the company (CEO) Per Mortensen.

![Problem tree](image)

**Figure 4.1:** Problem tree (in a bigger scale – appendix 4.1.) – stating step by step how the problem is evolving (according to the problems detected during the interviews – appendices 1.1. and 3.1.)

4.1.1. Delimitation

In the problem tree several branches of problems in the company have been identified and looked-upon. In order to provide a suitable solution for the company, the researchers have not focused or aimed on some problem areas within AE Stål montage A/S. Some areas such as Material supply, Storage management and no project planning system have not been considered due to time limitation, curriculum and interest.
In sub-chapter 5.5, the research conducted showed evidence of a lack of flexibility in the Project manager’s day to day responsibility and overburdening. The most important elements which have to be taken into account are the factors that will influence the performance of the Project manager (see figure 4.2.). As seen in the problem tree (figure 4.1.), an overburdened Project manager will lead to added stress, sick leave, time loss, incurred costs, reduced efficiency and motivation, everything potentially ending with losing a good employee. The company actually acknowledged that one employee quit the job because of stress related issues.

![Figure 4.2: Elements, which gradually increase a risk of having an overburdened Project Manager](image)

The overburdening of the Project Manager is regarded as a direct result of a lack of proper project planning as observed through both of the interviews conducted with the company. The company is facing a potential risk area due to the fact of unwillingness to plan.

The company admitted repeatedly that they have tried to implement a certain system of planning within a project, however it failed. The explanation provided by the management has been that it is usually impossible to plan due to all the changes that occur within a project.

The poor organization of project work can have certain consequences (as seen in the problem tree), such as missing deadlines resulting in fines, potential loss of contracts and bad reputation. The potential loss of contracts can be also traced back to the fact that the company does not engage in certain tenders if the Project managers would not have time to work on it. As a direct result potential projects are lost due to lack of personnel which can also be connected to a certain extend to the lack of a proper planning system which results in the overburdening of the Project managers.
The lack of proper planning goes even further. As explained, the absence of written documentation that can compensate a sick Project Manager or one on holiday, while a project is ongoing, can affect the well-being of the project (see figure 4.3.). The lack of process tracking is one of the problems that have to be tackled with a solution as well as the actual planning of a project. It was admitted by the company that replacing a Project Manager in an ongoing project is a very big problem since a lot of information is known only by him.

![Figure 4.3: Gradually evolving risk of not having database for storing all necessary documentation concerning an ongoing project (regarding problems detected during the interviews – appendices 1.1. and 3.1.)](image)

The challenge that AE Stålmontage A/S faces is a difficult one to adjust or resolve in any way, due to some of the reasons explained by the strategic level management within the company – the fact that the company takes only specific projects, and always custom made and difficult, can prove to be the main reason behind the lack of adaptability to the fast changing industry’s current trend.

The lack of digitalization mentioned at the investigation within the Production drawings, shows more or less the same connection and tendency towards a personalization of information within the company and a lack of a common informational system within the company and/or a specific project.

As discovered, the company experiences certain difficulties with the labelling and storage system used. This adds a certain amount of time to the Project manager’s work if he is unable to trace the right materials in the storage area and increases the time used for workers to select them accordingly to the specifications from the project.
4.2. Problem Formulation

4.2.1. Preliminary problem formulation

In this project report, an overburdening of the Project Manager has been one of the core problems identified in the preliminary investigation. Through interviews an example was mentioned, where a Project Manager working at AE Stålmontage A/S was exposed to too much stress while managing a project. Subsequently, that resulted in reduction of extent of his daily responsibilities. The effect of this event has formed a platform on which the investigation was initiated. The outcome of the investigation on the overburdening project manager has revealed a different twist to the initial problem detected. In an event of project manager’s absence or sickness, there is a risk factor of delay, because there is no system that documents the project manager thoughts on the way forward for the on-going project. This means that, a certain extent of difficulties would provide a great challenge, if another employee is to take over Project Managers responsibilities within an ongoing project.

4.2.2. Problem definition related to the Project managers scope of work

Further descriptions of the issues concerning Project Managers (PM) scope of work are discussed in chapter 5.5.3 - Exposed problems reflecting upon Project Manager’s scope of work. In order to understand the problems related to the Project Manager an understanding of the processes within the phases needs to be established. That information provided the basis for determining PMs scope of work.
Research questions
An analysis of processes within phases during an ongoing project was conducted; further
closure of the routes of the problems was established. The research questions are focused on
the routes of the problems identified in at AE Stål montage A/S.

The main research question
“How can strategy provide the necessary changes in the working
environment, improve the performance and develop the organization?”

Sub-questions
1) Which production philosophy is the most suitable for AE Stål montage A/S to be used as
guidance for their strategy?
2) How can implementation of some management tools such as Total Quality Management
(TQM) philosophy improve company’s efficiency and subsequently competitiveness on
the market?
3) How can project managers’ working processes be standardized, systematically
improved, and include contingency plans?
Chapter 5: Internal processes within the project phases

The purpose of this chapter is to provide an overall project overview of different phases of AE Stålmontage A/S in order to establish the involve a Project Manager through project phases, as well as proceedings involving external parties such as suppliers, stakeholders, etc. His contribution and involvement from the beginning of the tender phase, up to the final stages of the construction part in the company.

The chapter had been divided into different sub-chapters describing the process from getting the actual project, later on moving on to designing, manufacturing phases and etc. Before that, the first sub-chapter) has been based on a graph (Appendix 5.1. – flow chart), which had been prepared with an assistance of the CEO of AE Stålmontage A/S – Per Mortensen, explaining the process visually and briefly describing each point.

The process of gathering necessary information had required quiet frequent collaboration with the company. Since this chapter entirely focuses on the practical/existent part of the company’s processes, the entire information is based on two types of meetings with the company.

Firstly, the building site visit, which had taken place on 17th of October, 2014 of one of the current projects of AE Stålmontage A/S. All of the group members had visited the site with an assistance of Site Manager Christian Vind, who had been asked several explanatory and/or descriptive questions about the processes, parties involved etc. The project is called “Interascoustics” and is located at the following address – Barmstedt Alle 7, 5500 Middelfart (Denmark). It is to become a new head-quarter of the company “Interacoustics”, which will be officially finished on the 1st of April in 2015. “Interacoustics” is the world’s largest manufacturer of audio logical equipment. The project replaces the company’s current headquarters in Assens, Denmark. (Byggeri & konstruktion - Region Syddanmark, 2014)

Secondly, company visit meetings which had also revealed and provided the group with a more detailed understanding of how does the process look like. During the meetings, different employees had been interviewed and talked with. A tour in AE Stålmontage A/S had been
organized by Per Mortensen, during which group members, who had participated in the meeting, had a walk throughout different departments talking to company's staff, seeing the processes of manufacturing etc.

5.1. Flow chart, mapping milestones of project

5.1.1. Tender phase

Market exploration
AE Stål montage A/S is constantly looking for relevant projects and offering companies' services.

Awarded tender
The company is regularly competing for a share in the Danish market by participating in the tenders. Their experiences and fair production capabilities enables them to compete in a wide range of tenders.

Price estimation
After a contract is being awarded, price estimations are being updated.

Suppliers
Involvement of suppliers for raw materials for the production is crucial at early stages of a contact.

5.1.2. Project planning and detailing phase

Overall planning
All the aspects in regards to time planning, ordering material, preparation of drawings and quality assurance are being handled by the Project manager.

