Seizing costs of non-conformities in the business of projecting

Martin Jarhult
MSc thesis, University College of Borås

The Thesis comprises 30 ECTS credits and is a compulsory part in the Master of Science in Industrial Engineering with a Major in Quality, 300 ECTS credits
Nr 12/2008
Seizing costs of non-conformities in the business of projecting

Martin Jarhult  
martin.jarhult@eka.com

Master thesis

Subject Category: Industrial Engineering

Series Number: 12/2008

University College of Borås  
School of Engineering  
SE-501 90 Borås  
Telephone +46(0)33 435 4640

Examiner: Henrik Eriksson, Sahlgrenska Universitetssjukhuset  
henrik.eriksson@vgregion.se

Supervisor: Christina Hillforth, Site Manager  
Eka Engineering 100 61 Stockholm

Client: Eka Engineering

Date: 25-06-2008

Keywords: Non-conformity handling, Deviation handling, Improvement work, Process vs. Project, TQM
Preface

This is the last entry in the thesis, and ironically it is read first. I am the author of this thesis and my name is Martin Jarhult, former MSc student at University College of Borås. Prior to the MSc studies I studied Mechanical Engineering, also at University College of Borås. After the thesis was finalised I was employed by Eka Engineering to continue the work initiated in this thesis.

I would like to thank Lars Holst, Christina Hillforth, Stefan Persson and Anna Kinnander, all Eka Engineering employees, for their contribution on several meetings that were vital for the progress of this thesis work.

I would also like to thank Andreas Svensson, Christian Mjörnerud, Sigfrid Antonsson and Robert Sameholm, all students at University College of Borås, for their help and guidance in bringing my work forward.

I would also like to dedicate a special thank you to Claes Berlin for his contribution to the result of this report. Also, during the thesis work, Claes Berlin offered me an opportunity to accompany him as a lecturer to a seminar he was holding concerning cost of poor quality. This opportunity was gladly accepted and provided me with useful training in presentation of my thesis work.

_____________________

Martin Jarhult 25/6-2008
Abstract

The name of the thesis is: Seizing costs of non-conformities in the business of projecting.

The thesis is a compulsory part of the master programme: Master of Science in Industrial Engineering with a specialisation in Quality. The master’s programme is worth 300 ECTS credits.

Eka Engineering is in the business of projecting and is in need of a system to seize and measure costs of non-conformities. As of today, Eka Engineering can only estimate roughly how large or small the costs are related to non-conformances.

The purpose of the thesis is:

- To search for means that can be used to, foremost, seize non-conformities and, secondly, seize the costs of the non-conformities in the business of projecting.

The theory used to gather information is mainly studies on TQM. Methods used to answer and fulfil the purpose includes: Benchmarking, survey and interviews.

A survey distributed within Eka Engineering proved that employees did not have enough motivation or information to use non-conformity reporting as means of improving the business. This was perceived to work functionally as projects were carried out. Part of the results must therefore include motivation and information to why documentation is futile for successful business improvement.

Furthermore, a benchmarking was conducted in order to improve Eka Engineering’s way of handling non-conformities. This benchmarking was conducted at SAAB Space in Gothenburg.

Interviews were conducted within Eka Engineering to find solutions for problems that arose during the survey, and also to shape a tool proposal for handling non-conformities that was influenced by SAAB Space.

The result of the thesis presents Eka Engineering with a concept labelled Knowledge base, this concept includes:

- A tool for documenting non-conformities and derived improvements
- A work-process for the handling of non-conformities and derived improvements
- A tool to involve employees in improvement work
1. Definitions

This chapter presents the definitions used in the thesis.

1.1 Definition of Non-Conformity

According to WordFinder 8, English dictionary, the definition of non-conformity is:

1. failure or refusal to conform
2. absence of agreement or harmony

Non-conformance handling requires some form of standard, defined process or agreement in order to be measured. Eka Engineering’s definition of non-conformity is deviation from standards, processes, laws or supplier and customer deals.

1.2 Definition of Process

Bergman, Klefsjö (2001)\(^1\) defines a process as: “a process is a network of activities that repeatable in time creates value for internal or external customers as its purpose”.

Sörgqvist (1998)\(^2\) defines process as: “a series of activities whose purpose is to reach a predetermined goal”.

Bergman, Klefsjö (2001) emphasises that processes requires repeatability in time, otherwise there is no room for improvement i.e. unique projects cannot be improved the second time as they are unique.

1.3 Definition of Project

According to WordFinder 8 dictionary, a project is: “a proposal, scheme or design”.

Bergman, Klefsjö (2001)\(^3\) defines a project as: “’unique process, consisting of several co-ordinated and controlled activities with start- and finish-date, initiated to achieve a set target or goal within limitations of time, costs and resources’.”

\(^1\) Translated from Swedish into English.
\(^2\) Translated from Swedish into English.
\(^3\) Translated from Swedish into English.
Table of Contents

Preface ........................................................................................................................................... 3
Abstract ........................................................................................................................................ 4
1. Definitions .................................................................................................................................. 5
  1.1 Definition of Non-Conformity ............................................................................................... 5
  1.2 Definition of Process ............................................................................................................ 5
  1.3 Definition of Project ............................................................................................................. 5

Table of Contents .......................................................................................................................... 6
Table of Figures .............................................................................................................................. 9
2. Introduction ................................................................................................................................. 11
  2.1 Background .......................................................................................................................... 11
  2.2 Problem Discussion ............................................................................................................ 11
  2.3 Purpose and Goals .............................................................................................................. 12
  2.4 Demarcations of Methods .................................................................................................. 12
  2.5 Disposition ......................................................................................................................... 13

3. Company Presentation ............................................................................................................... 14
  3.1 Eka Chemicals, Business Unit within Akzo Nobel .............................................................. 14
  3.2 Eka Engineering ................................................................................................................. 14
    3.2.1 The Market of Eka Engineering .................................................................................. 14
    3.2.2 The Organisation of Eka Engineering ....................................................................... 15

4. Theory ....................................................................................................................................... 17
  4.1 TQM ..................................................................................................................................... 17
    4.1.1 Customers in Focus ....................................................................................................... 17
    4.1.2 Base Decisions on Facts ............................................................................................. 18
    4.1.3 Work with Processes ................................................................................................... 19
    4.1.4 Continuously Work with Improvements ..................................................................... 20
    4.1.5 Create Conditions for Involvement .......................................................................... 21
  4.2 Comparison – TQM and Six Sigma ..................................................................................... 21

5. Method ....................................................................................................................................... 23
  5.1 Literature Studies .................................................................................................................. 23
  5.2 Document Review ................................................................................................................. 23
  5.3 Survey .................................................................................................................................. 23
    5.3.1 Author Comments ........................................................................................................ 24
  5.4 Interviews ............................................................................................................................. 24
    5.4.1 Author Comments ........................................................................................................ 25
  5.5 Benchmarking ...................................................................................................................... 25
    5.5.1 Author Comments ........................................................................................................ 26
  5.6 Reliability and Validity ......................................................................................................... 26
    5.6.1 Author Comments ........................................................................................................ 27

6. Empirical Studies ....................................................................................................................... 28
  6.1 Eka Engineering Management System ................................................................................ 28
    6.1.1 Eka Engineering Management System ...................................................................... 28
    6.1.2 Non-Conformity Handling ......................................................................................... 30
  6.2 Benchmarking at SAAB Space ............................................................................................ 31
    6.2.1 SAAB Space Definition of Non-Conformity ............................................................... 31
    6.2.2 SAAB Space Non-Conformity System ....................................................................... 33
    6.2.3 SAAB Space Cost of Poor Quality ............................................................................ 34
  6.3 Survey .................................................................................................................................. 35
6.3.1 About the Survey..................................................................................................... 36
6.3.2 Results from the Survey....................................................................................... 36
6.4 Tool Proposal................................................................................................................. 37
6.5 Interviews....................................................................................................................... 41
   6.5.1 About the Interviews............................................................................................... 42
   6.5.2 Results from Interviews .......................................................................................... 42
6.6 Knowledge Base............................................................................................................. 44
   6.6.1 New Definition of Non-conformity......................................................................... 44
   6.6.2 The Work-Process for Non-conformity and Improvement Work........................... 45
   6.6.3 The Database – the Documentation Tool............................................................... 48
6.7 Adoption of TQM Values ............................................................................................ 49

7. Discussion............................................................................................................................ 51
   7.1 Eka Engineering Management ................................................................................... 51
   7.2 Benchmarking at SAAB Space ................................................................................... 51
   7.3 Survey .......................................................................................................................... 51
   7.4 Interviews ..................................................................................................................... 52
   7.5 Knowledge Base .......................................................................................................... 52
   7.6 Proposal for Further Research .................................................................................... 53

8. List of References ............................................................................................................. 54
   8.1 Written References ...................................................................................................... 54
   8.2 Electronic References ................................................................................................ 54
   8.3 Oral References .......................................................................................................... 55

Appendix 1:
Avvikelse under pågående projekt extern eller intern change order Avsnitt Behandling av
avvikande produkter (QM - QC13-6505 - 1 - A)

Appendix 2:
Ändring i kvalitets- och referenssystem Avsnitt Korrigerande och förebyggande åtgärder (QM
- QC14-7010 - 1 - A)

Appendix 3:
Reklamationsshantering Avsnitt Behandling av avvikande produkter och reklamationer (QM
- QC13-6510 - 1 - B)

Appendix 4:
Designändringar Avsnitt Projekt-, process-, konstruktion- och el- och instrumentstyrning (QM
- QC4-2525 - 1 - A)

Appendix 5:
Projektutvärdering Avsnitt Korrigerande och förebyggande åtgärder (QM - QC14-7001 - 1 -
A)

Appendix 6:
Benchmarking questions, SAAB Space

Appendix 7:
Survey questions, Eka Engineering

Appendix 8:
Interview questions, Eka Engineering

University College of Borås, School of Engineering, Master Thesis 12/2008
Appendix 9:
Survey results, Eka Engineering

Appendix 10:
Interview results, Eka Engineering
## Table of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Profitability of an Organisation. Sörqvist (1998)</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Eka Chemicals Organisation (<a href="http://www.eka.com">www.eka.com</a>, internet)</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Market Areas (Eka Engineering Interested Parties, intranet)</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Organisation Chart (Eka Engineering Organisation, intranet)</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Organisation Chart (Eka Engineering Organisation, intranet)</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>Five Cornerstones of TQM (image and text translated from Bergman, Klefsjö (2001) page 36)</td>
<td>17</td>
</tr>
<tr>
<td>7</td>
<td>Internal and External Customers. Bergman, Klefsjö (2001)</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td>The Seven Improvement Tools. Bergman, Klefsjö (2001)</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>The Seven Management Tools. Bergman, Klefsjö (2001)</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>A Vicious and a Virtuous Circle. Bergman, Klefsjö (2001)</td>
<td>21</td>
</tr>
<tr>
<td>21</td>
<td>Comparison between TQM, Six Sigma and Lean. Andersson et. al (2006)</td>
<td>22</td>
</tr>
<tr>
<td>22</td>
<td>Author comparison between TQM and Six Sigma. Images borrowed from Bergman, Klefsjö (2001) and Magnusson et. al (2003)</td>
<td>22</td>
</tr>
<tr>
<td>23</td>
<td>Title Screen (Quality Management System – Eka Engineering Title Screen, intranet)</td>
<td>29</td>
</tr>
<tr>
<td>24</td>
<td>Title Screen (Quality Management System – Eka Engineering Title Screen, intranet)</td>
<td>29</td>
</tr>
<tr>
<td>26</td>
<td>Improvement Board. Picture translated, Swedish to English, from Claes Berlin presentation 2008-02-18</td>
<td>34</td>
</tr>
<tr>
<td>27</td>
<td>Pick Chart – The Cost and Benefit of Ideas. Picture translated, Swedish to English, from Claes Berlin presentation 2008-02-18</td>
<td>34</td>
</tr>
<tr>
<td>29</td>
<td>Work-Process for Non-conformity Handling</td>
<td>46</td>
</tr>
<tr>
<td>30</td>
<td>Improvement and P.I.C.K chart board</td>
<td>47</td>
</tr>
</tbody>
</table>
2. Introduction

This chapter presents background, problem discussion and purpose of the thesis. The chapter also presents demarcations and the disposition of the thesis.

2.1 Background

In today’s competitive market, companies strive to minimise the costs in order to maximise profit. As competition has grown stronger, due to globalisation, a wider accepted perception of decreasing costs is to increase the quality of the product or service that the company provides. It is the authors opinion that TQM, Lean, Six Sigma and ISO 9000 are perhaps the most commonly used methodologies to work with continuous improvement in a company.

