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Developing Guidelines for Managing Processes by Objectives

- A Part of Implementing Process Management at Volvo Bus Corporation

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Master's Thesis in Quality Technology at Luleå University of Technology and Volvo Bus Corporation in Gothenburg

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Abstract

The purpose of the thesis was to develop guidelines for managing processes by objectives at Volvo Buses Corporation. Those guidelines were to be tested on three pilot processes, which were chosen to represent different kinds of processes to ensure the general applicability of the guidelines.

Interviews were conducted to investigate the current situation regarding Process Management in the company, and to find out what needs and wants the guidelines were to satisfy. Those interviews lead to the construction of the initial draft of the guidelines, which was the basis of the benchmarking that was performed. After the benchmarking, introductory studies of the chosen pilot processes were required to make the tests useful and reliable. The testing was then performed on basis of these pilot process studies. The three processes that were tested were of different natures, and each test contributed to the further development of the guidelines in various ways.

The result of the thesis is the final version of the guidelines, which consists of five parts. The first part, the method for implementing performance measurements, is a general step-by-step description for how to implement measurements in an appropriate way. Part two, the example list, contains suggestions for suitable measures within time, cost, and quality. This list is meant to be a guide and inspiration when trying to find appropriate measures. When a number of possible measures have been identified, the measure features in part three can be used as a filter to determine which measures are most suitable to be implemented. The factor definitions in part four are supposed to be a support when in doubt of what time, cost, and quality really means, and what measures are able to measure those factors in a good way. Finally, the follow-up procedure in part five is a company specific suggestion for how and where the measurement results should be followed up to be sure that the processes are managed by objectives, aiming in the right direction towards goal fulfillment. The follow-up procedure is also accompanied by a suggestion for report format, the VBC Status Report, which facilitates a manageable and constructive analysis of the measurement results.

The pilot processes chosen for testing did not include any management process, which put focus on the question of whether or not the guidelines could be considered general. However, since there are many similarities between support and management processes, the conclusion was made that the guidelines were suitable for general application.

Sammanfattning

Syftet med examensarbetet var att ta fram generella riktlinjer för att målstyra processer på Volvo Bussar AB. Dessa riktlinjer skulle sedan testas på tre pilotprocesses, som var utvalda så att de skulle representera olika typer av processer. Detta för att bekräfta att riktlinjerna verkligen var av generell natur.

Ett antal intervjuer utfördes för att undersöka nuläget angående processledning i företaget samt för att ta reda på vad som förväntades av riktlinjerna. Sedan konstruerades det första utkastet på riktlinjerna, vilket fungerade som underlag till den benchmarking som sedan utfördes. En intern och en extern benchmarking gjordes och de resulterade in många värdefulla idéer för vidare utveckling av riktlinjerna.

För att förbereda testningen av riktlinjernas pålitlighet studerades pilotprocesserna under den första delen av arbetet. Detta resulterade i en viss kunskap om processerna, som visade sig vara viktig som grund för testerna. De tre pilotprocesserna var av olika slag och bidrog till fortsatt utveckling av riktlinjerna på olika sätt.

Resultatet av examensarbetet består huvudsakligen av slutversionen av riktlinjerna, som består av fem olika delar. Den första delen, metoden för implementering av prestandamätningar, beskriver steg för steg hur man implementerar mätningar på ett bra sätt. Del två, exempellistan, ger exempel på lämpliga mått inom områdena tid, kostnad och kvalitet. Dessa exempel är tänkta att fungera som en vägledning och inspiration vid val av mått. När man identifierat ett antal mått kan de jämföras mot måttegenskaperna i del tre av riktlinjerna, för att avgöra vilka som är lämpligast att införa. Faktordefinitionerna i fjärde delen fungerar som ett stöd vid funderingar över vad begreppen innebär och vilka mått som bäst beskriver dessa faktorer. Tillvägagångssättet för uppföljning i del fem ger ett företagsspecifikt förslag på hur man ska följa upp resultatet vid mätningar, så att målstyrning av processerna säkerställs. Tillvägagångssättet är också kompletterat med ett förslag på rapportformat för mätningsresultat som är lätt att använda och lämpar sig bra för analyser.

De utvalda pilotprocesserna inkluderade ingen ledningsprocess, vilket gav upphov till tvekan angående riktlinjernas generella natur. Då det finns många likheter mellan stödprocesser och ledningsprocesses drogs ändå slutsatsen att riktlinjerna även kan användas på ledningsprocesser och därför kan betecknas som generella.