Involvement of stakeholders parties
As the overall planning of the project takes place, external parties and the stakeholders are being involved by the Project Manager.
Detailing of the drawings
In order to provide a smooth project flow, project material is being detailed and split into sections that can be accommodated by the production department. This is being the responsibility of the designated Project manager.

5.1.3. Manufacturing phase

Establishment of production drawings
Upon Project manager’s completion of detail drawings, the production planning department takes over and prepares drawings for the workers in the production.

Material delivery
Upon delivery of the materials, every badge is being checked according to the required specifications.

Storage handling
Upon delivery, the materials are being dropped off in the storage facilities.

Manufacturing processes
The elements that AE Stålmontage A/S produces have to go through different processes such as painting, coating, bending, punching etc.

Packaging
After the materials are being processed, the elements are ready are being packed and prepared for shipping into cassettes.

5.1.4. Construction phase

Delivery on site
All materials and tools that are required for completion of a contract are delivered on site.

Assembly of the elements
AE Stålmontage A/S has its own teams executing the installation process of façade elements on site.
Completion of the contract

Installed elements are providing the sunscreen for the building; therefore their contracts are not involved in closure of the buildings envelope.

5.2. Tender process

The participation of the company AE Stålmontage A/S for tender processes can be divided into 2 different ways (see figure 5.1.). The first way – the company had received invitation for tender process through the main/general contractor, which is relevant for approximately half of the projects, according to what Per Mortensen (the CEO of the company) had said. In this case, the main contractor had set the price range for the project and therefore it is considered as absolutely prince-oriented.

![Diagram of tender process](image)

Figure 5.1: Two different ways of AE Stålmontage A/S getting a project had been visually illustrated (according to the interviews during the company visit meeting – appendices 1.1. and 3.1.)

Afterwards the main contractor had chosen few companies and had invited them to participate in the process of tender. The documentation from the main contractor had been uploaded on such shared platform such as, for instance, byggeweb. Once the company had received the documentation, the next step for AE Stålmontage A/S is to get project price estimation as well as time planning, technical drawings and other documentation prepared. In the meantime, the company had also been looking for the best suppliers asking for the price estimation of materials’ and other goods, that AE Stålmontage A/S needs to be provided. At last, the lowest bid had been chosen by the general contractor and had been processed forward.
Another way of participating in tender process is when the company had been looking for the project in all sorts of media themselves. This process is preferred by the company due to the fact that this way they have direct contact with the Architect and the Client. In bigger scale projects the company might have been required to send the pre-qualification material, including description of the company, its experience, competences, references and other information. From the high number of the companies (according to the interview with the company the number might reach approximately 50) that had participated in the pre-qualification phase, only 5-6 of them had been invited to participate in tender process. Once again, the company contacts suppliers in order to find out the price of the materials. After that, the company had prepared the price estimation of the project, time planning, technical drawings and other necessary documents. All of the documentation had been sent for the Client. Based on criteria specified by the Client, the bid had been chosen.

5.3. Manufacturing process

In today’s manufacturing era of high industrial technology and development, there had been the integration of human skills and the fusion of computer technology. This concept had led to the introduction of optimized design styles and the reduction of manual labour.

As we know, manufacturing is the identity and backbone of any production company and AE

![Diagram of Manufacturing process](image-url)

**Figure 5.2:** Manufacturing process of AE Stål montage A/S (information conducted during the interviews – appendices 1.1. and 3.1.)
Stål montage A/S is not exception in this direction that is why the researchers are unveiling the complete understanding on the company basic manufacturing processes (see figure 5.2.). It is of great importance for one to have the knowledge of manufacturing process, handling of raw materials and the equipment that are used for manufacturing all the different products or components in the factory.

Beside the above, the layout in the figure 5.2 gives a vivid image on how AE Stål montage A/S produces their products in regards to the manufacturing system.

5.3.1. Planning and project schedules

The planning and project scheduling is basic tool design by the project manager to outline the working plan needed to make the production drawings and the manufacturing of a customarily products won in the tender contract by the company. The project manager assigned the production department to work on the production drawings in respect to measurement and design patterns that he had prepared for the given project at hand. The collaboration between these teams is incredible because any act of major mistake in line of duty can cause a huge financial loss to the company. When the production department is done with actual drawings to specifications, they pass on the production drawings to the manufacturing section of the company to start production of the elements.

In addition to this, there is always consultation behind the scene with all the stakeholders when the product is been designed and produced, because the company’s aim is not just to promote its products brand but to provide high quality products and satisfaction to its customers nationwide.

However, the magnitude of task on the project manager is overwhelming and there is an element of risk. In fact, there is no written documentation that compensates its responsibility when one is supposed to take over from him due to sickness or his absence from work while the project is ongoing.
5.3.2. Production drawings

At AE Stålmontage A/S, the office in charge of the production of the detailed drawings for manufacturing is the production department and it works in hand with the project manager, because original designs (see figure 5.3.) of the elements are being produced over there. The line of communication does not end with these two teams but they channel all the needed information to the production manager by way of the drawings worked on, to actual specification for his team to execute the given assignment. The only challenge confronting this department is a lot papers they have to work on, on every single project but the idea of digitalizing this part of their work ethics is something they are considering for the future.

5.3.3. Storage/warehouse of materials

The term material storage (see figure 5.4.) does not need explanation but the functionality of this concept required more managerial skills. There are different kinds of metals that AE Stålmontage A/S order from its loyal suppliers for the production of their products. It can take even up to six months for delivery, whether it is ferrous metals such as steel, cast iron, wrought iron or non-ferrous metals like copper,
aluminium, magnesium, zinc etc. These metal materials have their own distinct characteristics. Quality assurance is been performed upon delivery of raw materials at the factory. Base on that, a badge can be approved or rejected. That is why one cannot over look on how these raw materials are managed at storage depot.

AE Stålmontage A/S still uses outdated system of material storage which makes it difficult to trace rightful material at the depot if you are new in the company. There had been some situations, when technician used steel instead of aluminium due to the lack of labelling and database system at the depot and also surplus materials are poorly managed. In the interest of effectiveness and efficiency in this focal area, there is potential for improvement.

5.3.4. Cutting of metals

Metal cutting is the process where the ferrous or non-ferrous metal is cut to the desired shapes and sizes in relation to the production drawings (see figure 5.5.). This is done by the help of modern cutting machines which are power driven and can perform all kinds of operational functions such as bending, shaping, grinding and drilling. Since most of AE Stålmontage A/S products are custom made, there is always adjustment to the functionalities of these power machines. Again, quality checks are performed on the work piece by the production manager to ensure quality products for the customers.
5.3.5. Bending and remodelling

The remodelling is the concept where punching, bending, shaping, drilling and grinding is done on piece of metal by the help of machine (see figure 5.6.). All metal sheets turn out to the desired products when these activities are performed in respect of their constituent. Technicians that work on these elements had undergone some training courses to better their knowledge and skills in the production of these metal components and they have rich experiences on working in this section on the production line for many years.

5.3.6. Profiling and packaging

The beauty of any fine product is its finishes and package nature. This is the stage in the production line where coating and painting is performed on the finished products (see figure 5.7.) that would be transport to the construction site. The reason for this is to protect and preserve the components for a very long time and to add attractiveness to the products.

At AE Stål montage A/S, the products are then packed in a hard boxing in order to avoid damages when transporting products on site. They are also labelled with the specific codes for easy identification. When this is done, the
company arranges for transportation service to send the package to construction site for assembly.