Sörqvist (1998) state that 10 to 30 % of a company’s turnover could be due to cost of poor quality. Obviously this would affect the company profitability. Sörqvist (1998) presents, and discusses the formula below:

\[
\text{Profitability} = \frac{\text{Revenues} - \text{Costs}}{\text{Assets}}
\]

Figure 1. Profitability of an Organisation. Sörqvist (1998) p. 21

Improved quality can affect revenue, cost and assets in an advantageous way. Increased revenue and decreased cost increases the surplus, while capital tye-up is decreased through a lowered need of floating- and fixed assets. Thus, quality improvement yields increased profit.

To measure costs, companies needs to specify work-processes in a management system or similar. These specified, and accepted, work-processes later function as a foundation for the definition of non-conformance for a certain work-process. Any work that is not conducted in accordance to the specified work-process is a non-conformity and should function as a signal for improvement or correction. It may sound simple to specify and seize costs related to non-conformance for a machine process. A process of this kind is very much repeatable. However, in the business of projecting, where the word “project” itself implies some sort of estimation or plan, repeatability is perhaps harder to achieve.

2.2 Problem Discussion

From a third party perspective the management system of Eka Engineering is impressive and well detailed for the different work processes. The system also provides the user with complete access to the documents and templates required to maintain business and stability. The non-conformity reporting procedure appears to be solid and functional for its purpose.

---

4 The purpose of non-conformity reports is to detect all deviations that occurs, and by doing so, prevent them from re-occurring.
A discussion conducted with Christina Hillforth, plant manager Nacka, suggests that Eka Engineering lacks an effective tool to detect deviations. Further discussion implies that there are deviations occurring, but they are often solved and corrected without any or little documentation. Lack of documentation undermines the very purpose of non-conformity handling; without documentation of deviations, assessments of the costs related to them are very tough to make.

2.3 Purpose and Goals

The purpose of the thesis is:

- To search for means that can be used to, foremost, seize non-conformities and, secondly, seize the costs of the non-conformities in the business of projecting.

The derived goals from this purpose are:

- To present a tool that can store and estimate costs of observed and reported non-conformities.
- To present a procedure on how to handle reported non-conformities.
- To present a procedure and tools for how to use reported non-conformities as means for continual improvement.

2.4 Demarcations of Methods

As Eka Engineering is represented by two offices and because the author is resident closer to Bohus rather than Nacka, time and monetary restrictions inflict the selection of oral sources that contributed to the result of the thesis.
2.5 Disposition

This chapter briefly describes what every chapter of this thesis presents.

1. Definitions
This chapter presents the definitions used in the thesis.

2. Introduction
This chapter presents background, problem discussion and purpose of the thesis. The chapter also presents demarcations and the disposition of the thesis.

3. Company Presentation
This chapter presents Eka Engineering.

4. Theory
This chapter describes the theory used to solve the purpose of the thesis.

5. Method
This chapter presents and motivates the methods that were used to fulfil the purpose of the thesis.

6. Empirical Studies
This chapter presents the results from the benchmarking conducted at SAAB Space, as well as the survey and interviews conducted at Eka Engineering. This chapter also presents the management system of Eka Engineering and the final knowledge base proposal.

7. Discussion
This chapter presents discussions and conclusions for the results of the empirical studies. This chapter also presents proposals for further studies.

8. List of References
This chapter presents the references that were used during this thesis work.
3. Company Presentation

This chapter presents Eka Engineering.

3.1 Eka Chemicals, Business Unit within Akzo Nobel

Akzo Nobel is the world’s largest manufacturer of global coatings as well as number one in decorative paints and performance coatings. Akzo Nobel is based in Amsterdam and employs approximately 68000 people in more than 80 countries. The company was formed in 1994 when Akzo and Nobel industries merged to Akzo Nobel (www.akzonobel.com, Internet).

“Elektrokemiska Aktiebolaget (EKA) was founded in Bengtsfors, Sweden by Alfred Nobel in 1895. At the time, chlorine and alkali were the products that were produced. As of 1994, Eka Chemicals is Akzo Nobel Pulp & Paper Chemicals business (www.akzonobel.com, Internet).

Eka Chemicals employs 2900 people in 18 countries and is, since 1924, headquartered in Bohus, Sweden. The main areas for Eka’s expertise is found in: Paper chemicals, bleaching, water treatment, Eka onsite and Eka Engineering. (www.eka.com, Internet).

The figure below presents the organisational structure of Eka Chemicals.


Eka Engineering is a subunit to Technology and Engineering.

3.2 Eka Engineering

Eka Engineering acts as the in house engineering department for Eka Chemicals. Eka Engineering has the capacity to design and supply complete plants for chlorine, dioxide, sulphur dioxide, caustic soda, chlorine and sodium chlorate manufacturing. Engineering offer services that span from project management and construction to maintenance support and process optimization (www.eka.com, Internet).

3.2.1 The Market of Eka Engineering

Figure 3 below presents the different market areas for Eka Engineering.
Market Areas

Figure 3. Market Areas (Eka Engineering Interested Parties, intranet).

The picture presents the five different market segments for Eka Engineering. The A segment consists of internal customers within Eka Chemicals. The B segment consists of customers within Akzo Nobel. The C segment consists of external customers within Pulp and Paper Industries. D and E both consist of external customers to Eka.

Eka Engineering primarily acts to secure Eka Chemicals need of plant projects, which are A-projects. Secondarily, Eka Engineering serves external customers that are buyers of Eka Chemical products, C-projects. Third, Eka Engineering serves Akzo Nobel business units, B-projects. Forth, Eka Engineering serves external customers with expertise, D and E-projects (oral source, Anna Kinnander).

3.2.2 The Organisation of Eka Engineering

The organisation of Eka Engineering is presented in figure 4 and figure 5 below.

Figure 4. Organisation Chart (Eka Engineering Organisation, intranet).

The figure presents Eka Engineering’s matrix organisation as it fits in the organisation of Eka Chemicals.
Figure 5. Organisation Chart (Eka Engineering Organisation, intranet).

The figure presents Eka Engineering’s matrix organisation and how the employees are divided among the different departments.
4. Theory

This chapter describes the theory used to solve the purpose of the thesis.

4.1 TQM

According to Bergman, Klefsjö (2001) the cornerstones of TQM are: process thinking, continual improvement, fact-based decisions, good conditions for involvement and customer focus. These cornerstones have to be empowered by an engaged management in order to achieve successful quality.

![Diagram of TQM cornerstones]

The five cornerstones of TQM as presented by Bergman, Klefsjö (2001). Embedded round the cornerstones is engaged leadership.

In subchapters below the cornerstones of TQM are briefly presented as Bergman, Klefsjö (2001) explains them. If other sources than Bergman, Klefsjö (2001) is used it is explained in the text.

The reason for choosing TQM as base for the theory is that Eka Engineering has a commitment to TQM in their business. The result of this thesis is thought to provide a proposal (tool and work-routine) that uses the entire image of TQM presented in figure 6 above. Although, “continuously work with improvements” is perceived to be the most tangible and direct link with theory and the thesis result.

4.1.1 Customers in Focus

Quality is a measure of how a product or service is perceived by a customer. In this sense, quality is relative and partly decided by the amount of competition a company has. Keeping the customers in focus means actively finding out what the customer wants and then translating these wants into the product that the company produces. If customer needs are

---

5 TQM is an abbreviation for Total Quality Management
hard to determine, extra effort has to be put in to understand them. Prior to Toyota’s introduction of their luxury car, Lexus, on the American market, Toyota had employees live with American families in order to fully grasp their needs.

Levis provides an example of tailor-made products and high customer adaptation. Levis started producing jeans after measurements send in by the customer. The price was slightly higher than for jeans with regular measurements, but sales improved by 30 per cent. Another benefit from this conduct was the knowledge that Levis learned from their customers needs.

The centralisation towards customers must not only validate focus on the external customer i.e. the customer purchasing the product or service. Equally great focus must lie on internal customers. Quality improvement must strive for creating good conditions for employee satisfaction. This will create possibilities for pleased external customers. Figure 7 below illustrates the customers that are affected by, or users of a product.

![Figure 7. Internal and External Customers. Bergman, Klefsjö (2001) p. 37](image)

Eriksson (2003) state that one way to adept to TQM, and by consequence increase customer satisfaction, is to apply for a quality award or, to work with an in-company quality award using self-assessment. The results from his article indicate that, apart from increased customer orientation and a higher degree of employee participation, another benefit from the work with self-assessment arose – a systematic improvement work. This is very near the essence of this thesis as its purpose is to find a way of working with improvement proposal from non-conformities in a structured form. Although, it should be noticed that such an approach is very much dependent on how the proposal from this thesis is perceived i.e. if co-workers does not agree to the proposal from this thesis, a self-assessment approach could be motivated.

**4.1.2 Base Decisions on Facts**

An important cornerstone of TQM is to always base decisions on facts that are well undermined, and by doing so, avoiding coincidence to play a too great part in decision making. For this, knowledge of variation is required to be able to tell real causes from noise. Facts to analyse are naturally also required and they must be gathered in a structured approach. TQM provides a toolbox for gathering of both numerical and verbal information. In figure 8 and 9 below the tools are presented.
4.1.3 Work with Processes
A great part of the company can be seen as a process. The process shall transform certain inputs to certain outputs. The target of the process is to satisfy customer needs using as little resource as possible. Suppliers for processes are important to identify and also to assure that they receive information on what the process needs in order to minimise resources while satisfying customer needs.

A process functions as a mean of connecting the future with the past. The process generates information that can be used to verify the ability of the process i.e. how good it functions. The information generated by the process should be used to improve and evaluate the process.

There are mainly three different processes in a company or organisation. These are:

- **Core processes**: whose task is to satisfy external customer’s needs while improving the product that the company offer. These processes have external customers. Examples of this kind are: product development processes, production processes and distribution processes.
• **Support processes**: whose task is to supply resources for the core processes. The support processes have internal customers. Examples of this kind are: recruit processes, maintenance processes and information processes.

• **Management processes**: whose task is to set targets and strategies for the company. Furthermore these processes are responsible for improving the processes within the company. Management processes also have internal customers. Examples of this kind are: strategic planning and revision processes.

![Diagram of different processes in a company](image)

**Figure 10. Different Processes in a Company. Bergman, Klefsjö (2001) p.41**

*Illustration of the different processes a company has. Figure slightly modified from the original found in Bergman, Klefsjö (2001) page 41.*

4.1.4 **Continuously Work with Improvements**

The external customers’ quality demands are continuously increasing as new solutions are constantly made available. It is therefore of utmost importance to continuously improve or evolve company processes and operations. The symbol for continuous improvement is the “Plan – Do – Check – Act” circle.

![Diagram of PDCA Circle](image)

**Figure 11. PDCA Circle. Bergman, Klefsjö (2001) p.214**

• **Plan**: As soon as a problem has arisen, the root-cause to it must be established. Larger problem should be derived into smaller, feasible problems. Decisions on means must be made on facts. The toolbox for TQM presented in chapter 4.1.2 is preferably used for this purpose.
• **Do:** When sources of faults or variation are acquired, a team responsible for correcting the problem is assorted. It is important that all team members are in agreement with the problem at hand.

• **Check:** After the problem has been solved, tools must once more justify that the improvement was successful. Once the company is assured that improvement is lasting, measures must be made to maintain the new improved stage.

• **Act:** It is futile to learn from solved problems, this way reoccurrence will be minimised. The new improved way of working must be implemented; otherwise the PDCA circle must be reworked. Another important rule is that the method used to solve the problem also should be reviewed so that even methods are improved. If the solved problem was derived from a greater problem in the “plan” step; move on to the next problem and repeat the cycle.

The basic principle of quality improvement is: There is always a way of achieving higher quality at a lower cost.

### 4.1.5 Create Conditions for Involvement

Conditions for employee involvement are crucial for successful quality work. Efforts must be made to ease employee involvement and let employees actively affect decisions in improvement work. Key-words for involvement are: communication, delegation and training.

Involvement and engagement is attained through delegation of responsibilities and authorities. Vicious circles have to be transformed into virtuous circles.

![Vicious and Virtuous Circles](image.png)

**Figure 12. A Vicious and a Virtuous Circle. Bergman, Klefsjö (2001) p.46**

Oakland (2003) strengthens this by claiming that effective leadership is reached through close correlation between management and employees. Special attention should be paid to attitudes, abilities and participation of the employees. Oakland also emphasises that this attention should be considered both ways – not only from top down.

### 4.2 Comparison – TQM and Six Sigma

Andersson et. al. (2006) recommends that companies have a lot to gain if they combine the values of TQM, Six Sigma and Lean as they are highly complementary. In figure 21 below
the comparison between TQM and Six Sigma is presented. The comparison towards Lean is not a subject of this thesis, but is intentionally presented to maintain authenticity of the source.