Preface and Acknowledgements

This thesis revolves around finding a way to manage processes by objectives. The work was performed at Volvo Bus Corporation in Gothenburg, between October 2001 and March 2002. It resulted in guidelines, which helps the user to identify suitable performance measures and implement measurements. The guidelines also suggest report format and follow-up procedures to make sure that the processes are really managed towards goal fulfillment.

I want to thank my supervisor at Volvo Buses Corporation, Mats Johansson, for all his help during the thesis work. I am very grateful for the great support and assistance from the entire Department of Global Quality. I also want to express my appreciation towards all other employees at Volvo Bus Corporation who has contributed to my work.

I also want to thank Maria Fredriksson, my supervisor at Luleå University of Technology, for her help during the writing of the thesis. A special thank you goes to Per-Olof Egnell for his help and advice on theoretical issues regarding Process Management.

My hope is that the thesis can be of great help for Volvo Bus Corporation, and also an inspiration for any company trying to manage processes by objectives.

Gothenburg, February 18th 2002

Josefin Enström

List of Acronyms

BSC – Balanced Scorecard
CPT – Capacity Planning Tool
CSI – Critical Success Indicator
DtR – Delivery to Repurchase, main process at VBC
GDP – Global Development Process
KPI – Key Performance Indicator
OD – Operational Development
OtD – Order to Delivery, main process at VBC
MBO – Management by Objectives
PD – Product Development, main process at VBC
PID – Product and Industrial Development
PMR – Product Modification Request
PRP – Product Problem Process
StO – Sales to Order, main process at VBC
TQM – Total Quality Management
VAC – Volvo Aero Corporation
VBC – Volvo Bus Corporation
VPIM – Volvo Process Improvement Model
VPIS – Volvo Process Improvement Scale

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1 Introduction

This chapter provides a background to the thesis and explains its purpose. A reading direction is also presented, to make the report disposition understandable.

1.1 Background and Problem Description

Volvo Bus Corporation (VBC) has on account of inadequate performance decided to implement Process Management in their organization.

Process Management is an important part of Total Quality Management (TQM), which involves focusing on the customer, basing decisions on facts, continuous improvements, everyone's involvement, to see the system as a whole, and working with processes (Bergman & Klefsjö, 1995). These parts form an entirety, but working with processes is a big mission on its own. The result never gets better than the process that forms it, and therefore, working with processes is a key principle (Rentzhog, 1998).

The first attempt to work with processes at VBC started in 1997, when the main purpose was to gain synergies between similar processes, to avoid sub-optimization and different departments trying to solve the same problem. The work proceeded with much enthusiasm, but when the economic situation for VBC deteriorated, management decided to utilize the resources elsewhere.

When in economical difficulties, companies often decrease the budget with the same percentage everywhere in the organization, due to lack of better knowledge. This results in both "good" and "bad" costs being diminished, giving the company less ability to satisfy customers and by those means, making money. The only costs that should be cut are those that do not add value in the end (Alexandersson, Almhem, Rönnlund & Väggö, 1998). The costs involved with implementing Process Management should be considered "good" costs since they contribute to long-term improvements, and should therefore not be cut.

Now, the time has come for VBC to resume the work with Process Management, and this time with another focus. The company has selected a number of sub processes within the main processes to be part of the pilot project. The main process structure can be seen in Appendix 2. Process Management was going to be implemented in these pilot processes with full support, quick and effective. When this pilot project is stabilized, VBC is going to implement the strategy company-wide.

Implementation of Process Management requires a lot of work and preparation to succeed. Especially for a relatively large company, it is hard to get everyone to work in the same direction. One thing that is of major importance is therefore to have generic guidelines that make the implementation easier to carry out in the same manner everywhere. If people work according to the same rules and theories, cross-functional work is simplified. The guidelines needed for this are being constructed at present, and this thesis is part of it.

Having guidelines regarding what to measure simplifies the initial process work. If measurements are ongoing, or easy to implement, the work can be concentrated on measuring, evaluating and improving the process.

1.2 Purpose and Limitations

The purpose of this thesis was to construct guidelines, which makes it easy to implement performance measurements, considering time, cost, and quality, in the company's processes. A proposal for how follow-ups and reporting of the measurement results should be done was to be presented, to make it possible to manage the processes by objectives.