5.3.7. Transportation

AE Stål montage A/S does not have its own transportation service to deliver their finished products, so the company depends on rental services. The assessment of this venture is more beneficial to the company and they intend to keep it for unforeseeable future. The only problem for the company is that the arrangement for transportation should be made in good time in order to avoid delays in delivery of their products to the building site. Quality control is been loading on trucks and upon receiving the products at the construction site.

5.4. Construction process

5.4.1. Planning

Every construction projects has its own master schedule describing the estimated duration of different task accomplishment and specifying assigned resources. As mainly a sub-contractor AE Stål montage A/S shall adapt its time planning according to the allocated area within the master schedule. Since the master schedule is an overall planning, each trade is being linked to one another; this means that the company’s work, as one of the trades, is always dependent on the other trades working on the project before them. An example in the case could be: carpenters, who have to fix wind barriers for windows, being delayed, affect the starting date of AE Stål montage A/S fixing metal façade cladding.
5.4.2. Delivery and storage of materials

Once elements had been delivered on site, quality assurance is performed by the site manager – Christian Vind. According to him, elements rarely get damaged during transportation from the factory to the building site. Nevertheless, in case of damaged elements, work continues on site and the elements are re-ordered and delivered on site in a short period of time.

The delivery and storage of elements can be done in two ways, depending on the actual material. Regarding aluminium / steel, elements are to be delivered and stored on site (see the 5.9. figure) in the placement, allocated by the Project Manager, provided on the building site plan drawing.

Metal cladding elements, manufactured from such expensive materials as copper are to be delivered and assembled right away, unless kept in locked containers. It is due to high value of material and possible risk of it getting stolen.

In this project, metal cladding elements are stored on site. Elements are divided into different pallets; representing different vertical sections of each facade (see figure 5.10.).
5.4.3. Assembly

Cladding elements had been assembled according to the drawings, indicating sequence numbering and provided by the factory. Once employees on site had received print-out drawings they read them and assembled elements accordingly. According to the contract, lifting platforms and scaffolding are either provided by the main contractor or rented by AE Stål montage A/S. Christian Vind said that the company had rented out all the machinery from local suppliers due to different locations of the projects. This solution not only saves time spent for transporting the machinery from one side of the country to another but more importantly saves money.

Everything regarding Health and Safety is being discussed during the site safety meetings, which are held every 2 weeks. Christian Vind said there are not so many issues concerning employees from AE Stål montage A/S. During the building site visit of the ongoing project, none of the group member had noticed failure to comply with Health and Safety. Every single employee had been wearing helmet, highly visible vest, safety shoes and other personal protective equipment. Moreover, all work done by the employees of AE Stål montage A/S had been performed on site in a safe manner during the same building site visit.

During the ongoing “Interacoustics” project, the building site shall be visited twice a week in order to perform follow-up on work progress. This is being done by Christian Vind. He shall take a notice on the progress of the work done so far, on present delays if there are any and other issues on the building site. As part of his responsibility he has to participate in the site meetings, and discuss the outcome of the project with the project manager.

5.5. Scope of work of Project Manager

Work of the Project manager and the great extent of his contribution to project proceedings, embodies the backbone of AE Stål montage A/S and its development. However, the scope of work as explained further on shows, that certain practices currently used within AE Stål montage A/S are not so beneficial in the long run for the employees filling the Project manager positions.
Information forming the basis for this chapter is sourced by the company visits of AE Stålmontage A/S and meetings with the company’s employees filling different positions within the company. All information included in sections bellow, is subsequently related to topics on project proceedings already described earlier in chapter 5. Therefore, the purpose of this section is to extract the Project Managers’ scope of work and provide a greater detail on the topics related to his responsibilities within the company.

In connection to the problem formulation it is crucial to isolate Project Managers’ standing within the company and his involvement in the project. Those findings shall define the starting point for proposals and possible improvements within his scope of work.

5.5.1. Project Manager and organization

A Project manager works in a flat organization with flexible working environment build on continuous dialogue between individuals and departments collaborating though out a project.

There are currently 4 Project managers employed within AE Stålmontage A/S: Casper G. Jørgensen, Søren Vestergaard, Lars Bøje and Leif Sander.

5.5.2. Project Managers’ scope of work

Tender
The Project manager’s involvement in a project starts the moment a tender offer is considered to be competed for. A Project manager is informed about future considerations of upper management about competing and possible commitments to a construction project. His involvement at this early stage is important because he needs to be able to take extra load of work that a potential project would bring to the company. Sometimes it can become difficult for a PM to handle several projects in the same time; therefore allocation of resources within the company is necessary in order to accommodate the work to be done during a project.

A Project manager is to accept or decline his involvement in a project, according to his time slot – if the PM has enough time to handle another project or otherwise the company is required to
find alternative solutions in resource allocation internally or hiring external staff via “Live center” – specialists with a limited contract. However that always brings certain challenges of its own.

**Planning and manufacturing**

The main share of PM’s work starts right after a tender offer is being accepted. One of the first steps the PM takes into account is to start skimming through the drawings and tender documentation received from the client. It is his task to work with the tender drawings and prepare them for the manufacturing planning department.

His responsibilities in re-adjusting the tender drawings can vary from selecting specific drawings from the tender drawings and focusing on areas, AE Stålmontage A/S has to work with. An example provided by the company; project with a façade where only several parts had to be cladded with products from the company, and therefore the façade drawings provided by the client were not sufficient for the company to use them in the Production planning department. Therefore necessary adjustments were completed by the PM.

A PM is working in close collaboration with internal specialist for example an engineer and is in charge of communication with the stakeholders. The stakeholders (client, his adviser, turnkey etc.) requirements and considerations are to be included in his work while establishing the project planning and detailing of the drawings. Providing overall dimensions, design parameters and specifications for elements and substructure is being completed in close collaboration with experts within the company.

The amount of work for a PM is not limited strictly to detailing of the drawings; he is to prepare technical specifications for the project and assembly drawings for the execution phase on site. Furthermore, he is to keep a project overview together with making sure the work is proceeding as planned and up to the required standard. Therefore much of the responsibility throughout a project is being placed on the shoulders of the PM.

A constant dialogue between the Project manager and the manufacturing department as well as the construction site is curtailed in order to provide product up to desired standard. For example, drawings sent by the PM to the Production planning department, there is often uncertainties that
staff within the Production department are to know. Moreover, the burden of providing quality assurance for detailed drawing as well as manufacturing drawings falls under PM’s responsibilities. Therefore before manufacturing processes can start, the manufacturing drawings are to be checked by the Project manager.

Execution on site
PM’s duties do not end with the product leaving the factory. All charges on the construction site, related to the manufacturing are to be accommodated by the PM. Therefore the site manager is to have a constant dialogue with the Project manager in order to stay informed about the proceedings.

Larger projects, such as Musikkens Hus, the Project manager has been involved in helping the Site manager with supervision due to the extent of the work that had to be performed. This adds another task on the Project manager’s duty list that needs to be accommodated if the situation calls for it.

5.5.3. Exposed problems reflecting upon Project Manager’s scope of work
All the aspects mentioned above are to underline the importance of Project managers’ involvement throughout a project. All these responsibilities are a heavy burden for a PM in his day to day operations. Therefore relatively large amount of crucial information is being processed by him on a daily basis. As mentioned in the interviews there are practices of storing data related to ongoing projects.

All communication with external parties together with parts of the internal documents such as architectural drawings, specifications and quality assurance are stored digitally. On the other hand, documentation for instance project as well as personal planning, stock control, project monitoring, and production drawings are not being stored digitally.