<table>
<thead>
<tr>
<th>Concepts</th>
<th>TQM</th>
<th>Six Sigma</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>The quality evolution in Japan</td>
<td>The quality evolution in Japan and Motorola</td>
<td>The quality evolution in Japan and Toyota</td>
</tr>
<tr>
<td>Theory</td>
<td>Focus on customers</td>
<td>No defects</td>
<td>Remove waste</td>
</tr>
<tr>
<td>Process view</td>
<td>Improve and uniform processes</td>
<td>Reduce variation and improve processes</td>
<td>Improve flow in processes</td>
</tr>
<tr>
<td>Approach</td>
<td>Let everybody be committed</td>
<td>Project management</td>
<td>Project management</td>
</tr>
<tr>
<td>Methodologies</td>
<td>Plan, do, study, act</td>
<td>Define, measure, analyse, improve (or design), control (or verify)</td>
<td>Understanding customer value, value stream, analysis, flow, pull, perfection</td>
</tr>
<tr>
<td>Tools</td>
<td>Analytical and statistical tools</td>
<td>Advanced statistical and analytical tools</td>
<td>Analytical tools</td>
</tr>
<tr>
<td>Primary effects</td>
<td>Increase customer satisfaction</td>
<td>Save money</td>
<td>Reduce lead time</td>
</tr>
<tr>
<td>Secondary effects</td>
<td>Achieves customer loyalty and improves financial performance</td>
<td>Achieves business goals and improves financial performance</td>
<td>Reduces inventory, increases productivity and customer satisfaction</td>
</tr>
<tr>
<td>Criticism</td>
<td>No tangible improvements, resource-demanding, unclear notion</td>
<td>Does not involve everybody, does not improve customer satisfaction, does not have a system view</td>
<td>Reduces flexibility, causes congestion in the supply chain, not applicable in all industries</td>
</tr>
</tbody>
</table>


Studying figure 21 above, it is quite clear that TQM’s process thinking is the main difference towards Six Sigma’s project methodology. In figure 22 below, the author of this article illustrates where and how the TQM framework differentiates from the Six Sigma framework.

(1.) TQM’s foundation is engaged leadership whereas Six Sigma strives for senior management commitment.
(2.) One cornerstone of TQM is to continuously work with improvements whereas Six Sigma’s core is improvement projects. (3.) Another cornerstone of TQM is to create conditions for involvement whereas Six Sigma suggests training schemes and stakeholder involvement. (4.) TQM says that decisions must be based on facts whereas Six Sigma suggests a measurement system. (5.) TQM wants the user to work with processes whereas Six Sigma suggests a well defined methodology for improvement projects. (6.) The TQM framework strives to always keep the customer in focus whereas Six Sigma’s framework will lead to a satisfied customer.

The black arrows symbolise similarities in TQM and Six Sigma, whereas the red arrow symbolises the difference. As both Andersson et. al.(2006) and figure 22 above suggests, using influences of both TQM and Six Sigma will manifest the importance of both “what” to do, as in TQM, and “how” it is done, as in Six Sigma.

6 Opinion of the author of this thesis
5. Method

This chapter presents and motivates the methods that were used to fulfil the purpose of the thesis.

5.1 Literature Studies

Literature used for the purpose of this thesis mainly consists of principles in TQM and Six Sigma. The studies of TQM are motivated by the fact that Eka Chemicals, for which Eka Engineering acts as an in house engineering department, have TQM as their improvement philosophy. The studies of Six Sigma are motivated by the fact that Six Sigma bases their improvement work on projects and not, as for TQM, processes. As Eka Engineering is in the business of projecting the author of this thesis suggests they could benefit from influences of both TQM and Six Sigma.

5.2 Document Review

Documents reviewed while writing this thesis are exclusively documents that are linked to the management system of Eka Engineering. The management system was reviewed in order for the author to sustain a common perception on how, specifically, non-conformities are supposed to be handled within Eka Engineering. These studies are presented in chapter 6.1.

5.3 Survey

Dahmström (2000) lists four different types of survey methods, these are: Mail survey, Internet survey, Group survey and Visiting survey. Below the different types are presented as Dahmström (2000) explains them.

- **Mail survey:** Surveys distributed to individuals within the area of interest, such as: a company, organisation, authorities, specific demographic group etc. The survey can either be distributed via e-mail or regular post. For respondent anonymity, regular post distribution is preferable. E-mails can be tracked and thereby also information of respondent.
  - **Pros:** Cheap, possibility to reach a lot of people, many different types of questions, the respondent can choose when to answer the questions, the information gatherer does not affect the respondent
  - **Cons:** Risk of high degree of drop outs, time-consuming, diffuse answers could be hard to interpret, one does not know who answered what, technical problem with e-mail might arise

- **Internet survey:** Surveys distributed via a web address where the respondent is granted access. This type of distribution, like mail survey, also aims towards individual answers. The difference towards mail survey is mainly that the respondent does not have to send back their answers, but rather store it in a database. It is important to inform the respondent of anonymity or confidentiality for their answers.
o **Pros:** Quick, possibility to verify answers as they are stored

o **Cons:** Technical problems, increase of drop out due to technical issues, internet-access not general, expensive and time-consuming planning, risk of exploiting the integrity of the respondent

- **Group survey:** Surveys distributed at a specific time to a specific group, may it be a class, lecture or conference. The group or population can easily be defined as: everyone in this group including the missing, or everyone in this group except the missing.

  o **Pros:** A lot of people can be investigated, cheap and quick, few drop out due to refusal

  o **Cons:** Risk of group-leader affection, risk of group member affection, no guarantee for anonymity or confidentiality, no chance of reviewing unclear answers if the opportunity is unique

- **Visiting survey:** Surveys distributed as the thought respondent visits the source of investigation, may it a hospital, school, office or a webpage. This type of survey requires that the respondent in some way uses the facility or webpage that is under investigation. Common for this type of survey is that personnel is used to ask the respondents questions as they are using the service of investigation.

  o **Pros:** No frame for visitors needs to be created in advance, quick presentation

  o **Cons:** Risk of high degree of drop outs, Resource demanding

Ejvegård (2007) furthermore emphasises that surveys works good as means to bring up opinions, attitudes and tastes from a broad mass. He further suggests that guarantee of anonymity or confidentiality can bring up issues of concern that is not visible or tangible otherwise.

### 5.3.1 Author Comments

For this thesis a mail survey was used. This is motivated by the fact that a lot of the employees work abroad and are not always accessible. This motivation would rule out visiting surveys and group surveys. Due to financial limits and database expertise the internet survey was also ruled out as means of collecting data.

### 5.4 Interviews

Both Dahmström (2000) and Ejvegård (2007) present two types of interviewing techniques. These are Visiting interview and Phone interviews. Dahmström (2000) says that visiting interviews can be characterised as an expensive method, which in some cases is necessary, too obtain answers that suffice quality wise. Visiting interview are always more time-consuming than phone interviews, and if the respondent is hard to reach, phone interviews can be conducted for complementary information. Below, pros and cons for visiting interviews according to Dahmström (2000).
• **Visiting interviews pros**: Many and sensitive questions can be asked, visual aid can be brought, unclarity in questions can unravelled, integrity issues can be strengthened

• **Visiting interview cons**: Expensive and time-consuming, risk of affecting the respondent

Dahmström (2000) says that a quicker way of collecting data is to conduct interviews via phone. Naturally, as the interviewer and respondent do not see each other, these types of interview are not as informative as visiting interviews. Also, this type needs to be kept somewhat shorter than visiting interviews. Below, pros and cons for phone interviews for phone interviews according to Dahmström (2000).

• **Phone interviews pros**: Quick and cheap – especially in comparison to visiting interviews, unclarity in questions and answers can often be resolved

• **Phone interview cons**: Demand on known or accurate phone numbers, interviews can not last too long, not too hard and sensitive questions, surrounding environment might disturb, risk of not thought through answers

5.4.1 Author Comments
For this thesis visiting interviews was chosen as interviewing technique. This is motivated by the fact that the interviews were conducted with a tool proposal as foundation. This proposal was demonstrated at the beginning of each interview. Naturally this rules out phone interviews as method of information gathering.

5.5 Benchmarking
According to Bergman, Klefsjö (2001) benchmarking works as a mean to find possibilities for process improvements. Bergman, Klefsjö (2001) and Oakland (2003) lists four different categories of benchmarking; they are:

• **Internal Benchmarking**: Benchmarking within the company or organisation that uses an identical process.

• **Competitive Benchmarking**: Benchmarking with an identical process at a competitor.

• **Functional Benchmarking**: Benchmarking with a recognised good company or organisation in a similar field of work, or similar activities.

• **Generic Benchmarking**: Benchmarking with the recognised best company or organisation independent to field of business.

Bergman, Klefsjö emphasises the importance of just not copying a system that works for another process. Instead, deep self-assessment and ability to translate techniques, ways of working and process solutions that works for the subject of the benchmark is required.
5.5.1 Author Comments
For the purpose of this thesis, the best suited benchmarking type was General Benchmarking conducted at SAAB Space, Gothenburg. Attempts to conduct benchmarking at competitors were made, but as willingness to comply was more or less absent, a general approach was chosen. This is furthermore motivated by the fact that similar departments could not be found internally, apart from an Akzo Nobel Engineering office in Holland.

SAAB Space has worked with non-conformances since late 60ies and thereby they have, in the authors’ opinion, great and wide knowledge very much suitable for the purpose of this thesis.

5.6 Reliability and Validity
Wallén (1996) explains reliability as how good different measures, of the same issue, provide the same values. He further explains validity as a proof that the measurement measures what was intended and that no irrelevant issues affects the results.

Ejvegård (2007) emphasises that readers should consider extra attention to reliability and validity for almost all science. He motivates this by the fact that the author or researcher often creates their own tools to evaluate conditions. A great example of a tool-creation is this thesis, where the author created a tool, survey, to evaluate current perception on non-conformance handling within Eka Engineering.

To test a survey for reliability Ejvegård (2007) list four possible scenarios or techniques, these are presented below.

- **Retesting:** Test the same individuals twice. If the differences in the answers are high, it is warning that the test may have low reliability. The tester should however consider an important factor that might inflict such a test – this factor is time. The respondent might not be the “same” person when answering the questions the second time, many issues affecting the respondent could have occurred and thereby affecting the answers.

- **Half the selection:** The answers are randomly divided into two halves and compared. The smaller difference, the higher degree of reliability.

- **Parallel method:** Use two different surveys that are thought to measure the same issue. If the survey results are similar, the reliability is good.

- **Test-questions:** A number of questions, seeking the same issue, but slightly different formulated are included in the survey. For good reliability, the questions should provide similar results.

To test a survey for validity is harder than testing the same survey for reliability according to Ejvegård (2007). He says that validity testing requires some sort of prediction of the results. Ejvegård explains this by comparing opinion polls with actual election results. If the result of the actual election is similar to the prediction, or opinion polls, the opinion poll did have a good validity.

Ejvegård (2007) states that if a tool, such as a survey, is considered to have a low degree of reliability then the validity should also be considered low. However, the same tool could be
considered to have good reliability, but that does not necessarily mean that the validity is good.

5.6.1 Author Comments
The validity for the survey presented in this thesis cannot be determined to be good nor bad. This is due to the fact that no prediction of results could be scientifically specified or verified. The opinion of the author is, however, that the perception of non-conformity handling within Eka Engineering was not satisfactory. This could indicate that the result of the survey speaks for good validity. Note that this is just a hunch, not proof.

The reliability for the survey was increased by asking the respondent for answers concerning the same area or issue. This is defined as Test-questions by Ejvegård (2007). The reliability of the survey is considered high and thereby, fully functional for further evaluation.
6. Empirical Studies

This chapter presents the results from the benchmarking conducted at SAAB Space, as well as the survey and interviews conducted at Eka Engineering. This chapter also presents the management system of Eka Engineering and the final knowledge base proposal.

6.1 Eka Engineering Management System

6.1.1 Eka Engineering Management System

The management system of Eka Engineering (Eka Engineering was labelled Eka ENP Cellchem until 2007) was created in 2003 as the result of a merge by two separate sales departments. One of them was Eka ENP located in Bohus and the other one was Eka Chellchem located in Nacka, both sites located in Sweden. Prior to the creation of the management system for Engineering, Eka Cellchem had an ISO 9001:1994 certificate and thereby also a working management system. This certification was achieved in May 1998. Eka ENP, on the other hand, had no certificate and therefore no documented management system.

Prior to the merge, ENP mostly dealt with internal customers\(^7\) whereas Cellchem mainly dealt with external customers. This caused some differentiates of what good the implementation of a management system would do (oral source, Stefan Persson). ENPs’ customers were provided a survey where they were asked of the importance of an ISO certification. The results explained that certification was of no importance to the customer. Cellchem saw no use of asking their customers whether a re-certification would be beneficial. This was taken for granted and when the two departments were merged, management saw fit that a new certification according to ISO 9001:2000 would lead to a beneficial position on the market for this new department (oral sources; Stefan Persson 2008-01-22, Anna Kinnander).