The developed guidelines were tested on three sub processes, which were chosen as follows:

- The request process (a sub-process to the main process Product Development, PD)
- The quality report process (a sub-process to the support process Quality)
- The product problem process (a sub-process to the main process Product Development, PD)

The idea was that the guidelines would be applicable on the other processes in the company as well. Therefore, they are of a generic nature. The three pilot processes were considered to be representative for the spectrum of processes, thus affirmative of the general applicability of the guidelines.

1.3 Reader's Guide

This thesis contains several parts, and depending on the reader, the parts of interest might differ.

For the uninitiated reader, the whole thesis can very well be read. For someone interested in the subject, but not the specific case, Chapter 3 and 6-8 might be interesting. The reader that is curious about VBC, and this case in particular, should read Chapter 1 and 4-8.

2 Methodology

This chapter contains a description of the used methods and motivations to why they were chosen. It also provides an overview of the working procedure used to fulfill the purpose of the thesis.

2.1 Research Approach

There are two different approaches on which an investigation can be raised; an inductive or a deductive approach. The inductive approach relies on observations, on which a theory is founded. The deductive approach starts with an analysis of the current situation, from which a hypothesis is developed. To confirm the compliance with the theory studied, the hypothesis is then tested (Wiedersheim-Paul & Eriksson, 1989). In parallel to this, the research can be conducted on few or many individuals, and the investigation method is chosen according to this choice, which is further explained in Chapter 2.3.

In this thesis, both approaches were taken in different parts of the work. From the main perspective, it can be considered a deductive approach, since the guidelines were developed based on a combination of situation analysis and theory studies, and then tested. On the other hand, the case studies done on the pilot processes is a kind of inductive approach, since they partly consisted of observations that later helped the development of the "theory", being the guidelines.

2.2 Type of Data Collection

There are two aspects of data collection; for one there is the question of using a qualitative or a quantitative approach, and on the other hand there is the use of primary or secondary data.

Quantitative investigations emphasize keeping the distance between the researcher and the source. The information used is of a "hard" character, meaning mostly figures useable for statistical processing. These methods are often very formalized and structured (Patel & Tebelius, 1987).

Qualitative methods are characterized by the researcher trying to familiarize himself with the source and taking the source's own perspective. The researcher uses "soft" information, not expressed in numbers. This method helps gaining a deeper perspective of the problem, and should facilitate a holistic description (ibid).

Primary data is collected by the researcher himself, and can be exemplified by surveys, interviews, or observations. Secondary data has been documented earlier, and the researcher conducts further analyses on this material (ibid).

The data collection included in the thesis work used both primary and secondary data, but focused on qualitative investigations. The interviews can be seen as qualitative and delivered primary data, but they also contributed to collection of secondary data, since summaries from earlier projects and process maps were obtained during these interviews. There is no quantitative part in the thesis, even though the testing could have been. However, the decision was made not to use a quantitative approach, due to lack of process performance knowledge.

2.3 Investigation Method

There are many different ways to conduct research, and which method is suitable should be decided with regard to the problem description. Examples of investigation methods are anta facto research, post facto research, experimental research, survey investigations, and case studies (Patel & Tebelius, 1987).

A case study approach has been used in part of this thesis work, because case studies investigates many variables on few individuals[1], and is considered a good way to give the researcher a deeper understanding of a process (Patel & Tebelius, 1987). To confirm the usefulness of the guidelines in the thesis, the method has been tested on three pilot processes. To be able to do this in an adequate manner, a certain amount of knowledge about the processes had to be obtained, hence the case study. This is considered a part of the data collection in Figure 2.1.

2.4 Procedure

Constructing guidelines for this type of matter takes a lot of literature studies, and comparison of different methods and theories. The extensive studying of literature has lead to enough insight in the subject to enable the development of guidelines specific for VBC.