Therefore, there is still a lot of information that is not accessible to other employees stored digitally. That results in company’s dependency on a single PM during an ongoing project since there is a lot of crucial information for successful project proceedings that is in the designated
PM’s mind. As mentioned in one of the meetings every single PM has his own way of doing his work. Therefore, there is no standardized system used by the companies’ project managers that would enable access to digitalized information.

Subsequently if the information is not stored anywhere it cannot be accessed by other individuals within a company. That represents potential risk for the company. People are not machines, so they get stressed if overburdened with work. Long periods of exposure to stress can lead to reduced efficiency and motivation of an employee. If that phenomenon continues on a daily basis an individual might be reluctant to continue his work in a company or be unable to continue. As established in the sections above an experienced Project Manager that is good as his work would be a great loss to the company of a moderate size like AE Stålmontage A/S. Therefore, keeping the PMs motivated and working within a standardized working process should form the basis for potential future expansion and development of the company.

As it was mentioned by the company, the Project manager’s work becomes very stressful if allocation of resources cannot take enough load-off an operating PM’s back. Even though the PM’s might become overloaded the company is avoiding hiring temporary staff due to fluctuations in the workload. As described by the company there is “quiet and stressful periods” within a year. This problem is not directly related to the PMs; however it is something to be considered in the company’s market strategy and competing with tender offers.

As explained in the meetings it is hard to plan ahead; while working with custom projects a PM cannot afford to waste time on planning due to the fact that “something always goes wrong”. That is the main reason why no standardized planning system is in place. No specific tools are used in order to standardize planning, changes and drawbacks during an ongoing process. Because of the of the company size, these changes can be accommodated as they arise. The company seems to be handling the changes and find short-term solutions. That strategy used in a long run surely cannot embody the shortest way to future development and placing the company where they want to be on the market.
Chapter 6: Proposals and solution

Today’s manufacturing companies all over the world have to face many challenges. Fast expansion of technology and information sharing changes drastically the way how work is performed. During last couple of decades, more changes had occurred than in the whole history of manufacturing. Many systems and philosophies of manufacturing management have been developed during that time. Leaders of companies realise that quality plays very important role in the manufacturing processes and focused on continues improvement of it.

6.1. Considered philosophies

Below is a short summary of considered philosophies which should provide the necessary tools, forming a framework that is to set a foundation for potential proposals that will improve company’s working environment and performance. Following philosophies were taken into account:

6.1.1. Enterprise resource planning (ERP)

It is “an enterprise-wide set of management tools that balances demand and supply, employing proven business processes for decision-making, and providing high degrees of cross-functional integration among sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development, and human resources, thereby enabling people to run their business with high levels of customer service and productivity, and simultaneously lower costs and inventories; and providing the foundation for effective e-commerce”. (Kremzar, 2001, p. 18)

6.1.2. Supply chain management (SCM)

SCM is a management philosophy, focusing on integration of external members of the supply chain together with emphasis on the services and customer satisfaction. (Fisal Talib, Integrating Total Quality Management and Supply Chain Management: Similarities and Benefits, 2010)
6.1.3. Total quality management (TQM)

TQM is aiming to achieve integration of all levels of organization and continuous improvement together with manufacturing of quality products and customer satisfaction. (Fisal Talib, Integrating Total Quality Management and Supply Chain Management: Similarities and Benefits, 2010)

6.2. Argumentation and chosen philosophy

SCM and ERP were identified as not suitable to be implemented at AE Stålmontage A/S because of the following reasons. Further information of the philosophies can be found in appendix 6.1.

Supply chain management’s primary focus lies in integration of external members of the process. That philosophy was not identified as one that would provide an appropriate framework for solutions to problems identified in chapter 4 that are related to internal processes at AE Stålmontage A/S.

Enterprise resource planning is a concept that is considered as being too broad for small manufacturing firm to be implemented in; it includes aspects that are currently not existent at AE Stålmontage A/S (marketing, sales department, etc.). Furthermore a significant investment of resources and restructuring would be needed. For these reasons most of the implementation attempts in smaller companies fail.

Chosen philosophy: Total Quality Management is primarily focused on continuous improvement of internal processes and subsequently reduction of waste. Found issues that were defined into problems are in close relation to the internal process at the company. This philosophy can be implemented in small manufacturing companies. TQM was chosen as the suitable philosophy that will provide a framework through which companies’ goal can be achieved.
6.3. Total Quality Management

Total Quality Management it is both philosophy and guiding principles on how to continuously improve organization. It involves and applies to everyone within organization and parties related to organization for e.g. suppliers. TQM gathers fundamental management techniques, tools, experience etc. and use all resources and assets to continuous improvement process. TQM examining the process the work is carried out through systematic, constant overseeing organizations processes. It applies to everyone within organization equally regardless of position in the company: management, administration, design or labour. The managers' leads through the entire improvement process, however everyone else must commit and participate equally in the overall effort. (Pekar, 1995) (Schacht, August, 1989)

By implementing TQM fundamental principles, quality of management, product and services increases, cost and waste will be reduced which result in lower price in finished product. Low price for the high quality product can open doors for the wide range of new clients. Increased number of clients can create more jobs within the organization and overall expansion of the business. Improvement of the quality can be beneficial for everyone involved in the organization. (Pekar, 1995) (Schacht, August, 1989)

6.3.1. Getting started

Each and every company in the market differs due to individual goals and values, people as well as inner culture. Therefore, there are no strict set of rules or steps applicable for any type/industry/size of the company for the purpose of implementing TQM. The philosophy behind the TQM had set the foundation in the form of guidelines, setting and preparing a company before an actual implementation, otherwise considered as false start. (Pekar, 1995) (Schacht, August, 1989) Then specific methods and tools are applied for an ultimate goal – an implementation of TQM – aiming for the total customer satisfaction, as high product quality as possible as well as well functioning project management. “You can’t build an adaptable organization without adaptable people – and individuals change only when they have to, or when they want to” (by Gary Hamel). Therefore, the success of the preparation first of all
includes every single employee’s effort and will towards change internally in the company. It is being considered as the bravest decision of the entire implementation due to the fact that incorrectly or not gradually implemented TQM not only will lead the company to having started over but also had wasted tremendous amount of time. “The Total Quality Management is not a destination but a journey toward improvement”. (Schacht, August, 1989) Moreover, “the road to continuous improvement is and must be an appropriately tailored and personal one” (Schacht, August, 1989).

6.3.2. Preparation of the company internally

Organizations, which have already applied TQM, reveal that the integration of different tools and techniques is most successful when applied in the environment which believes in this particular change and understands it (Schacht, August, 1989). As mentioned before, to begin the journey, AE Stål montage A/S shall begin according to the 12 specific guidelines/practices of TQM in this particular sequence, which regarding to different sources have been combined accordingly. (Schacht, August, 1989) (Pekar, 1995)

1) Demonstrate leadership

One should take the initiative in the company to establish the momentum for continuous improvement of that particular person. By heading towards personal improvement, the one that originally initiated the leadership will demonstrate his/her belief in TQM philosophy, its effectiveness in practice and will reinforce the company’s interest. The philosophy, principles and practices should be part of the one’s daily activities. By becoming a leader the one should demonstrate such behavior as he/she would rather receive from subordinates and other colleagues. (Schacht, August, 1989)

Besides that, today’s management is not autocratic, meaning that the leader of an organization tells or rather insists others on performing some particular tasks, which he/she thinks are the best and other employees have nothing to say or offer. Nowadays, organizations focus on team management, where the leading person should have knowledge of what other employees are responsible for, for instance, production manager or sales department. However, it does not
mean that the leading person in the team management shall be trained in all of the areas. (Pekar, 1995)

Since the company’s aim should be the improvement of the entire organization, the leading person shall pass on his/her knowledge and experience to other candidates. There should be one leader in each of the department to monitor, coordinate the process. A leader person shall also remove as many barriers as possible, meaning that more “free” environment allows them to act freely in the meantime strengthening their own abilities, increasing their willingness to improve their own performance, which is a part of the entire company’s performance too.