The wish from management to certify Eka Engineering (ENP Cellchem at the time) resulted in an interactive management system to which the users have access through intranet. The main screen and the title process screen of the quality management system are presented in the figures below.

\(^7\) Internal customers, meaning customers within the Akzo Nobel company

University College of Borås, School of Engineering, Master Thesis 12/2008
Figure 15. Title Screen (Quality Management System – Eka Engineering Title Screen, intranet)

The figure is the title screen of which the user is presented when activating the management system. The pictures and textboxes are hyperlinks further down in the structure. From this title screen, the user can use the “browse” function to locate any document of interest. As can be seen, issues such as suggestions for improvement and non-conformities can be accessed from this screen.

Figure 16. Title Screen (Quality Management System – Eka Engineering Title Screen, intranet).

This figure is what the user is presented when clicking the “Eka Engineering Processes” picture presented in figure 24 above. Here the main process is broken down into smaller fragments, each symbolising another process. In similar manner, the user can navigate deeper into the system and by doing so, finding the specific process that is of interest. Alongside with this screen, not visible in figure 24, the user is presented with documents and templates that are somehow linked to the current process.

The system provides the user with all the information that is necessary to maintain stability of the business. Examples of information to be found is templates or checklists for project initialisation, project evaluation, routine descriptions and much more. The information or tools needed, can either be reached using a built in search system, or in connection to the actual process of interest i.e. the process that the user is currently viewing.
As Eka Engineering was merged from two different sales offices, there are some documents and templates that refer to, or use, different system platforms. Since some of the systems are old and need to be upgraded, Eka Engineering has launched a project that aims to develop and implement a common toolbox that can be used by both sites and by so, increasing easiness in collaboration between the offices (oral source, Christina Hillforth).

6.1.2 Non-Conformity Handling
Looking back at figure 23, which is the main title screen of the management system, the link “Non-conformity reports” presents the user with a general definition of what non-conformity is at Eka Engineering. The general definition translated from Swedish is: Deviations are: deviations from standards, processes, laws or supplier and customer deals etc. All employees as well as consultants within Eka Engineering are responsible to report discovered deviations (http://nkan10.d20.intra:83/Ledningssystem/, intranet)

It also lists three possible types of non-conformities that should be reported and in connection to the text, a checklist on how to report. The three types of deviations are translated from Swedish and presented below.

Deviations during ongoing project
Deviations during ongoing projects are deviations concerning Eka Engineering’s products that are detected internally during ongoing projects.

For A, B and C projects, where the capital letters refers to the different customers presented in figure 3, deviations are to be reported to the vice project leader who is responsible of correcting the deviation. Deviations are brought to attention in project meeting minutes as well as in the final project report. This way management is notified of the deviation and can take decisions on whether countermeasures towards repeatability are required (http://nkan10.d20.intra:83/Ledningssystem/, intranet).

For D and E projects, deviations during ongoing projects are handled according to appendix 1, 4 and 5 (http://nkan10.d20.intra:83/Ledningssystem/, intranet).

Internal Shortcomings
Internal shortcomings are deviations in Eka Engineering’s management system regarding quality, i.e. either the routines are not in agreement with the ISO 9001:2000 standard, or else the written routines are not representative of how work is conducted. Deviations concerning Eka Engineering’s products not caught in “deviations during ongoing project” shall be treated as internal shortcomings. Deviations of this sort are handled according to appendix 2 http://nkan10.d20.intra:83/Ledningssystem/, intranet).

Claims
Deviations that concerns complaints, i.e. customer and supplier complaints as well as external complaints on the management system, shall be reported according to the instructions in appendix 3 and 5.
6.2 Benchmarking at SAAB Space

SAAB Space was chosen for a benchmarking study as they have been working with non-conformity reporting system since the business started in the late 60ies, thus, they have a great and wide knowledge spanning almost 40 years. The background for this long experience and application is that within space industry, non-conformance handling is an essential task for success and learning. According to Claes Berlin, Quality Manager at SAAB Space, they have made quantum leaps in cost savings during this period of time. Claes Berlin has been the leader, creator and driver of today’s combined non-conformity and cost of poor quality system since its implementation 1987. The name of the database is QUEbase\(^8\) and Claes emphasises that the name itself, “Que\(^9\)”, implies co-workers to ask themselves “what” and “why” while conducting their daily responsibilities.

SAAB Space develops and produces digital- and microwave products and technology for use in satellites and launchers worldwide. Claes Berlin says that within the space industry, product & quality specifications are extremely high due to difficulties in maintenance while the satellite orbits the earth – “product deliveries with no after sales possibilities”. Therefore, the root cause analysis, corrective actions and verification handling as well as the cost impact are very important fields in the project operation. The cause of the non-conformity function as an input of what to improve while the cost function as means to motivate the improvement.

The benchmarking conducted at SAAB Space with the Quality Manager Claes Berlin was intended to answer three base questions; these were (full list of questions found in appendix 6):

1) How SAAB Space defines non-conformities.
2) How SAAB Space handles non-conformities.
3) How SAAB Space estimates costs of non-conformities.

6.2.1 SAAB Space Definition of Non-Conformity

Essential for the detection of non-conformance in a process is definition of the process as well as definition of non-conformance. SAAB Space defines their processes in system labelled SEMS (SpacE Management System) \textit{Change Management} Berlin (2004). In figure 25 below the main process map for SAAB Space is presented.

\(^{8}\) QUEbase stands for Quality Under Evaluation in data Base system.

\(^{9}\) The word "Que" is Spanish for what.
Customer needs are fulfilled by the eight core processes. The core processes are supported by four management processes and five support processes. The output from the core processes are presented as product and customers.

Claes emphasizes the importance of defining company processes out of customer needs. This is also one of the five cornerstones in TQM as Bergman, Klefsjö (2001) presents it. Claes says that the mission of SAAB Space,

“To market, develop and manufacture equipment for use in space that supports and strengthens our customers’ competitiveness” Change Management Berlin (2004),

is implemented throughout the entire management system. By maintaining a high degree of customer focus in the definition of SAAB Space processes, processes that are value adding are more easily defined. From these process definitions non-conformities are, by consequence, also more easily defined.

SAAB Space defines non-conformities in degree of severity, Major deviation, Minor deviation and Observation. Observations are issues discovered by co-workers before a deviation has occurred. It could be anything from flaws in routines or equipment to unintentional malpractice in work conduct.

Minor deviations are deviations that occur within work processes or routines. The management system of SAAB Space holds very detailed instructions of the different work processes. Initially the routines were composed by the quality department but today the different teams compose and manage their own specific work process. Claes Berlin says that user/co-worker responsibility increases credibility of the system as well as involvement.

Major deviations are deviations of the product quality, that is, deviations from customer demands. These severe deviations are handled openly towards the customer whom is provided a report within 24 hours. The customer can later at any time review the handling of the deviation, majors as well as minors. Also the customer of the customer is provided this “right of access”. Claes Berlin says that this conduct provides goodwill towards SAAB Space as the customer can see that deviations are handled transparent and reliably.

**University College of Borås, School of Engineering, Master Thesis 12/2008** 32
6.2.2 SAAB Space Non-Conformity System
The system that is used to report non-conformities is, as known, labelled QUEbase. QUEbase is accessible to all users within the company, but only certain responsible have the access to put in data into the system. Furthermore it is regulated by standards that require co-workers how and what to report if they discover deviations. Claes Berlin says that the culture within SAAB Space is crucial for its many reported deviations. On the question whether an anonymous choice of reporting could increase the number of reports, Claes corresponds:

“No, we would have the wrong company culture if we would need an anonymous reporting system. We are not interested in placing blame; we are interested in improving ourselves” (Claes Berlin, 2008-02-18).

Claes estimates the total efficiency of the system to approximately 80 per cent, which he says is quite sufficient, but he also says that if the efficiency drops below 60 per cent the system will loose statistical credibility. The main drivers empowering such a high efficiency is according to Claes:

- management involvement,
- regular feedback,
- the use of basic facts from the system in the systematic improvement work and
- user responsibility.

Every quarter project teams gather in meetings, joining them is a representative from management. On these meetings deviations are reviewed and considered for improvement just as other deviations are considered non-improvable. Claes says that this conduct proves as a great base for the continuous improvement undertaking that SAAB Space has\(^\text{10}\). Furthermore, after deviations are reviewed, the suggested improvements are placed on a big board located in close vicinity to production. On these boards, co-workers gather for short meetings where they, as a group, prioritise the improvements for implementation. Claes Berlin emphasises the importance of making improvement work easy to understand. This easy, and basic, approach has caused great breakthrough for SAAB Space improvement work. They started to use the Toyota way\(^\text{11}\) supporting the continuous improvement with 5 improvement boards in production in 2005. As of today, SAAB Space uses 15 boards in different processes of the company. Examples of processes are: verification, purchase, design, project management, marketing, finance. Claes says that the challenge in an effective improvement work is to prioritize the different improvement ideas and then to have it done. SAAB Space use PICK-Charting\(^\text{12}\) to visually help them prioritize improvement proposals. Below, in figure 26 and 27, the ideas behind the board and the pick chart are presented.

\(^{10}\) SAAB Space is certified in accordance to AS/EN/JISC 9100 and ISO 9001:2000 (www.saabgroup.com, Internet).

\(^{11}\) Focus on eliminating waste (Lean production).

\(^{12}\) The name PICK is an acronym for Possible, Implement, Challenge and Kill.
From the review of a non-conformity report, causes of the deviation are established. The causes are then put on the improvement board’s waiting list where they are prioritised using the Pick Chart. After the idea for improvement has been completed, changes and costs are documented into QUebase and the non-conformity can be closed.

The Pick Chart aids the user to test ideas for feasibility, either group wise or single handed. The idea is tested for feasibility by estimating benefit and cost. As the figure presents, ideas with low cost and high benefit would naturally be implemented, whereas high cost and low benefit would not be implemented.

“We are very successful in the business of rocket science, and we use basic tools to stay successful” (Claes Berlin, 2008-02-18).

6.2.3 SAAB Space Cost of Poor Quality
As presented earlier it was in 1987 that SAAB Space merged the non-conformity handling with the cost of poor quality. The costs of deviations are estimated as teams review the deviations. Costs are quantified in man-hours lost and the specific costs related with the deviation, examples of related costs can be: new materials, failure investigation, tools, travels etc. Claes says that the estimation, even though it might not be perfect, is good enough to
function as motivator for management to approve improvements. In figure 28 below the decrease in cost of poor quality is presented as percentage of annual turnover.

![Figure 20. The Cost of Poor Quality at SAAB Space. Kvalitet är Pengar Berlin (2004).](image)

The figure presents the decrease in cost of poor quality for SAAB Space as percentage of annual turnover.

Claes says that the decrease in costs of poor quality is achieved by concentrating on prevention instead of concentrating on correction. Although the preventive costs doubled for SAAB Space from 1988 to 1992 the Quality Cost Index\(^\text{13}\) was more than halved during the same period of time. The cost of poor quality could be as large as 30 per cent of the turnover for industrial companies *Kvalitet är Pengar* Berlin (2004).

The merged non-conformity and cost of poor quality system, QUEbase, serves SAAB Space with over 20 years of documentation. After the closeout of the non-conformances, they are stored in a databank. This databank provides SAAB Space with very important experience for the use in future product development. The documentation is used as a learning platform for new employees, design teams, technology development, and supplier evaluation. The system also functions as knowledge feedback from earlier and similar projects *Kvalitet är Pengar* Berlin (2004).

### 6.3 Survey

A survey was created and distributed to all employees at Eka Engineering, including hired work-force as consultants. The reason for creating this survey was all in accordance to TQM’s base decisions on facts and Six Sigma’s measurement system\(^\text{14}\). The survey’s main purpose was to work as a foundation for future decisions depending on how proposals from this thesis work worked as improvements or not. Naturally, the survey also provided the author of this thesis necessary information on key-elements on where today’s non-conformance handling needed improvement.

\(^{13}\) From Jurans Quality Cost Model.

\(^{14}\) See chapter 3.7 – Comparison TQM and Six Sigma.
6.3.1 About the Survey

The questions on the survey were all constructed to ask the respondent only on today’s whereabouts on different subjects, mainly focusing on non-conformance handling. This way the survey can be redistributed after changes in non-conformance handling have been implemented, and by doing so, enabling an evaluation and decision base for future work. The answers for each question were all constructed as perceptive scale where the respondent could choose from 1 to 7, how good today’s non-conformance handling is. The survey questions can be found in appendix 7. Each question was provided with an opportunity of adding comments.