There are a lot of different theories regarding Process Management, and one initial task was to find out which one(s) VBC is living by. More specific, to learn about which definitions of responsibilities, roles and limits VBC is using. An understanding of these definitions was crucial to the thesis. To accomplish this, the first step was to have an investigative meeting with Mats Johansson, supervisor, to straighten things out. This meeting resulted in a better

[1] In this context, an individual can mean a person, an object, an organization etc.

understanding of the different roles in Process Management at VBC as well as access to documents (Volvo Process Improvement Model (VPIM), 1996), which made things much more understandable. A number of personal interviews were also to be conducted. The respondents to those interviews were supposed to cover a wide range of knowledge within the organization, contributing with their different perspectives of what Process Management means to them and their department. Therefore the respondent selection was done in cooperation with the supervisor at VBC. The interviews were also to give an idea about why the previous attempt to implement Process Management did not work as expected. What lessons can the company learn from that? This is an important question to ask, because the economical problems are even more serious now than in 1997, so the process work really has to be prioritized to have a chance of becoming successful.

In addition to this, an internal benchmarking on Process Management and/or measuring processes was performed on a company within the Volvo Group. A general benchmarking on a company outside Volvo Group was also conducted. The reason for this was that VBC plans to evolve selected processes to world class, thus they will need to know the best practice in Process Management, and also confirm that their own method is usable in an external perspective. The benchmarking also gave an idea about the accuracy of the thesis work so far.

When preliminary guidelines had been completed, it was tested on the previously mentioned pilot processes. After that, the guidelines had to be revised according to the findings made visible by testing the method practically. Therefore, this part of the work had to be done in a stage where there was still enough time left to revise the model, if needed.

After the testing, the thesis work consisted mainly of documenting and analyzing the final guidelines. Conclusions and suggestions for future work were also developed.

A simplified overview of the procedure can look as follows:

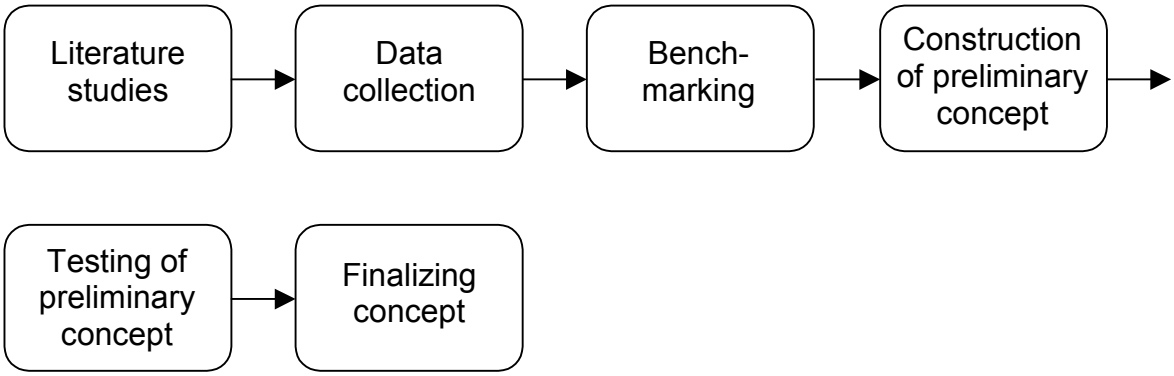


Figure 2.1: Procedure for thesis work.

An alternative approach, not taken in this thesis, could be to develop a so-called Balanced Scorecard (BSC) to use for measurements. This, however, was ruled out since VBC wants to measure relating to time, cost, and quality, and a BSC was not considered suitable for this purpose.

2.5 Reliability and Validity

Two important concepts to consider when conducting investigations are reliability and validity. These concepts describe to what degree the results correspond with reality, and if they are trustworthy.

Reliability refers to the accuracy of the research, and describes the amount of stochastic interference in the investigation. If repeatability is high, meaning that the result is not depending on by whom, when, and where the investigation is conducted, the research has a high reliability (Patel & Tebelius, 1987).

The validity of an investigation describes the amount of systematic interference. It is a measure of whether or not the investigation really covered the intended issues (ibid).

Reliability is always a big concern when personal interviews are conducted. The respondent might adjust their answers to what they think the interviewer wants to hear, and there is also the aspect of personal opinions being stated as facts. An attempt to increase reliability in the interviews has been made by confirming the answers with the thesis supervisor to see if the apprehensions correspond. The interviews have also been conducted according to a standardized questionnaire. Validity was also a problem while doing interviews. It is easy to slip into a discussion about something not connected to the thesis work. The questionnaire was a useful help here as well. The reliability of the guideline testing can probably be questioned. Since some

process knowledge was needed to conduct the testing, the result could differ, depending on how much the tester knows about the process.