2) Build awareness
This step of implementing TQM is perhaps the most important one. Each and every single employee within the company shall understand what TQM is, why the company needs it and how the company is going to implement it. It shall begin, as previously mentioned, by everyone being interested and understanding the need of it. Additionally, employees could be offered to attend various workshops, conferences and other type of informative meetings to get a better overview of TQM. Afterwards, the findings could be discussed together internally in the company, which could bring up useful and interesting topics.

Another very important fact in taking this step is to be aware that you should not be the only person to understand the concept of TQM, the top management should too. Otherwise yours, as single employee’s will, might be restricted by the top management, as it plays the leading role of the company or department. When everyone within the company is aware of TQM, the company shall inform the suppliers and customers about the new philosophy.

3) Open lines of communication
As leader/leaders have been established, it is essential to set clear communication. Initially, communication involves a sender and a receiver. A leader is in the position, where his/her position involves a lot of listening and more importantly understanding what he/she has been told. It functions in this way:
It is necessary to keep this communication free (see point number 1. Demonstrate leadership) both ways in the company’s organization structure: vertically as well as horizontally (see figure 3.1. – chart of company’s organization). The TQM philosophy determines the importance of the leader/leaders maintaining information sharing, clear personal as well as company’s goals, vision and other significant statements of the company kept open and known for everybody within the organization. “Individuals tend to be the most dissatisfied when kept in the dark<…>” (Schacht, August, 1989). This attitude of the leader makes employees feel more secure allowing them to contribute, share and communicate freely and openly. (Schacht, August, 1989)

4) Create constancy of purpose

Basically, it is all about the company having stated its own vision and mission, which solidify ultimate goals, when communicated with the rest (related with the previous statements, see point no. 3). These long-term goals shall reflect an understanding of customers’ needs, requirements and expectations. Moreover, they shall be in relation to the company’s values and again they have to be known for every employee. Also they must be a part of the company’s ultimate goal in order to lead that direction.

Beside the long-term goals, the company shall have meaningful short-term goals, which are being set for the shorter periods of time. Those short-term goals should be reasonable and achievable for the ones assigned. The top management has to track the entire project, therefore goals are to be monitored, which means they are going to be checked in regards to the quality, time frame etc. According to TQM, weather goals have been reached or not, people must not be judged, however they can be rewarded. It builds the focus not on the results, but on the way they are being reached. By asking or being interested in other employees tasks the leader
shows concern while the employee feels appreciated and respected dealt directly in person and not had been punished or talked about. Thus the system of respecting everybody individually will stabilize over time within the company. (Schacht, August, 1989)

5) Focus on the customer
There are 2 types of customers: external and internal. Internal customers are employees within the company, while external customers – suppliers, clients etc. External customers provide income for the company by ordering goods and services, made in accordance to their own requirements, which internal customers are to satisfy. Each and every single customer is the reason the company grows its business. Without the customer there will be no order, no requirements to be met, no work, no invoice etc. Therefore, the focus of the company should be to fully satisfy the customer in regards to quality, communication and performance on time. (Pekar, 1995)

6) Detect critical areas to success
"The trick is to find something that is neither so large that you are doomed to failure nor so small that no one will notice if improvements are made". (Schacht, August, 1989) The most benefitting for the company is to find the middle of the two, this way the results will speak for themselves. In order to create continuous improvement and reach best possible results, it needs to be implemented as high in the organization as possible. This way the implementation will gradually affect the rest of the company’s structure (see figure 6.2.). It works as funnel, whatever you pour in the top, what comes out is visible in the bottom – something implemented in the top management will be passed on for the managers, their subordinates and etc. The end result will be noticeable when it affects all levels of the organization (see figure 3.1.). (Schacht, August, 1989)
7) Develop Teamwork

One of the most important acts the top management can take is recognize the importance of contribution employees constantly do towards the success of the company. Those are educated experts and they are trustworthy. According to TQM, teamwork is management of participation. At the beginning, during the phase of company’s preparation for TQM implementation is important for each of the employee to learn to count on and trust other employees. It could be expressed by establishing special cross-functional teams in different departments, being responsible for different parts and different phases of the project. Each team is assigned to focus on particular problem solving; afterwards members of different teams are grouped with other colleagues to gain the mutual trust with them too. Teams keep changing time after time and after a period of time, everybody is familiar with each other’s working techniques, personalities, knowledge and skills, which determined and used up to their full potential, bring the biggest results. Hence, empowering teamwork within the company benefits entire organizational structure. (Schacht, August, 1989)

8) Provide support, training and education

In order for the company to continuously improve, employees need to be regularly trained and educated upon new working principles, methods, new programs or techniques etc. However, needs assessment analysis need to be performed for every single employee according to his/her position and scope of work, not on the individual, in order to find out if they have an ability to perform their job: what are their strengths and weaknesses. To reasonably prepare needs assessment analysis, the products certification flow chart (the process of making the product – (see the flow chart of the processes within AE Stålmontage A/S appendix 5.1). shall be analysed step by step and required skills, knowledge of employees working directly for each phase shall be determined. (Pekar, 1995)

9) Build trust and respect

"If their opinions are respected, they will share their knowledge and creativity with management<…>". (Schacht, August, 1989) TQM is all about every person being comfortable to take chances and make decisions. However, some of the employees might feel shy to
express their ideas in the group meeting, despite that fact, the conversation with those people can be maintained individually. Therefore, leader’s responsibility is to listen for even the smallest voice and encourage everybody to participate in discussions. That explains main moto of TQM towards building trust and respect: “If people broach ideas, they should be praised; if they identify problems in the process or system, they should be thanked; when they contribute, they should be recognized; when they fail, they should be supported; and when they succeed, they should be rewarded”. (Schacht, August, 1989) Such great attitude could be valuable asset not only for the companies, but in any environment.

10) Recognize and reward
First of all, management is responsible for providing safe working environment for the employees and this consideration and concern for their work force will be noticed and appreciated. It is advisable to establish steering committee consisting of employees of different job positions. Steering committee’s aim is to create a system/program, explaining and setting guidelines and expectations within these 3 areas:

- Pay-for-performance;
- Perfect attendance;
- Service awards.

Pay-for performance stands for the recognition of the employees work performed, which should include such criteria as quality of work, productivity, attendance, initiative, knowledge and safety.