The survey was distributed as an e-mail survey. The total number of recipients was 174 persons, these were categorised as:

- Bohus office employees = 29 with 18 answers, blank or filled.
- Bohus office consultants = 47 with 9 answers, blank or filled.
- Nacka office employees = 32 with 11 answers, blank or filled.
- Nacka office consultants = 66 with 0 answer.
- Eka Engineering total = 174 with a total of 38 answers, blank or filled.

It should be noticed that the recipients were taken from an e-mail list, which was reviewed for false or invalid names. There is a chance that some names were missed during this review, thereby causing a too great number of recipients. Also noticeable from the figures presented above is that the answering percentage is evidently higher when comparing the Bohus and Nacka office. The reason for this is most probably due to a meeting held in Bohus where all employees were encouraged to answer the survey. To the author’s knowledge, no such encouragement was made in Nacka and that could perhaps explain the low answering percentage for both employees and consultants representing the Nacka office.

As for the presentation of the results from the survey, it was thought most suitable to provide presentation in a similar forum as the questions were asked. Once again the author of this thesis tried to follow the philosophies of TQM and Six Sigma by involving the recipients in what would function partly as decision basis for the future studies by the author of this thesis.

6.3.2 Results from the Survey

In appendix 9 the results of the survey is presented as it was presented for the respondents. That is, via e-mail as a PowerPoint presentation. The comments on all slides are comments from respondents and the only text influenced by the author is the summarization provided in the beginning and in the end of the presentation.

---

15 This is motivated in chapter 4.3.

16 TQM’s create conditions for involvement and Six Sigma’s stakeholder involvement.
In this subchapter the summarisation of the survey is presented. The summarisation presents four main topics that the author could point out as significantly important to improve. These four topics or issues are:

- Increase reliability and motivation to use a non-conformity handling system.
- Improve quickness in handling non-conformities.
- Non-conformity reporting must lead to improvement of business.
- Definition and interpretation of non-conformance must be made easier.

6.4 Tool Proposal

Priory to the interviews were conducted a tool proposal for documenting non-conformities was created. The reason for this proposal was to use it as foundation for discussion. Up to this date Eka Engineering had no database for documenting and handling non-conformities. It is the author’s opinion that due to this, the interview could benefit very much from having this proposal as a base.

The creation of the tool was made in the simplest of manor, by producing screen dumps of Eka Engineering’s web portal and then drawing a forged tool in a picture editor. The result of this forge is presented below as it was presented to the respondents during the initial part of the interviews.
Purpose for the interviews

• Together work out a reliable and inspiring system for seizing non-conformities, and by doing so, enabling quantification of costs related to them within Eka Engineering.

Goals with interviews

• Establishment of what to report as a non-conformity.
• Establishment of whom should be owner of reported non-conformities.
• Establishment of appropriate response times for registered non-conformities.
• Establishment of appropriate forum for this system.
• Establishment for choice of presentation
## Tool proposal

**Non-conformity and improvement routine:**

1. **Statistics**
   - New non-conformity or improvement report

2. **News feed:**
   - Latest ideas
   - Latest non-conformities
   - etc.

Let's try out what happens when we press this button.

Let's finally check the statistics section, please press this button.

As the name implies, this space could be used to present news concerning improvement work.

This picture demonstrates how non-conformities and improvements are handled.

---

## Opportunity for improvement

**Description:**

In this box we describe the improvement idea or the non-conformity.

(Below we choose whether it's an idea or deviation)

### Improvement idea

Let's say we've written an improvement idea, please press this button.

### Non-conformity

This time, let's say we have written non-conformity, please press this button.
Improvement idea

In this box we describe the improvement idea or deviation that has occurred.

Use the Pick Chart to estimate benefit vs. cost of implementation. If the idea has special benefits or need motivation, please use the box below. This box is used to motivate the idea, or to list special benefits.

Issuer:
Fill in your name (perhaps a drop list).

Decision taker:
Fill in appropriate name (perhaps a drop list).

Send

Let's say we're done, please press the Send button.

Non-conformity

In this box we describe the improvement idea or deviation that has occurred.

Type of non-conformity:
Specify deviation or choose from drop list.

Cause of non-conformance:
Specify cause or choose from drop list.

Cost of non-conformity:
Estimate the cost.

Probability of occurrence for non-conformity:
Estimate the probability of occurrence.

Issuer:
Fill in your name (perhaps a drop list).

Decision taker:
Fill in appropriate name (perhaps a drop list).

Send

Deviation during ongoing project:
- Deviations concerning Eka Engineering’s products that are detected internally during ongoing projects
- Internal shortcomings:
  - Deviations in Eka Engineering’s management system regarding quality, i.e. either the procedures are not in agreement with the ISO 9001:2000 standard, or the written procedures are not representative of how work is conducted. Deviations concerning Eka Engineering’s products not detected in “deviations during ongoing project” shall be treated as internal shortcomings
- Claims:
  - Deviations concerning claims, i.e. customer and supplier complaints as well as external complaints on the management system

More drop lists etc. can be used to narrow the cause and provide useful presentation of statistics. (detect ability, severity etc.)

When done, please press this button.
The statistics provided here should be easily presented i.e. show most common deviations in different parts of a project etc.

- Some sort of drop lists could be used to alter the way statistics are presented (view by costs, frequency, time consumption etc.).
- Perhaps we could use a search function here as well.

**Tool proposal - Comments**

- The tool is naturally useless unless we use it. Therefore, we must strive for:
  - Simplicity and quickness in handling
  - Quick decisions
  - Quick feedback
  - Common presentation
  - Easy accessible, and useful statistics
  - Search function
  - Have we forgotten anything?

### 6.5 Interviews

The interviews were conducted at both the Bohus and Nacka office. The number of respondents for Bohus was 12 individuals and representing Nacka was 7 individuals, adding up to a total of 19 interviews each lasting approximately one and a half hour. The main purpose of the interviews was to use the tool proposal to gather sufficient user input for the creation of a real documenting tool, and to determine the handling of the information.
6.5.1 About the Interviews

The questions, found in appendix 8, were all created to ask the respondent on how they would like the system to look. The system should also include the handling of information from the tool. The total number of interviews was 19, 12 from the Bohus office and 7 from the Nacka office. The respondents were chosen so that they would represent every department of Eka Engineering, see figure 5 – organisation chart. The reason for interviewing slightly more from the Bohus office is due to the author’s residency, which lies much closer to Bohus rather than Nacka.

After the interviews were conducted, the answers were summarised and only the common answers were presented as results from the interviews. By presenting the results this way the promised confidentiality could be kept.

The purpose, derived from the results of the survey, for the interviews was:

Together work out a reliable and inspiring system for seizing non-conformities, and by doing so, enabling quantification of costs related to them within Eka Engineering.

The purpose is obviously linked to TQM’s involvement of employees discussed in chapter three. The purpose of the interviews was carefully described so that the respondent would know that their opinion would work as basis for the final database and work-process proposal.

The goals derived from the purpose were:

• Establishment of what to report as a non-conformity.
• Establishment of whom should be owner of reported non-conformities.
• Establishment of appropriate response times for registered non-conformities.
• Establishment of appropriate forum for this system.
• Establishment for choice of presentation

Apart from the goals above the interviews also sought specific project phases, this to enabling categorising of non-conformities. Today’s definitions of non-conformities was also a subject for discussion during the interviews, this to determine if they needed to be upgraded or perhaps even re-worked.

6.5.2 Results from Interviews

In appendix 10 the results from the interviews are presented as they were presented for employees at Eka Engineering during the final presentation. In this subchapter the different questions and compiled answers from the interviews are presented.

Project Phases

When the respondent was asked if they could describe a normal project conduct, the answers were wide and not easily compiled. However, two groups could be presented; one group suggesting that a project consisted of:
• Idea, Pre study, Pre project, Realisation of project, Hand over of project, Documentation and Guarantee/Service

Whereas the other group sought of a project as:

• Request, Offer, Purchase, Delivery, Documentation, Assembly, Start up and Guarantee/Service

It should be noted that this compilation is limited by the author’s knowledge of Eka Engineering’s business. It is possible that wider knowledge in Eka Engineering’s business could lead to further narrowing of project phases.

**What is non-conformance to the respondent and what is the occurrence rate?**

The respondent was asked what they saw, or perceived as non-conformance. The answers were wide also for this question, but they could quite easily be summarised into Scope Changes and Deviations towards work-routines.

When respondents were asked to estimate the occurrence of their already explained non-conformities, the spectra among the answers was very wide i.e. every day to once a year. This fact ruled out any compilation, but it stood clear that there is a great potential for improvement if these non-conformities could be seized.

**Ownership of a reported non-conformity**

When the respondent was asked of who should be the owner of a reported non-conformity, the answers clearly pointed towards either the project leader or discipline leader. The project leader would naturally handle deviations regarding ongoing projects whereas the discipline leader would handle deviations in routines or adminstrational issues.

Another perception from the survey result is that employees wishes to work with problems as they are handled today, that is: directly and swiftly in the projects as they are carried out. This is strengthened by Nilsson (2005).

**Minimisation of re-occurrence**

When respondents were asked how they thought re-occurrence could be minimised, the compiled answer consist of two blocks; these are:

• Enabling categorisation and sorting of reported non-conformities.

• Presentation of actions taken in other, already handled non-conformities in appropriate meeting forums. The appropriate forum is chosen depending on the subject of the reported non-conformity.

**Motivation and reliability of non-conformity system**

According to the respondents, the motivation to use this kind of system is self-motivated via obvious results from earlier work. The respondent’s compiled answers also list some sort of
carrot\textsuperscript{17} for established improvements. Note that the reward only applies to established improvements or changes, and not as means of triggering a massive reporting procedure.

Reliability towards a system handling non-conformities comes, according to the respondents, from focusing on the problem and not on the people. Furthermore feedback, traceability and openness to the system (open for all) are factors that generate trust and thus reliability according to the respondents.

**Perception of non-conformity definitions**

When the respondents were asked to comment on today’s definitions of non-conformity the results were impressively aligned. Definitions concerning ongoing project and internal shortcomings were hard to understand and interpret whereas claims were easily understood.

6.6 Knowledge Base

Simultaneously to conducting interviews a database was created that would not only work as discussion basis, but rather as a fully functional proposal. The interviews could decide that the forum used for the tool proposal, Eka Engineering’s intranet or workspace, would be a good forum for the actual documentation tool. The respondents motivated this forum for its accessibility for all employees, regardless of field work. The database was therefore created in this environment with simplicity and easiness as guide-words. Simplicity and easiness was two guide-words found crucial for its existence as the survey results explains.

The interview results also showed that new definitions of non-conformance were crucial along with an accepted approach of handling documented non-conformities. It is the author’s opinion that the best way of establishing an accepted work-process is to let the user, themselves, decide how to work. This can also be traced back to TQM and Six Sigma as involvement of employees or stakeholders.

6.6.1 New Definition of Non-conformity

As can be seen in the results from the interviews, today’s definitions were not easily understood and interpreted. For this matter the author presented Eka Engineering with three new types of definitions. These new definitions were copied and modified from SAAB Space’s definitions found in chapter 5.2 in this report. As Bergman, Klefsjö (2000) recommends a benchmarking study should not result in copying the subject’s behaviour, rather should the benchmarking result in adapted interpretations. The old definitions are presented and compared to the new definitions below:

\textsuperscript{17} Metaphorically speaking for reward.
Table 1. Comparison Old and New Definitions of Non-conformities

<table>
<thead>
<tr>
<th>Eka Engineering’s Old (today’s) Definitions</th>
<th>Eka Engineering’s New (tomorrow’s) Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Deviation during ongoing project:</strong></td>
<td>• <strong>Major:</strong> Non-conformance that results in significant economic consequences.</td>
</tr>
<tr>
<td>Deviations concerning Eka Engineering’s product that are detected internally during ongoing projects.</td>
<td>• <strong>Minor:</strong> Non-conformance that results in insignificant economic consequences.</td>
</tr>
<tr>
<td>• <strong>Internal shortcomings:</strong> Deviations in Eka Engineering’s management system regarding quality, i.e. either the procedures are not in agreement with the ISO 9001:2000 standard, or the written procedures are not representative of how work is conducted. Deviations concerning Eka Engineering’s products not detected in “deviations during ongoing project” shall be treated as internal shortcomings.</td>
<td>• <strong>Observation:</strong> Observation of event that could lead to either a Major or Minor non-conformity.</td>
</tr>
<tr>
<td>• <strong>Claims:</strong> Deviations concerning claims, i.e. customer and supplier complaints as well as external complaints on the management system.</td>
<td></td>
</tr>
</tbody>
</table>

As can be seen in the comparison above the difference is obvious between the old and new definitions. The reader should however be advised that the new definitions of non-conformities has not been evaluated when this thesis was published. However, they can be evaluated by using the same survey that was distributed by the start of this thesis work. This was naturally the intention of the survey; to function as a tool to evaluate today’s conditions.