3 Frame of Reference

This chapter presents the theories on which the analysis and results are based. The theory relevant for the thesis covers quality, processes, measurements, benchmarking and management theories.

3.1 The Quality Concept

Quality is becoming increasingly important to stay competitive at the global market today. The definitions of what quality is tend to differ, a few conceptions are presented in Bergman & Klefsjö (1995):

"Conformance to requirements" (Crosby)

"Fitness for use" (Juran)

Juran's definition has a drawback. It refers exclusively to the end user, and this should be widened to include activities that precede end consumption. Every manufacturing operation is a user of the product, and the product shall therefore be of sufficient quality in every step of the production (Sandholm, 1995).

Bergman and Klefsjö's own formulation of the definition is "the quality of a product is its ability to satisfy, or preferably exceed, customer needs and expectations". Another view is to define the lack of quality (Taguchi & Wu, in Bergman & Klefsjö, 1995), as "society's total loss caused by the product after its delivery".

Not one of these definitions can be considered the only true one. Every definition holds its own truth. What can be stated is that everyone seems to agree that quality is customer oriented, and that it is a considerable competitive advantage.

To talk about quality in such general terms can seem confusing and abstract. A more tangible approach to quality is the concept of Total Quality Management, which divides total quality into six important cornerstones (Bergman & Klefsjö, 1995).

3.2 Total Quality Management (TQM)

Total Quality Management is about constantly striving to meet the customer's needs and expectations to the lowest cost possible by continuous improvements, to which everybody commits. TQM is about preventing,

changing, and improving, not controlling and repairing. It is an ongoing process that develops not only processes and products, but people as well (Bergman & Klefsjö, 1995). The TQM concept means that quality thinking has to penetrate every function in the company, in order to reach optimal quality (Sandholm, 1995).

The different parts in the so-called cornerstone model are shown in Figure 3.1 seen below.

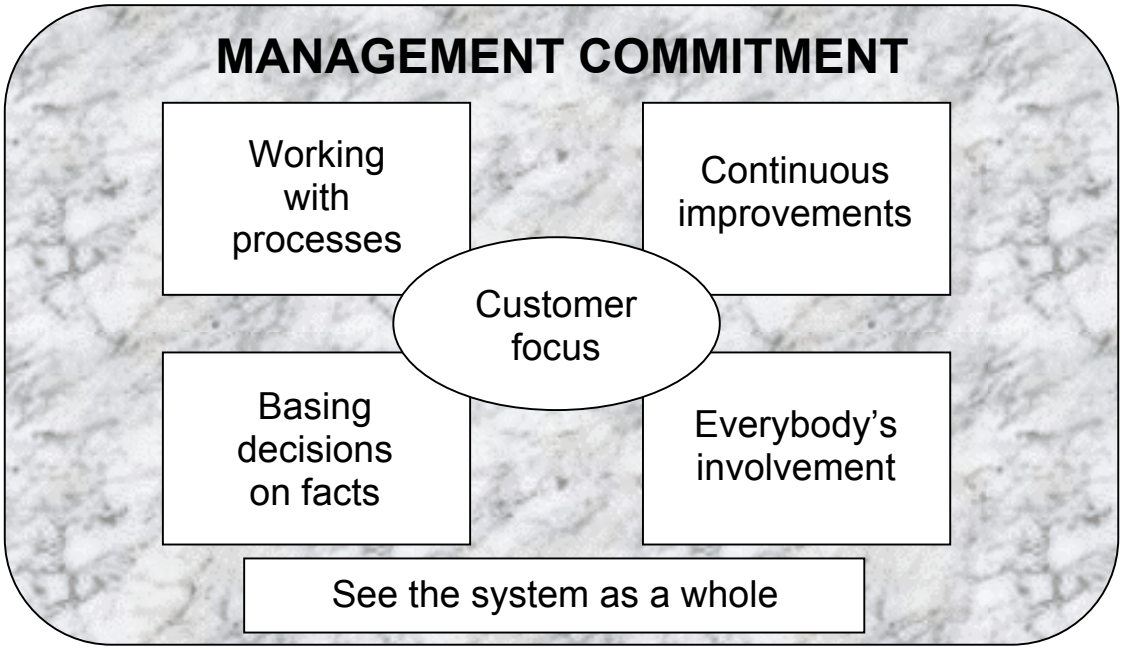


Figure 3.1: The cornerstone model (free interpretation from Bergman & Klefsjö, 1995).