Perfect attendance should contain rules that are established and applicable for every single employee. They are to define when they are expected to be at work, when they are to finish also when they are excused of work. Once they are equally maintained within the company, regardless of job position, scope of work, busy schedule or other aspects, every single employee’s time and effort will feel equally appreciated. It might seem it goes without saying, but what is not covered does not mean that does not apply or exist. This way the company forestalls misunderstandings regarding attendance at work.
Service awards shall be a part of the company's policy, which recognizes and rewards employees for their length of service as devotion and contribution for many years. Throughout the years they have gained valuable knowledge, have become experts in what they do and company shall treasure them. (Pekar, 1995)

11) Create an ideology of continuous improvement
Making continuous improvement shall become a daily routine for all of the managers, subordinates and others. It means that each employee contributing to the company and expecting a positive change shall seek for it. It could be done by continuously asking questions “is it good enough?”, however if it is not – shall never be expressed negatively. On the contrary, it shall be turned into the drive for improvement. Problems aroused shall be seen as only chance to improve the process because without problems there is no incentive for improvement. In the meantime company will detect policies, procedures or practices that contradict TQM goals. In this case they shall never be ignored, in fact “tailored” for desired TQM implementation to be successful. (Schacht, August, 1989)

12) Expand the culture of suppliers
Regarding previous guidelines on informing all parties, involved in the project process, about a decision to implement TQM, it is essential to do it in line with the company. Implementing TQM is a long process, requiring major adjustments and changes in the way company functions and performs. Therefore, external customers (suppliers, customers etc.) shall be informed as early in the process as possible, otherwise implementation of TQM might take twice as long. Besides, involving suppliers and other external parties will benefit from the improvement both the company as well as external customer. Additionally, involvement of suppliers will improve purchased goods and services. (Schacht, August, 1989)

6.3.3. Moving on to Quality tools
After the company has made major readjustments internally, it is time for the company to implement actual tools for the quality improvement. There are numerous tools for quality, productivity and customers’ satisfaction improvement, however the 2 broadly used tools are ISO
standards and Six Sigma. Most commonly used are ISO 9000 (fundamentals and vocabulary), ISO 9001 (requirements regarding quality) and ISO 9004 (guidelines for performance improvements). “These standards focus on developing, documenting and implementing procedures to ensure consistency of operations and performance in production and service delivery”. (Lindsay Evans, 12 May, 2010) However, due to ISO being recognized by many countries in the world, these standards are more beneficial for the companies, aiming for expansion in other countries. On the other hand, Six Sigma is a set of tools and techniques, which follow 2 methodologies inspired by the Deming’s philosophy, (each of them consist of 5 phases):

- DMAIC (define, measure, analyse, improve and control) – focus on the existing business improvement;
- DMADV (define, measure, analyse, design, verify) – focus on the new product design (Lindsay Evans, 12 May, 2010).

In spite of the possible company’s consideration to implement, for instance, DMAIC it must be supervised, advised and assisted by the professionals in the field.
Chapter 7: Implementation

7.1. Description of steps in AE Stålmontage A/S

In relation to the previous chapter, the implementation of TQM in AE Stålmontage A/S is divided into 3 main phases: informing and understanding, preparing, implementing. The process of implementation of these 3 phases has been described and explained as follows.

7.1.1. Informing and understanding

The process starts with employees and stakeholders being informed about the upcoming changes in the company and as early it is done, less time is about to be wasted. It is due to the fact that the entire process of TQM implementation is quite a long process including major changes in regards to the company’s mind-set and project work and since the company has its own way of functioning, knowing their way around, it is going to require everybody’s will and contribution. Therefore, the involvement of all parties as early in this process as possible will not only save precious time but will allow the company, suppliers, clients and other parties to learn from each other and work towards the improvement of total quality.

7.1.2. Preparing

The one to start the change, by initiating and expressing his/her commitment, ideally from the top management, for example, the CEO of the company Per Mortensen. In this case, regarding internal structure of the company, Per Mortensen may ensure that everyone within the organization has gained an understanding of what TQM stands for, how the company will benefit from implementing this philosophy and what are the potential challenges. One way of doing so is to provide all of the employees an opportunity to participate in the conference held by an external professional in Total Quality Management.

Once everybody within the company has gained an understanding of TQM principles, Per Mortensen should initiate and demonstrate the commitment to the philosophy of Total Quality Management by “walk and talk” rule. It means that he is the one to set a good example by
sharing his enthusiasm and knowledge with others. Additionally, it would be ideal for Per Mortensen to attend a course or training, this way he will be the most familiar with the philosophy and will be able to pass on information that others are not familiar with. Besides that, it will ensure that the information passed on to others is correct. Later on, the next step of familiarizing and strengthening employees’ knowledge is to provide them with opportunity to participate in various workshops.

Furthermore, continuing the process of TQM implementation in AE Stålmontage A/S, it is important that leaders would establish a well-functioning communication, which works both ways – horizontally and vertically – meaning that anyone in the company can have a direct face-to-face contact with any of the fellow colleagues. For instance, an employee from the manufacturing department could easily talk about his/her personal concerns regarding project work to one of the managers as this could be the fastest way of identifying the problem and acting upon it. According to Per Mortensen this is the way communication already is functioning within the company. However, there is always a place for improvement.

Moreover, during the process reasonable problem areas are going to be detected. The main idea is to choose neither too small area for improvement, which might not be even noticed within the company, nor too ambitious – impossible to improve. It is crucial because failure to meet expectation at improvement progress can result in loses of interest of the fellow employees. However, success will build confidence in the philosophy and enhance interest and overall attractiveness of TQM.

It is known that AE Stålmontage A/S has experienced trustful and respected workers. However, encouragement of individual ideas can built even stronger mutual trust and respect among employees. Therefore, it is crucial that the leader in the company would listen to every single idea of potential improvement and encourage those who do so.

In addition to that, every employee in the company shall be aware of the significant statements, such as company’s short and long-term goals, vision and mission – it is called creating constancy of purpose. The essential part of it is to have those statements clearly in writing and
shared as well as introduced to the employees. It also includes keeping them updated about the progress of reaching those goals. Since the philosophy behind TQM states that each one should be willing to change as well as to progress, these statements shall become everybody’s personal goals too.

Both types of customers, internal and external, play a significant role for the company’s existence, performance and etc. Company must ensure that employees (internal customers) have a good working environment, which makes them feel appreciated and motivates them to perform their part of work more efficiently, where meeting clients’ (external customers) requirements, specifications and desired quality is a part of. They shall be valued by the company because without the order they give there will be no work for anyone within company.

Though AE Stålmontage A/S is a small company, getting to work in constantly changing teams is an advantage. Establishing small groups of, for example, 2-3 employees would lead to team members helping each other out when needed, brainstorming, and getting to know each other’s working and communication styles. Regarding one of the problem statements such as the Project Manager frequently being overburden, knowledge and information regarding the projects he is working on is not documented, it could be advantageous for the company to establish rotating teams. This way, in case of someone’s absence, the rest of the team members can easily take over. Another advantage of working in teams is that even though an additional person would be assigned (for example, in case of heavy work load) the rest of the group members are familiar with the work progress and can easily familiarize the other person too.

Moreover, AE Stålmontage A/S may establish a steering committee consisting of employees of different job positions, for instance, project manager, production manager, site manager, production worker, site labourer. The meaning of having organized this group is to establish a system/program, explaining and setting up guidelines and expectations regarding recognition of performed work by employees, description what each employee is expected to do and policy regarding reward for effective contribution to the company.
At that point of TQM implementation in AE Stålmontage A/S, the company is ready to introduce employees to new methods, new programs or techniques. Depending on how complex changes are, the company must assess if additional training should be provided to avoid unnecessary confusions and frustrations; for instance, introduction to digitalization method internally. More complex changes such as instalment of new production machinery might require sending employees for an additional external training. Additionally, for the top management to be sure if a specific training is necessary, needs assessment analysis may be performed. This analysis is to be prepared specifically for each employee regarding his/her role and scope of work, providing the company with the results upon everyone’s awareness and knowledge to perform work efficiently. Afterwards, the ones that need to be introduced to specific work principles shall be offered a participation in training/course. It also allows the company to invest in their employees carefully.