6.6.2 The Work-Process for Non-conformity and Improvement Work

In accordance to the results from the interviews a work-process was created. This work-process is demonstrated below, first in figure 29 and then in the following bullet list:
Figure 21. Work-Process for Non-conformity Handling

- Observed non-conformity by employee registered in the database.

- QA (Quality Assistant) sorts and groups non-conformities. The QA also monitors which areas need actions if the report is not treated as urgent immediately.
  
  - QA sends non-conformities of high urgency or high occurrence to the PL (project leader) or DL (discipline leader (or site manager or management committee)) depending on what type of report it is.

- The DL or PL will thereafter take actions and inform required personnel of the issue at hand. At this point the actual non-conformity is treated, documented and also cost-estimated (described in the next subchapter). But, as Bergman, Klefsjö (2000) states in their TQM description, working with continuous improvement is just as important as, for instance, employee involvement. This is also proven as the result from interviews; in order to be motivated to use the system employees need to see results from their input. Therefore improvement of QMS (Quality Management System), routines, tools or wherever else the reported non-conformity might be traced back to must be an issue for improvement. Hence, the final step of the work-process for handling non-conformities is:

- Improvement of QMS/Project Handbook, project handbook in this case comprising tools, routines, standards etc. The idea for working with improvements at Eka Engineering was once again an issue translated from the prior benchmarking study conducted at SAAB Space (see chapter 5.2). Their work using a physical improvement board and P.I.C.K-chart board has, according to Claes Berlin, truly worked very satisfactory. The procedure for handling and improvement ideas is preferably described with a figure; below in figure 30 and 31 the procedure is presented.
Figure 22. Improvement and P.I.C.K chart board

Urgent or frequent non-conformities are presented in an appropriate forum, project-wise or organisational-wise. At this point employees can brainstorm for improvement proposals that could avoid future similar non-conformities. If an improvement proposal was attached to the actual report it will be presented simultaneously as the other proposals.

Figure 23. Improvement and P.I.C.K chart board
The group that attends this fictional meeting will then use the P.I.C.K chart to estimate benefit vs. resource utilisation for each of the proposals. This is illustrated as Post It notes in the figure above. After estimation, proposals are prioritised up to implementation, prioritising from top left corner of the P.I.C.K chart down to low left corner. A responsible person is designated and the improvement proposal is carried out. When the proposal is implemented, the original non-conformity report is updated and once more documented in the database.

6.6.3 The Database – the Documentation Tool

Figure 24. Knowledge Base – Title Screen

Figure 32 above shows the title screen for the documentation tool of non-conformities. From this title screen the user can decide whether to report a non-conformity or access the statistics section. The image to the left in figure 32 is thought to demonstrate how Eka Engineering personnel should work with improvement proposals generated from a non-conformity report. The figure below presents the actual reporting page used to document non-conformities.
Figure 25. Non-conformity Report

The figure above demonstrates the page on Eka Engineering’s intranet where non-conformities are documented. Using a few drop-lists and explanation-boxes this tool strives for easiness and simplicity in reporting. The statistics section for this database is naturally fully dependent on what type of input or choices the issuer chooses for the report. The choices the issuer make is what lies as foundation for the QA’s sorting and prioritising for future actions. In this report the issuer is asked to estimate the costs that originate from the non-conformance. This is similar to how employees at SAAB Space estimates cost for their non-conformities. Also, since Eka Engineering is in the business of projecting it is important that the issuer chooses in what phase or project part the non-conformance originates from. This will work as a sorting (statistics) and, thereby, also a basis for action-prioritising performed by the QA. The more sorting ability the report admits, the more narrowed causes can be found and, by consequence, improved.

6.7 Adoption of TQM Values

The comparison between TQM and Six Sigma shows how the issue for this thesis, seizing non-conformities in the business of projecting, needs careful attention. In TQM the ideal is to strive for processes as each cycle is comparable, and thereby also available for evaluation. Six Sigma, on the other hand, strives for repeatability in methods i.e. each improvement project will run through the same steps or phases. A documentation tool that asks for “where” in the project the non-conformance appeared would provide valuable information of what work-process or work-routine that needs to be improved. In similarity, the documentation tool should ask for different characteristics that would help pinpoint different causes.
It has been the authors will to implement a tool and work-process for non-conformance handling in full accordance to Bergman and Klefsjö (2001) image, see figure 6, of TQM with the natural exception of process vs. project.
7. Discussion

This chapter presents discussions and conclusions for the results of the empirical studies. This chapter also presents proposals for further studies.

7.1 Eka Engineering Management

The studies conducted on Eka Engineering’s management system worked as great means of getting to know Eka Engineering. The studies were performed both by studying the management system and by meetings with QA from Bohus and Nacka. During the studies it became more and more clear that the current definitions and handling of non-conformities was not satisfactory.

Regardless of the perhaps not satisfactory non-conformity handling, the studies showed that Eka Engineering has thoroughly defined work-processes for their business. This is, as discussed earlier in this thesis, a basis for improvement and would naturally work as a good foundation for future development through improvement work.

7.2 Benchmarking at SAAB Space

The benchmarking conducted at SAAB Space was very profitable for the purpose of this thesis. Definitions and handling of non-conformities, Improvement board and P.I.C.K chart are all examples that were translated to fit the business for Eka Engineering. Claes Berlin, the quality manager at SAAB Space was very helpful in answering my questions. He also provided me with extra material for further understanding on how SAAB Space handles non-conformities and improvement proposals derived from them. These documents are not presented in this thesis due to confidentiality.

The reliability and validity of this benchmarking study is rather hard to determine. But as the purpose of benchmarking is not to just copy behaviour, it is considered acceptable as research and input for this thesis. The generalisation of the benchmarking is however considered good, no matter what company the benchmarking would take place at – the questions asked would still be applicable.

7.3 Survey

The survey was, as previously described, initiated to work as a tool to measure today’s whereabouts regarding non-conformity reporting at Eka Engineering. The results of the survey where not surprising due to earlier research and discussion with Eka Engineering employees. This is according to the author of this thesis sufficient to work as a measure of validity for the survey, which in this case proves to be good.

The survey distributed at Eka Engineering was tested for reliability by dividing the results office wise, or by using the parallel method (described in chapter 4). The reliability of the survey is considered sufficient; this can be observed in chapter 5.3.2.
Regarding generalisation of the survey it also considered to be good. As for the benchmarking questions, the survey questions are considered to be applicable on any company or organisation only with slight adjustment to their specific definition of non-conformity.

7.4 Interviews

The interviews worked as means of achieving an employee developed system for handling non-conformities. Although the answers very much helpful for the result and, naturally, very helpful for the author’s knowledge of the business Eka Engineering is in; it must be said that the reliability and validity of the interview questions cannot be verified. The interviews are also not considered to be applicable to another company or organisation. This is obviously a consequence of the tool proposal that was used as basis for the interviews. This tool was very specific for Eka Engineering and, by consequence, led to low generalisation.

As for the selection of respondents for the interviews, they were distributed evenly among the disciplines. Although the Bohus office was slightly higher represented with respondents, it is the author’s firm belief that it did not affect the results for the result. The only question that clearly separated the two offices result-wise was the question that sought specific and re-occurring phases or steps in a project. This issue is recommended for future research and also, the ongoing project running at Eka Engineering aiming to provide Eka Engineering’s offices with a common toolbox will most likely shed more light to this issue.

7.5 Knowledge Base

As a result of this thesis work the author presented Eka Engineering with a proposal to handle and document non-conformities and improvement work. Looking back at the purpose of the report;

- To search for means that can be used to, foremost, seize non-conformities and, secondly, seize the costs of the non-conformities in the business of projecting.

And the derived goals from this purpose:

- To present a tool that can store and estimate costs of observed and reported non-conformities.

- To present a procedure on how to handle reported non-conformities.

- To present a procedure and tools for how to use reported non-conformities as means for continual improvement.

It is clear that the goals are fulfilled. Nevertheless, to reach fully satisfactory the purpose has to be reached as well. Only fulfilling the goals says nothing of how Knowledge base is perceived and understood by employees. This was considered from the beginning as the survey can be distributed on a regular basis and thereby functioning as an evaluation tool.

The generalisation for this proposal is semi-good according to the author. The idea behind Knowledge base is very much applicable for any company or organisation trying to improve their non-conformity handling, but naturally the database is too much specific for Eka Engineering to be applicable in another company or organisation. Knowledge base is
appropriate as a subject for benchmarking, or for studies with companies that already have a tool or database for documenting non-conformities.

7.6 Proposal for Further Research

As described earlier, a subject that could contribute to an improvement of the proposed Knowledge base is: A more thorough study of the different project phases. Another subject that would greatly benefit to the proposed work-method for improvement proposals derived from non-conformities is to measure and evaluate how employees at Eka Engineering perceives and accepts the improvement- and P.I.C.K chart-board. The survey created for this thesis does not contain sufficient material for evaluating the improvement-work (P.I.C.K chart and Improvement Board) part of non-conformity handling. The survey only asks one question of this subject, and that question will only provide answers; whether or not employees are satisfied with it or not.

Another approach for future research is to translate results from the survey presented in this thesis and put them into the database for non-conformities. This way the survey can be distributed and the other results from coming surveys can be compared with each other overtime, thereby enabling telling of trends. Trends are, in similarity to instant warnings, very important for decision-making in all business.

The final recommendation for future research is to more thoroughly decide on which costs that are related to the actual non-conformity. The proposal from this thesis only asks the issuer of a non-conformity report to estimate the costs in man-hours used as a direct consequence of the non-conformity. Perhaps this estimation could be developed to consider more factors than time.
8. List of References

This chapter presents the references that were used during this thesis work.

8.1 Written References


8.2 Electronic References


www.akzonobel.com (From 2008-01-14 to 2008-02-04)

www.eka.com (From 2008-01-14 to 2008-02-04)

www.eka.intra/default.aspx (From 2008-01-14 to 2008-02-15)

www.saabgroup.com/en/AboutSaab/Organisation/SaabSpace/AboutUs/ (On 2008-02-20)

University College of Borås, School of Engineering, Master Thesis 12/2008
8.3 Oral References

Claes Berlin, SAAB Space Benchmarking Interview (2008-02-18)

Christina Hillforth (from 2008-01-14 to 2008-05-15)

Lars Holst (from 2008-01-14 to 2008-05-15)

Anna Kinnander (2008-01-24)

Stefan Persson (2008-01-22)

Eka Engineering employees whose names will not be revealed due to confidentiality
Appendix 1

OMFATTNING

Denna instruktion gäller för avvikelser avseende Eka Engineerings produkter, som upptäcks internt inom Eka Engineering under och inom ett pågående projekt.

ANSVAR

Den som upptäcker avvikelsen samt projektledaren.

Definition och Syfte

**Extern change order**: avser avvikelser mot kontraktet initierade av kund.

Dessa skall godkännas av kund och leverantör såväl kommersiellt som tekniskt.

**Intern change order**: avser interna projektavvikelser, initierade av intern leverantör alt. intern kund.

Ex. designändringar som påverkar redan utförd konstruktion i senare led.

Eller ändringar under montage pga ofullständig projektdokumentation (t.ex. ritningar, P&ID, listor). Dessa skall dokumenteras och spridas på tillämpligt sätt inom och utom projektet för att säkerställa kvaliteten och SHM i projektet men också för att ge en feedback till design och därmed kontinuerligt förbättra kompetensen.

BESKRIVNING

Om en avvikelse upptäcks under ett pågående projekt skall konsekvenser och åtgärder i samband med avvikelsen hanteras enligt ändringsrutin QC4-2525.

Rapportering skall förutom i projektmötesprotokoll, ingå i projektets slutrapporter enligt instruktion för projektutvärdering, QC14-7001.

GILTIGHET / IKRAFTTRÄDANDE

Denna instruktion gäller från och med fastställandedatum och tillsvidare.
OMFATTNING

Denna instruktion skall följas vid förbättring / ändring av Eka Engineerings kvalitets – och referenssystem inkluderande QAM, QCM, och Projektmanualerna.

ANSVAR

Var och en som konstaterar avvikelse från eller förbättringsmöjlighet av Eka Engineerings kvalitetssystem och produkter. HSE-Q-chef samt dokumentansvariga ansvarar för att denna instruktion följs.

BESKRIVNING

Förslag till nytt eller ändring av befintligt dokument som ingår i QAM, QCM, eller Projektmanual inlämnas av försöksställaren till kvalitetssamordnaren på site Nacka.

Förbättringsförsöksgruppen går regelbundet igenom inlämnade förslag och bedömer angelägenhetsgrad.

Fastställande och registrering

Efter genomgång och eventuell justering beslutar förbättringsförsöksgruppen om godkännande och vid behov registrering samt när distribution av berört dokument skall ske.