Management Commitment

A successful implementation of TQM in an organization mainly depends on the degree of management commitment. Management has to write a quality policy, and facilitate quality work by giving economic, moral, and resource support. If management does not show their support in actions, and by stating that long-term quality is at least as important as short-term revenues, the organization's employees will probably not fully understand the importance of quality (Bergman & Klefsjö, 1995).

Efraimsson and Magnusson (1998) argues that being a committed management means to allocate resources for change, to be involved in the development of new routines, and to constantly steer the organization towards its goals. As can

be seen in Figure 3.1, the commitment of management is the foundation on which all the other parts of TQM are based.

Customer Focus
Total Quality Management revolves around putting the customer in focus. Quality is a relative term, and it is decided by the customer's demands and expectations. It is important not to forget that it is not only the end user that is considered a customer. Every step in the organization should be regarded as an internal customer. If the internal quality is poor, a sufficient external quality is hard to obtain (Bergman & Klefsjö, 1995).

Basing Decisions on Facts
Basing decisions on facts, not on intuition or opinions, should be a fundamental principle in today's organization. According to Bergman and Klefsjö (1995), this is often not the case, but erratic decisions are determining the company future. The relevant facts are often easily found by measuring a few important things (Bergman & Klefsjö, 1995). A necessary condition for basing decisions on facts is that the company has effective methods and tools for gathering and summarizing the information (Bergh & Lindgren, 1995).

Everybody's Involvement
For TQM to work, the elements in the cornerstone model have to influence the thinking of every employee in the organization. Management has to create conditions for everyone to actively influence and participate in the change work (Bergman & Klefsjö, 1995).

Consideration has to be given to others than the internal actors regarding involvement. For example, the suppliers that provide the organization with its ingoing material has to be involved in the change work (ibid).

Everybody's involvement and management commitment can be looked at as two sides of the same coin, where one can not exist without the other (Efraimsson & Magnusson, 1998).

See the System as a Whole
It is important not to forget that all the different processes in an organization are affecting, and depending on, one another. Therefore, a long-term system approach is necessary. It is also preferable to extend the system from including only the internal parts of the organization, to contain the customers and the suppliers too. By optimizing the entire system, a win-win situation can be created (Bergman & Klefsjö, 1995).

Continuous Improvements

Through continuous improvements the organization can gain competitive advantages, or prevent loss of market shares. From a cost point of view, continuous improvement is promoted, since the poor quality costs can be extensive. Bergman & Klefsjö (1995) argue that the one that stops improving soon ceases to be good.

The improvement cycle, or the PDCA-cycle, is a symbol for continuous improvement. It has four stages, Plan-Do-Check-Act (see Figure 3.2), and is designed to prevent new problems from arising and prevent the reoccurrence of existing problems (Jönson, 1995).

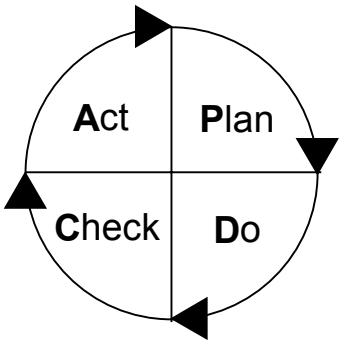


Figure 3.2: The PDCA-circle (Interpretation from Bergman & Klefsjö, 1995).

Other important tools for working with continuous improvements are the seven tools for quality control, presented in Bolstad (1994).

Traditionally, companies are often searching for an optimized quality level. This has to be replaced by a belief that there are always a possibility of improvement (Rentzhog, 1998). Bergman and Klefsjö (1995) defines the ground rule of quality as follows:

" There is always a way to achieve a higher quality to a lower cost."

Working with Processes

To work with processes means to focus and control the business concentrating on the horizontal flows in the company, instead of managing the company with a functional approach (Bergh & Lindgren, 1995).

This is a key principle for continuous improvements, since processes are what form the products or services that are supposed to satisfy the customers. The repeatable nature of processes, is then what makes the improvements

continuous (Rentzhog, 1996). For further information about processes, see Chapter 3.3.

3.3 The Process Concept

3.3.1 Definition

The word process originates from the Latin word "processus" which means "to walk forward". There are a lot of definitions of what a process is, almost one for every author in the subject, and the word is also often used in the wrong context in today's society.