Lastly, by asking themselves a question – “is it good enough?”, AE Stålmontage A/S employees, top management and everyone else within the company get a chance to honestly rethink of that they have already done and if it could actually be done better. This question first of all should be asked individually and/or team members each other. However, if someone else is to ask about the improvement of work, it is to be done in non-judgemental way. Though problems will arise on the way, they should be looked at as they are the only way to improve, because people learn from their mistakes. Every person should bear in mind that it could be their part of work that is being questioned. Despite that fact, it should be taken as non-personal-criticism, but as process of improvement. Due to the fact that everyone was being trained and informed about TQM during the process a policy or procedure might be noticed to be not in compliance in regards to the philosophy. In this case, the action should take place and the specific area should be readjusted.

7.1.3. Implementing

As previously stated there are numerous tools to improve quality, for example, 2 of them – ISO standards and Six Sigma, which were briefly introduced in the sub-chapter 7.2.3. Based on AE
Stålmontage A/S unwritten goal to open-up a branch in Copenhagen and to become a preferred supplier in Danish market, ISO standards are not suitable due to their main focus on international expansion. In accordance to the researchers’ findings, one of many TQM improvement philosophies is Six Sigma. However, it is a very broad system and for a small company such as AE Stålmontage A/S one of its methodologies previously described as DMAIC (sub-chapter 6.3.3), might be the most suitable for the implementation.

In spite of AE Stålmontage A/S goals, the statistic of the 2012 and 2013 showed that the company had won approximately 24% of bids during the tender processes, which for the company, providing such high quality standards could be much higher. According to Per Mortensen, the reason for such percentage of bids won is high price of products and services. In this case the researchers consider Six Sigma philosophy and its tools as a worth considering system for the implementation to provide reduction of waste and cost while already high quality is being increased. An implementation of such system could possibly be an opportunity of the company to win more projects.

7.2. Study cases – real life examples of TQM implementation

7.2.1. Study case 1

Evaluation of Total Quality Management Implementation in Small and Medium Manufacturing Companies

The survey consisted of in depth interviews and questionnaires completed by the employees that were equally distributed between the three manufacturing companies. Gathered data was summarised in the findings. Following parameters were considered: Types of training, soft skill training, training in statistical quality tools, monitoring and organizational transformation (annex 7.1.)

Findings

All three companies understood the success of implementation of TQM hinges in successful involvement of the whole organization down to every member of the staff. Management initiated the training process and set the organizational goals of the implementation. Managers from
each of the participating company’s pointed out that during the implementation they realized the importance of costumer focus, continuous improvement and team work.

The concept of continuous improvement was identified as poorly implemented in all three participants. A need for improved training methods was pointed out as necessary in order to enhance standardization of processes that would lead to breakthroughs in implementation. None of the groups in participating companies reached a developed stage functioning by daily tasks and work assignments. According to the managers, their companies were not able to enforce authority and delegate authority. Employees’ decision making and problem solving capability was not sufficient enough and therefore managers’ guidance was needed. Furthermore, limited training on involvement and customer service was provided. Other barriers identified were the difficulty to change behavioural attitudes, barriers between departments and general lack of resources invested into the development of TQM.

**Recommendations**

Most challenging part of the implementation was the establishment of “growth of quality culture” and the need to involve everyone within the organization. It is crucial that strong leadership structures are in place together with involved union representatives in order to address the issues of employee training and teamwork. Continuous education together with efforts to improve the practices “of today” is needed in order to provide long term success. Collective behavioural changes from TQM facilitators to each staff member working in a quality team are to be accommodated in order to provide a sound foundation for TQM implementation.

### 7.2.2. Study Case 2

**Factors affecting TQM implementation: an empirical study in Tunisian firms**

A qualitative research was conducted with through a questionnaire send to the managers responsible for quality in 80 firms (annex 7.2.).

Following aims for implementation of ISO 9000 were defined:

- 23 companies; to improve quality;
- 19 companies; to improve competitiveness;
38 companies; ISO as the first step of further development.

Study case referred to eight critical factors of quality management was identified in the book: An instrument for measuring the critical factors of quality management. The factors stated in the book were: “top management leadership, role of the quality department, training, product design, supplier quality management, process management, quality data reporting and employees’ relations”. (Saraph J. V., 1989)

**Recommendations**

Authors of the paper have stated that “ownership structure, leadership style and quality experience represent the most influential components while implementing a TQM system”. Another comment made by the authors was that manufacturers with high experience in quality together with strong leadership and used to collaborate internationally, show bigger interest in implementation of TQM.

The final recommendation stated by the authors was: “The decisions regarding plans to develop TQM come as a consequence of the internal demands of quality policy followed up by general management”. (Sun, 1999)

### 7.2.3. Summary of the case studies

Commitment and willingness to invest resources into continuous improvement in how their company is managed in order to create a competitive advantage in the future, could be defined as the most important factor, which is going to determine the success of the whole implementation and maintenance process of a TQM.

As subjected in the second case, companies with higher level of quality and strong leadership tend to be more receptive to changes that an implementation of TQM would bring to the table. These companies internal demand for improvement and efficiency brought about the changes rather than following trends set by other companies or the market.
7.3. Mapping of existing practices

The mapping of existing practices to that of Total Quality Management (TQM) is to identify the existing tools already in operation at AE Stålmontage A/S, which needs to be restructure or re-adjusted to improve the cross-functional integration system within the present company operations. The table 7.1 gives a clear understanding and re-focusing areas in regards to the implementation of Total Quality Management (TQM) tools as the researcher’s proposed to AE Stålmontage A/S in this project report.

<table>
<thead>
<tr>
<th>Theme</th>
<th>TQM</th>
<th>AE Stålmontage A/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition / description</td>
<td>Management philosophy, focusing on integration of all levels and organizational functions, continuous improvement, quality product and services and customer satisfaction.</td>
<td>Manufacturing company, focusing on high quality product and services, customer satisfaction.</td>
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<td>Origin</td>
<td>Quality</td>
<td>Experience</td>
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<tr>
<td>Goal</td>
<td>Strengthening organizational competiveness and customer satisfaction.</td>
<td>Be a preferred supplier of metal cladding façade elements for projects in Denmark. Expansion of the company (opening new branches e.g. in Copenhagen).</td>
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<td>Focus</td>
<td>Performance as per specification or Quality.</td>
<td>Quality, customer satisfaction, meeting deadlines.</td>
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<tr>
<td>Tools</td>
<td>Six sigma, Taguchi methods, quality circle and quality award models.</td>
<td>Document folder structure (digital), standardized procedures (tender processes etc.) visual control (paper-</td>
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<tr>
<td>Practices</td>
<td>Top-management commitment, customer focus, training and education, continuous improvement and innovation, supplier management and employee involvement (Talib and Rahman, 2010 and Talib et al., 2010)</td>
<td>Top-management commitment, quality focus, experience of employees, use of existing resources to full potential, traditional supply model.</td>
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<td>Scope</td>
<td>Product safety, flexibility and improved quality products and services (quality assurance), quality management issues, measurement of quality, cost of quality, quality excellence models, process management and improvement, and strategic, tactical and operational issues for TQM implementation and maintenance.</td>
<td>Product design, manufacturing, assembly services, partial quality assurance and quality control, vertical and horizontal communication, process management, paper based stock control.</td>
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<tr>
<td>Applications</td>
<td>Manufacturing, Service, Small Medium Enterprises and all ISO 9000 certified organizations.</td>
<td>Manufacturing to order, assembly service, medium size enterprise, quality over quantity, flexibility in terms of design,</td>
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Table 7.1: Existing practices of TQM partially implemented in the company (Faisal Talib, Integrating Total Quality Management and Supply Chain Management: Similarities and Benefits, 2010)
The implementation of a new philosophy in the company is a hard and long process. Luckily, AE Stålmontage A/S has developed some processes and principles similar to the ones in TQM philosophy, however not fully. Despite that, the process of implementing these particular parts in the company can be eased.