Godkännande och distribution

Godkännande och distribution av dokument sker enligt QC5-3001.

GILTIGHET / IKRAFTTRÄDANDE

Denna instruktion gäller från och med fasställandedatum och tillsvidare.
OMFATTNING

Denna instruktion skall följas vid all hantering av reklamationer från kunder eller internt. Det inkluderar även externa klagomål mot vårt kvalitetssystem.

ANSVAR


BESKRIVNING

Policy

Eka Engineering's policy i varje reklamationsärende är att kunden skall ha snabb och effektiv service samt att möjligheter till erfarenhetsåterföring tas till vara.

Ärenden som under projektet hanteras i +/- listor skall inte hanteras enligt denna instruktion utan följa rutin QC14-7001, projektutvärdering.

Utförande

Reklamation från kund skall dokumenteras i någon form exempelvis brev eller fax från ansvarig hos kund.

Avvikelser och reklamationer skall elektroniskt lämnas till kvalitetssamordnaren på site Nacka snarast efter mottagande av avvikelsen / reklamationen. Kvalitetssamordnaren skall sedan informeras om det fortsatta arbetet och avslutet av reklamationen. Bilder, e-mail, fax, mötesprotokoll mm som rör reklamationen skall elektroniskt bifogas reklamationsrapporten.

Rapportering

Rapport skall muntligen delges alla på Eka Engineering via månadsmöten eller motsvarande. Resultat från eventuella undersökningar delges, lämpligen via e-mail, avdelningschef, siteansvarig, försäljningschef, inköpschef, processchef, kvalitetssamordnare och HSE-Q-chef.

Kvalitetssamordnaren registrerar rapporten och sammanställer underlag till ledningsgruppen, som summerade kvalitetsbristkostnader, ärendetid och sortering av återkommande problem.

Handläggningen innehållar:
- Formell reklamation till underleverantörer
- Uppföljning av gjord reklamation hos underleverantör
- Säkerställande av att beslut fattas om defekt utrustning skall returneras från kund och om närmare undersökning skall ske
Appendix 3

- Fortlöpande information till kunden
- Säkerställande av att kunder får erforderliga reservdelar / service
- Ekonomisk reglering av reklamationen med kunden
- Ekonomisk reglering av reklamationen med underleverantör

**Rapporten namnges**

Varje reklamation ges ett löpnummer utifrån respektive kund.

Rapporter namnges utifrån detta nummer enligt följande:

```
xxxCllyy rev z
```

xxx Projekt nummer
Cl Claim
yy Löpnummer
z Bokstav för respektive revision

**Arkivering**

Dokumentation från handläggningen av reklamationer samt reklamationsrapporten skall arkiveras hos kvalitetssamordnaren på site Nacka som dessutom ser till att materialet finns tillgängligt i det elektroniska ledningssystemet.

Rapporterna och dess bilagor arkiveras enligt gällande arkiveringsrutin.

**GILTIGHET/IKRAFTTRÄDANDE**

Denna instruktion gäller från och med fastställededatum och tillsvidare.
OMFATTNING

Denna instruktion skall följas vid all ändring av granskade och godkända handlingar.

ANSVAR

Ansvarig inom respektive teknikområde ansvarar för att denna instruktion följs.

BESKRIVNING

Syfte

Att säkerställa att alla behov av ändringar hanldlaggs så att berörda handlingar blir reviderade samt därefter åter granskade och godkända.

Genomförande

Behov av ändring som uppkommer i projektet skall omgående vidareförmedlas till de berörda teknikområdes ansvariga. Dessa ansvarar i sin tur gemensamt för att ändringen blir registrerad och utvärderad. Följande frågor skall som minimum alltid behandlas vid utvärderingen:

- är begärd ändring funktionsmässigt motiverad och inom ramen för kontraktet
- påverkas tillförlitlighet, användbarhet, underhållssäkerhet, eller miljöanpassning
- krävs nya beräkningar ur process – eller hållfasthetssynpunkt
- krävs revision av scheman, spec, listor, beskrivningar eller driftsinstruktioner
- påverkas förutsättningarna även i andra teknikområden
- krävs revision av layouts, sammanställningar, tillverkningsritningar,
  massningslistor och andra entreprenadhandlingar.

Efter utförd ändring av berörda handlingar skall de granskas och godkännas av ansvariga inom berörda teknikområden. Härvid skall tillämpliga delar av QC4-2520 och QC4-2521 följas. Ändring utom ramen för kontraktet skall innan den behandlas enligt ovan vara principiellt godkänd av projektledaren.

Dokumentation

Genomförda ändringar skall dokumenteras som intern alternativt extern change order i enlighet med QC13-6505

GILTIGHET/IKRAFTTRÄDANDE

Denna instruktion gäller från och med fastställandedatum och tillsvidare.
OMFATTNING

Denna instruktion skall följas vid utvärdering av alla Eka Engineeringprojekt.

ANSVAR

Utsedd projektledare ansvarar för att denna instruktion följs.

BESKRIVNING

Om inte styrgrupp för berört projekt beslutar annat, skall minst följande huvudfaser i projektet slutrapporteras:

- Projektering till och med skeppning
- Montage inklusive godkänd provkörning
- Efter garantitidens utgång

Härtill kommer behovsanpassade protokollförda utvärderingsmöten inom respektive huvudfas.

Slutrapport från avslutad huvudfas skall i tillämpliga delar innehålla redovisning under fasta rubriker enligt följande:

- Projektnamn och projektnummer
- Ort, datum och utfärdare
- Distribution
- Sammanfattning
- Projektbeskrivning
- Kontrakt
- Kunden / konsulten
- Projektorganisation
- Tidplan / Tidsåtgång
- Projektering
- Leverantörer
- Dokumentation
- Montage
- Provkörning
- Projektekonomi
- Övriga kommentarer

Utöver faktiska förhållanden skall rapporten redovisa vad som varit bra, dvs önskvärt att bibehålla, och vad som kan förbättras.

DISTRIBUTION

Rapporten skall förutom allmän cirkulation distribueras till projektets styrgrupp samt till avdelningschef, sitechef, försäljningschef, ansvarig försäljare, processchef, inköpschef, HSE-Q-chef.

University College of Borås, School of Engineering, Master Thesis 12/2008
ARKIVERING

HSE-Q-delen arkiverar rapporten i pärmen “Utvärderingsrapporter” som står i biblioteket plan 5, Nacka. På motsvarande sätt arkiveras en rapport i Bohus på allmänt tillgänglig plats.

GILTIGHET / IKRAFTTRÅDANDE

Denna instruktion gäller från och med fastställandedatum och tillsvidare.
Appendix 6

1) Why and when did you start working on mapping non-conformities?
2) Could you please explain your definition of non-conformities?
3) How did you establish that definition? (in group, top management etc.)
4) Non-conformities are normally perceived as deviations from a defined process, how did you establish these processes?
5) Are these processes thoroughly or generally described?
6) How do you seize non-conformities?
7) Is there a reward system for reporting non-conformities?
8) Do you have an anonymous reporting system?
9) How do you motivate co-workers to report non-conformities?
10) How do link non-conformity reporting to your obligation of continuous improvement?
11) Is this link firmly understood by co-workers?
12) How do you develop non-conformity handling in general?
13) Do you only have costs as basis for presenting results of non-conformities?
14) How do you estimate costs in projects?
15) If you had the chance of doing it all over again, what would you have done differently?
16) What mistakes were made during the implementation your management system?
17) How do you measure efficiency in QUEbase?
18) Is QUEbase a voluntary reporting system or is it used in fixed periods during projects?
Non-conformity handling within Eka Engineering

This survey is compiled by Martin Jarhult, MSc student at the University in Borås, as part of his thesis work carried out at Eka Engineering. The survey will function as a tool to measure how changes concerning non-conformity handling are experienced by co-workers. Your identity will be kept confidential and the answers will be used only for statistical purposes.

The survey consists of 20 questions and it will take you approximately 20 minutes to complete.

The definition of non-conformity within Eka Engineering is: deviation from standard, work-processes, laws or supplier and customer agreements, etc.

The purpose of non-conformity reports is: to detect all kinds of deviations and prevent them from re-occurring.

1) How well do the procedures of the quality management system describe your role?

   (very well) □ □ □ □ □ □ □ (badly)

   Comment:

2) In your opinion, how reliable is today’s system for non-conformity handling?

   (very reliable) □ □ □ □ □ □ □ (not at all reliable)

   Comment:

3) How motivated have you been to use the non-conformity reporting system?

   (very motivated) □ □ □ □ □ □ □ (not at all motivated)

   Comment:

4) In your opinion, how good is today’s definition of non-conformities?

   (very good) □ □ □ □ □ □ □ (bad)

   Comment:
Appendix 7

5) In your opinion, which are the 3 most important factors when you do a non-conformity report?

☐ Reward for finding and reporting deviation
☐ Quick measures/decisions
☐ Take part in measures/decisions
☐ Quick follow-up
☐ Joint follow-up
☐ other: 
☐ other: 
☐ other:

Comment:

6) In your opinion, who should be responsible for correcting deviations?

☐ Yourself
☐ Site manager
☐ Project leader
☐ Team leader
☐ Discipline leader
☐ Quality co-ordinator
☐ other:

Comment:
7) To what extent do the current non-conformity reports contribute to the improvement of your work-process?

(great extent) □ □ □ □ □ □ □ (not at all)

Comment:

8) How informed are you about the deviations that occur within your work-process/processes?

(very well) □ □ □ □ □ □ □ (very little)

Comment:

9) In your opinion, how important is it to inform others about the deviations within your projects?

(very important) □ □ □ □ □ □ □ (not at all important)

Comment:

10) How informed are you about the deviations that occur within other’s work processes?

(very well) □ □ □ □ □ □ □ (not at all)

Comment:

11) How important is it for you to be informed about deviations within other’s projects?

(very important) □ □ □ □ □ □ □ (not at all important)

Comment:
12) How easy is it to separate deviations from normal conduct while carrying out a project?

(very easy) □ □ □ □ □ □ □ (not at all easy)

Comment:

13) In your opinion, how satisfactory is the current non-conformity reporting?

(fully satisfactory) □ □ □ □ □ □ □ (not at all satisfactory)

Comment:

14) In your opinion, how satisfactory is the current presentation of non-conformities?

(fully satisfactory) □ □ □ □ □ □ □ (not at all satisfactory)

Comment:

15) To what extent have you been provided with training and information regarding the purpose of non-conformity reporting within Eka Engineering?

(fully sufficient) □ □ □ □ □ □ □ (not at all sufficient)

Comment:

16) How sufficient, in general, is the project follow-up in connection with the handing over of projects between different disciplines?

(fully sufficient) □ □ □ □ □ □ □ (not at all sufficient)

Comment:
Appendix 7

17) How sufficient is the project follow-up in connection with the handing over of projects between work-processes within disciplines?

(fully sufficient) □ □ □ □ □ □ (not at all sufficient)

Comment:

Today there are three different types of deviations specified in the quality management system, these are:

a. **Deviation during ongoing project**: Deviations concerning Eka Engineering’s products that are detected internally during ongoing projects.

b. **Internal shortcomings**: Deviations in Eka Engineering’s management system regarding quality, i.e. either the procedures are not in agreement with the ISO 9001:2000 standard, or the written procedures are not representative of how work is conducted. Deviations concerning Eka Engineering’s products not detected in “deviations during ongoing project” shall be treated as internal shortcomings.

c. **Claims**: Deviations concerning claims, i.e. customer and supplier complaints as well as external complaints on the management system.

18) Based on the above mentioned types of deviations, in your opinion which alternative represents the highest occurrence of deviations, regardless if it is documented or not?

- □ Deviation during ongoing project
- □ Internal shortcomings
- □ Claims

Comments:

19) Which alternative represents the lowest occurrence of deviations, regardless if it is documented or not?

- □ Deviation during ongoing project
- □ Internal shortcomings
- □ Claims

Comments:
Appendix 7

20) In general, how well does the definition and specifications of deviations at Eka Engineering correspond to your understanding of deviations?

(very well) □ □ □ □ □ □ (not at all)

Comments:

Do you have other viewpoints or suggestions concerning non-conformity handling at Eka Engineering?

Background questions

I am/have:

☐ Situated in Bohus
☐ Situated in Nacka

☐ Eka employee
☐ Consultant

☐ Worked between 0-5 years at Eka Engineering (a.k.a. ENP Cellchem)

☐ Worked more than 6 years at Eka Engineering (a.k.a. ENP Cellchem)

☐ In the discipline Project Management or Project Administration (including Controller, Sales and Accounting)

☐ In the discipline Procurement, Logistics & Spare Parts

☐ In the discipline Process

☐ In the discipline Civil & Structure or Mechanical Piping / Erection

☐ In the discipline Process Control & Industrial IT

Thank you very much for taking time to answer the questions!

Please follow these instructions in order to send me your response.

Choose File in the menu and Send To, click Mail Recipient (as Attachment)… and write martin.jarhult@eka.com in the address field.
Appendix 8

The interview starts with comments from the respondent on the tool proposal after which it has been presented.

1) Could you please describe your work?
2) Could you please describe a project realisation?
3) What is a non-conformity to you?
4) How often would you say you see non-conformities?
5) How many hours would you estimate that either you or someone else need to correct these non-conformities?
6) Is it possible to divide a project in specific, re-occurring, parts or phases and in such a case, which are they?
7) How, in your opinion, should responsibilities look for this system?
8) How can we assure our self that we minimise the re-occurrence of non-conformities?
9) What type of statistics should we present in order to create a learning system?
10) How can we be motivated to use the system?
11) How can we create reliability towards the system?
12) How can we create quickness in a system for non-conformities and improvement work?
13) What are your opinions on today’s definitions of non-conformities?
14) Are they easy to understand?
15) How would you like to search for other non-conformities as means of improving your daily work?
**Survey statistics – Explanation**

- Questions are presented
  - Comments are presented

The percentage shows how many that answered the specific question.

EE total is always presented in the top etc.

**Summary**

- We lack reliability and motivation to use today’s system for deviation handling
- We must improve our quickness in handling deviations i.e. quick decisions, quick and common feedback
- Deviation handling must minimize occurrence of deviations and also contribute to the improvement of work processes
- Definition and interpretation of deviation must become clearer to simplify seizing them
Survey results – **Question 1**

- How well do the procedures of the quality management system describe your role?
  - Comments: The management system is not pedagogical and it is hard to use; Needs to be updated/re-worked

Survey results – **Question 2**

- In your opinion, how reliable is today’s system for non-conformity handling?
  - Comments: no instructions or routines; is done during project meetings; focus on Nacka office; hard to follow up in reality; we work to individual; the will to follow routines is to low
Survey results – Question 3

• How motivated have you been to use the non-conformity reporting system?
  – Comments: is done in each project; a lot that priorly has been reported wasn’t handled; if I would have known about the system I would have been more motivated

Survey results – Question 4

• The definition of non-conformity within Eka Engineering is:
  – deviation from standard, work-processes, laws or supplier and customer agreements, etc.

• The purpose of non-conformity reports is:
  – to detect all kinds of deviations and prevent them from re-occurring
Survey results – Question 4

• In your opinion, how good is today’s definition of non-conformities?
  – Comments: too overall; lack relevance for work contents – reporting not feasible due to the high frequency; rather good – would be preferable with a common interpretation

Survey results – Question 5

• In your opinion, which are the 3 most important factors when you do a non-conformity report?
  – (1) Reward for finding and reporting deviation
  – (2) Quick measures/decisions
  – (3) Take part in measures/decisions
  – (4) Quick follow-up
  – (5) Joint follow-up
  – (6) other: easy-to-handle system for both finding and registration
  – (7) other: minimize possible damage
  – (8) other: prevent re-occurrence
  – (9) other: costs
  Comments: people working with deviations must be competent; important if it affects my work
Survey results – Question 6

• In your opinion, who should be responsible for correcting deviations?
  – (1) Yourself
  – (2) Site manager
  – (3) Project leader
  – (4) Team leader
  – (5) Discipline leader
  – (6) Quality co-ordinator
  – (7) other: doer in collaboration with work process owner
  – (8) other: line manager
  – (9) other: EE executive group

Comments: everyone should be responsible; depends on type/level; the management system should define who is work process owner; everyone should be responsible – though highest responsibilities for the line manager; people working with deviations must be competent

Survey results – Question 7

• To what extent do the current non-conformity reports contribute to the improvement of your work-process?
  – Comments: lack of feedback; what reporting?!; we used to learn from our deviations

Comments: lack of feedback; what reporting?!; we used to learn from our deviations
Survey results – Question 8

• How informed are you about the deviations that occur within your work-process/processes?
  – Comments: Those who are affected by the deviation usually tell others – the remaining are out of my knowledge; own-control and third party control; through corridor talk; knowledge isn’t shared – it’s a matter of prestige; they affect my work

Survey results – Question 9

• In your opinion, how important is it to inform others about the deviations within your projects?
  – Comments: prevent reoccurrence; also within administrative routines; we should not re-invent the wheel with every project
Survey results – Question 10

• How informed are you about the deviations that occur within other’s work processes?
  – Comments: round the coffee table; The Nacka office has documentation and presentation – The Bohus office lack both parts; they affect my work; knowledge isn’t shared – it’s a matter of prestige

Survey results – Question 11

• How important is it for you to be informed about deviations within other’s projects?
  – Comments: depends on type of deviation; in particular economics and finance; we must learn from each other; avoid reoccurrence; we should not re-invent the wheel with every project
Survey results – Question 12

• How easy is it to separate deviations from normal conduct while carrying out a project?
  – Comments: because we do not quite know what a deviation is, it can be hard to seize them; depends on type; claims are easy – others are more difficult due to variation of projects; in reoccurring tasks it’s easy otherwise it’s harder – we lack instructions

Survey results – Question 13

• In your opinion, how satisfactory is the current non-conformity reporting?
  – Comments: there is none; must be faster and provide better feedback; the Bohus office lacks reporting – the Nacka office has a good reporting system; knowledge isn’t shared – it’s a matter of prestige
Survey results – Question 14

• In your opinion, how satisfactory is the current presentation of non-conformities?
  – Comments: there is none; the organization is poorly informed – few people take time to search for information in the management system; for whom should deviation be presented? – have seen presentations on department meetings in Nacka

Survey results – Question 15

• To what extent have you been provided with training and information regarding the purpose of non-conformity reporting within Eka Engineering?
  – Comments: on monthly meetings; within the project organization; via DL and TL – but nothing via the management system
Survey results – Question 16

• How sufficient, in general, is the project follow-up in connection with the handing over of projects between different disciplines?
  – Comments: the only opportunity of follow-up is when sales hands over the project to the project group; most people try to pass the ball without ever getting it back; this is a on-going cooperation; I don’t understand the question – we don’t work according to relay principle using a baton

Survey results – Question 17

• How sufficient is the project follow-up in connection with the handing over of projects between work-processes within disciplines?
  – Comments: most people try to pass the ball without ever getting it back; development of specifications and technical basis must be improved
Survey results – Question 18

• Deviation during ongoing project:
  – Deviations concerning Eka Engineering’s products that are detected internally during ongoing projects

• Internal shortcomings:
  – Deviations in Eka Engineering’s management system regarding quality, i.e. either the procedures are not in agreement with the ISO 9001:2000 standard, or the written procedures are not representative of how work is conducted. Deviations concerning Eka Engineering’s products not detected in “deviations during ongoing project” shall be treated as internal shortcomings

• Claims:
  – Deviations concerning claims, i.e. customer and supplier complaints as well as external complaints on the management system

Survey results – Question 18

• Based on the above mentioned types of deviations, in your opinion which alternative represents the highest occurrence of deviations, regardless if it is documented or not?
  – Comments: varies between offices; I don’t think that many people knows about deviation handling at EE; what is meant by EE products? – deviations often depends on customer related conditions; the visible are definitely claims, however, there is probably hidden statistics within internal routines; claims provide a monetary return to the projects – the other types of deviation creates extra costs
Survey results – Question 19

• Which alternative represents the lowest occurrence of deviations, regardless if it is documented or not?
  – Comments: What is meant by EE products? - deviations often depends on customer related conditions

Survey results – Question 20

• In general, how well does the definition and specifications of deviations at Eka Engineering correspond to your understanding of deviations?
  – Comments: The system for deviations is bureaucratic construction that can’t be used in real life – miscalculations, slips or conduct errors have nothing to do with ISO and can be eliminated by improved way of working – today they are ignored and they are many in numbers
Survey results – Other viewpoints

- Takes too long to report deviations. Circumstantial routine that to great extent can't be used in real life. Due to this, only a few deviations are reported.
- Besides the reporting of claims we need simple and concrete routines to bring this issue to life.
- I didn't know of any deviation handling and when or how to use it.
- We have to see the problems of writing reports, very few issues can be handled this way. The handling of daily deviations stay as it is today i.e. through/via personal contacts.
- Should be presented on EE web portal for quick communication and to minimize reoccurrence.
- The management system is cryptic and doesn't provide easy access of finding documents.

Summary

- We lack reliability and motivation to use today's system for deviation handling.
- We must improve our quickness in handling deviations i.e. quick decisions, quick and common feedback.
- Deviation handling must minimize occurrence of deviations and also contribute to the improvement of work processes.
- Definition and interpretation of deviation must become clearer to simplify seizing them.
Intervju – Kan du beskriva ett normalt projektförfarande?

- Idé
- Förstudie
- Förprojekt
- Genomförande
- Överlämnande
- Dokumentation
- Garantitid
- Förfrågan
- Offert
- Inköp
- Skeppning
- Dokumentation
- Montage
- Start Up
- Garanti

Intervju – Vad är en avvikelse för dig?

- Omfång av projektet förändras
  - Tid, budget, ändringar
- Avvikelse mot arbetsrutin
  - Verktyg, standarder (ANSI/DIN)
Intervju – Hur ofta stöter du på avvikelser?

- För stort spektra bland svaren för att kunna säga exakt, dock är det tydligt att det förekommer flera per projekt.
- Alla stöter på avvikelser i någon form och därmed har vi en bra förbättringsgrund

Intervju – Hur många timmar uppskattar du att du eller någon annan får lägga på att korrigera dem?

- Skattas till mellan 3-10% av de totala kostnaderna för ett projekt
- Skattas till mellan 2-8 timmar per vecka
Intervju – Hur ska ansvarsfördelningen se ut för ett sådant här system?

- Majoriteten vill se central person/grupp (QA) som mottagare av rapport. Nästan lika många vill se DL som mottagare av rapport
- Gemensamt för båda är att dessa i sin tur skickar vidare rapporten för åtgärd och uppföljning – vart den går beror på typ av avvikelse. I linjen eller i projektgruppen.

Intervju – Hur kan vi se till att upprepning av avvikelser minimeras?

- Genom gruppering och sortering av QA eller DL.
- Beslut om åtgärd tas av antigen SM eller PL.
- För presentation önskas MM eller projektmöten som forum beroende återigen på typ av avvikelse.
- Viktigt att det blir en återkommande och belyst del under båda forumen.

University College of Borås, School of Engineering, Master Thesis 12/2008
**Intervju – Vilken typ av statistik ska vi presentera för att skapa ett ”lärande” system?**

• Sökfunktion inte nödvändig, dock kategorisering av avvikelser. T.ex. via:
  – Kostnader, typ av avvikelse, status, kund, leverantör, disciplin, arbetsprocess, rutin, produktgrupp och projektfas

**Intervju – Hur kan vi motiveras att använda systemet?**

• Motivering genom att rapportering av avvikelser ger resultat
  – Belysning av förbättringar
• ”Morot” för påvisade förbättringar
  – Beröm, biobiljett eller något annat med låg kostnad
Intervju – Hur kan vi skapa tillförlitlighet till systemet?

• Resultat och feedback tydligaste faktorerna
• Fokus på problem och inte person är viktigt
• Öppenhet i system och spårbarhet i rapporter
• Vi ska inte leta syndabockar – vi ska förbättra oss

Intervju – Hur skapar vi enligt dig snabbhet i ett system för avvikelsehantering och förbättringar?

• Snabbheten kommer i och med att medarbetare och ledning visar ett tydligt engagemang och genom aktivt och repetitivt arbete
Intervju – Vilka är dina synpunkter på dagens definition av avvikelse?

- Avvikelse under pågående projekt:
  - Avvikelse avseende Eka Engineerings produkter, som upptäcks intern under och inom pågående projekt
- Internt fel:
  - Avvikelse i Eka Engineerings ledningssystem rörande kvalitet, d.v.s. antingen överensstämmer våra rutiner ej med standarden ISO9001 eller så avviker de skrivna rutinerna från det arbetsätt som praktiseras. Avvikelser som rör Eka Engineerings produkter som inte fångas upp i rutinen för Avvikelse under pågående projekt skall också rapporteras som ett internt fel
- Reklamationer:
  - Avvikelser som är av typen reklamationer, d.v.s. kund- och leverantörsreklamationer, samt externa klagomål på vårt ledningssystem

Intervju – Vilka är dina synpunkter på dagens definition av avvikelse?

- Avvikelse under pågående projekt:
  - Begreppet produkt uppfattas som diffust
- Internt fel:
  - Båda dessa framstår tydligt som svåra att förstå och ta till sig. Dessa måste tydliggöras, kanske genom exempel för att få en gemensam bild.
- Reklamationer
  - uppfattas av majoriteten som bra och lättförståelig