Regardless of practices that AE Stålmontage A/S is already partly familiar with, the most challenging part is to introduce something completely new. Referring to the tools section in the table 7.1 it can be noticeable that the company does not have any particular system or program as a quality improvement tool in place, therefore the ones that are mentioned in the sub-chapter 6.3.3 or recommended by the professionals could be considered.
Discussion

This paper is aimed towards providing practices that will improve the company’s working environment, performance and development. After examining number of appropriate frameworks, an analysis of pros and cons was conducted. According to data gathered in the report, Total Quality Management was identified as the most suitable theoretical framework that AE Stål montage A/S could implement in the future.

The results show that an implementation of TQM is an effective way to solve the most if not all of the company’s weaknesses (addressed in the SWOT analysis) and the problem formulation (chapters 3 and 4). Overall aims of implementation are to provide improvements regarding working environment, performance and company development over time. Researchers agree that there are existing parallels between TQM framework and the company’s focus regarding high quality standards and open communication.

The research established that a written document concerning companies’ vision and strategy for the future. Through the process of defining clear goals a strategy based on how the defined goals are to be achieved. The TQM philosophy is providing the foundation a framework that is established in interconnection with the strategy that is unique to the company.

Based on the interviews with the CEO of the company – Per Mortensen, Project Managers and other employees, it had been established that the company is heading the right direction. Meaning that they have already partially implemented some of the steps, such as keeping open and free communication horizontally and vertically in the organizational structure, and having expressed leadership in the company. These factors will definitely contribute to the TQM implementation and will make some of the steps to be adapted easier. However, to make sure the implementation process will be successful AE Stål montage A/S shall follow the 12 steps in the particular order (described in chapter 6), while being assisted by external consultants, who would supervise and monitor that the entire transformation is proceeding according to plan.
Extensive experience, the company has acquired over the years together with knowledge and skills of the employees form the basis of smooth project work operation. Therefore, AE Stålmontage A/S is competent to conduct project work throughout all of the project phases, from getting on the offer until an actual hand-over of the project.

By implementing TQM, AE Stålmontage A/S would benefit a lot by standardizing and developing the entire project work, describing the scope of work for each of the employee, setting up clear communication and many other steps explained and described in the sequence of implementation (chapters 6 and 7). A correct implementation of TQM will prevent any misunderstandings and subsequently improve employees’ satisfaction regarding work and its environment, in the meantime will keep them more motivated due to the expressed concern of the company.

A standardized process including how project work is being approached and conducted would to a great extent limit company’s dependence on a single employee throughout a project. Meaning that the companies’ ability to accommodate changes and unforeseen events like longer absence of a project manager that is exposed and working with a large quantity of information. TQM implementation would provide a system of continuous improvement of practices used by all managers in the company. That way it would be easier for another project manager to take over or seek for help with an ongoing project.

The secondary aim of the report was to identify causes of the problems and provide solutions concerning overburdened Project Manager. Further issues beyond project managers’ scope of work have been identified as being subsequently part of TQM implementation. As stated earlier, TQM represents a holistic approach that takes into consideration all parties involved in the day to day operations. Meaning that it is impossible to introduce and implement improvements concerning Project Manager and expect success without considering the whole organization and single processes that form the phases of a project.

The first step for the company is to create a clear vision and mission. Those goals might be forgotten; therefore it is essential to have them clearly stated in writing. The statement must
contain information regarding company’s future plan, both short and long-term goals, and clear statement of where the company wants to be and what intentions they have for the future. That document is to serve as a tool that is to be revised and adjusted to changing conditions in the future. Vision and mission must be announced among everyone within the organization so that employees are aware of the common goals and can contribute towards theirs’ realization. From the research that has been conducted, it is possible that AE Stålmontage A/S would clearly be capable of reaching its unwritten goals (mentioned in chapter 1): remaining unique in the market, manufacturing high quality products, opening the new branch in Copenhagen and becoming a leading supplier in Danish market. However, before all these goals can be defined, the board needs to be committed to the cause and provide support to the steering committee. This way everybody is committing equally and company’s goals start to go hand in hand with personal goals of every employee.

At last, according to the research, TQM would as proposed provide solutions that would through implementation solve the routes of identified problems (described in chapter 4). However, the ultimate goal of TQM implementation is to become a strong and competitive organization. By improving already high quality and reducing waste and cost company would be able to win more tenders. Increased number of awarded tender processes would result in more work and growth of the company.
Conclusion

There is no active philosophy taking into account improving managerial practices currently implemented at the company. Therefore a need to do so is becoming necessary in order to stay competitive on the market. It might be true that the company is doing reasonably well at the moment but that does not necessary mean that this is going to be the case in the future. Furthermore, educating staff and implementing up to date practices, is considered to be a great investment that is going to provide a competitive edge on the market and contribute to a healthy working environment.

Based on the research and analysis conducted in this paper, the most suitable philosophy (TQM) was found and proposed as a solution to the identified problems areas in AE Stål montage A/S. The TQM offers guidance which aims for continuous improvement of performance and working environment.

Project Managers’ working process can be improved by implementing tools provided in TQM philosophy as mentioned in chapter 7; Six Sigma can provide necessary guidance for the PM to plan his day to day operations, digitalize his knowledge and provide necessary solutions for the communication within the organization. Teamwork and communication will enable the organization to benefit better from the knowledge that individuals possess and combined as described in chapter 7. Moreover, it will give the opportunity to compensate for any absence of the Project Manager through mean of empowerment to fellow co-workers.

Through implementation of TQM long term efficiency will be improved over time. By minimizing waste and cost without compromising quality of the final product the company would increase their profit. Subsequently a larger share market will belong to AE Stål montage A/S. That will result in achieving stability on the market and provide a solid foundation for future expansion.

However, the TQM does not stop with a successful implementation; on the contrary that is just the beginning. If long term benefits are to be reaped, TQM philosophy is to be integrated into
the DNA of AE Stål montage A/S; success can be achieved just through dedication and patience from all the parties involved.

**Recommendations for Future Research**

The research that has been undertaken for this project report has highlighted the importance of new system’s implementation, starting with the readjustment of the company’s internal organization. However, few areas have been excluded (mentioned in the introduction of the project report) due to the primary focus on the detected area, which led the researchers to an actual problem statement.

The initially proposed solution shall work as a preparatory phase for AE Stål montage A/S in order to establish standardized working methods for every employee. Although this is the beginning of the full-scale change the entire process will follow by further analysis in the company and afterwards an establishment of which quality improvement tools in particular shall be proposed for the company, such as briefly described Six Sigma. A further process of implementation will lead the company to applying a system and/or a program which allows detecting risky areas and preventing them from occurring, in the meantime optimizing processes.
Bibliography