Harrington (1991) choose to define a process as:

"Any activity or group of activities that takes an input, adds value to it, and provides an output to an internal or external customer. Processes use an organization's resources to provide definitive results."

Rentzhog (1996) makes another definition, that does not take the value adding into consideration, but covers the repetitiveness of a process:

"A process is an activity or a set of orderly linked activities transforming an input to output for customers in a repetitive flow."

Rummler and Brache (1995) describe working with processes as a way to "manage the white space on the organization chart". What they mean by that is that the horizontal nature of the process covers the interfaces between the different functions in the organization, where a lot of problems are known to occur.

3.3.2 Process Features

Distinguishing for a process is that it (Egnell, 1999):

- *Has a supplier*

The supplier contributes to the process with a measurable object. The supplier can be either internal or external.

- *Consists of one or more activities*

The activities refine the object in various ways to a predefined measurable result.

- *Has a customer*

The customer has a demand for the output from the process. The customer can be either internal or external.

- *Is defined*

The process has a beginning and an end that are well defined by so-called interfaces

- *Is repetitive*

The activities in a process are performed frequently, in the same manner. The intensity and interval are process specific. Repetitiveness does not however imply that the process remain unchanged over time (see continuous improvements, Chapter 3.2).

- *Uses the organization's resources to enable the transformation from ingoing object to outcoming result*

The holistic view that process work implies increases the employees' understanding of work done by other departments. This can indirectly lead to fewer problems in the functional interfaces (Loinder & Rentzhog, 1994).

3.3.3 Process Categories

The nature of the process can, according to Rise and Wiklund (1992) place it in either of three categories; operative processes, support processes, or management processes. A description of the different categories looks as follows (ibid).

Operative processes:	Aims at fulfilling customer needs and refine the products the organization is offering the customer. These processes are normally in direct contact with the external customer. An example of an operative process is the Product Development process.
Support processes:	The purpose of support processes is to provide resources to the operative processes. Support processes create indirect value for the customer and the business itself. The recruitment process is an example of a support process.
Management processes:	Decides on the goals and strategies of the organization and also plans, manages, improves, and follows up on the other processes in the organization.

The planning process is a typical management process.

An illustration of how the different kinds of processes work together can be found in Figure 3.3, which can be compared to the VBC main process map in Appendix 2.

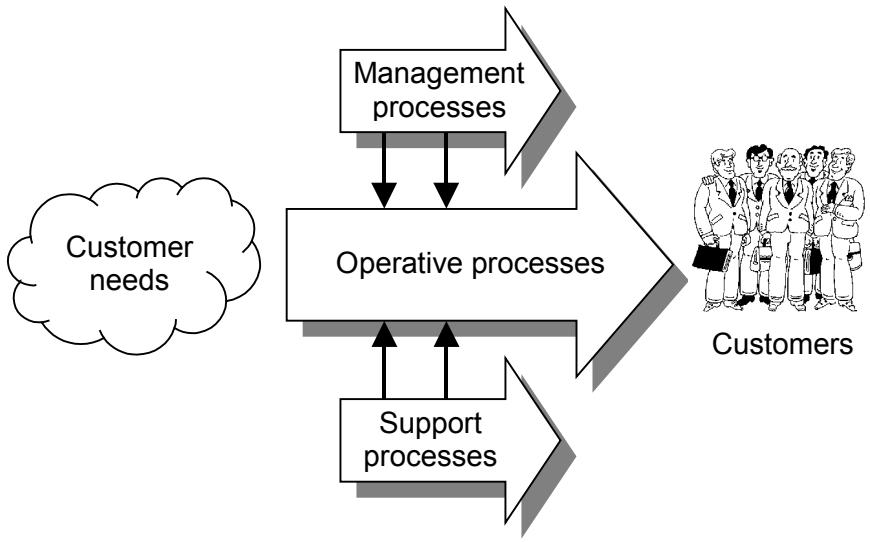


Figure 3.3: Illustration on how the different kinds of processes work together. (Free interpretation from Rise & Wiklund, 1992).

There are many different ways to categorize processes with respect to their nature, but since Rise and Wiklund is the model used at VBC, that is the only way prestented in this thesis. For other approaches, see Rummler and Brache (1995), Melan (1993), or Forsberg (1998).

Melan (1993) suggests the following hierarchy for the classification of processes regarding the level of detail: Process – Sub-process – Activity – Task. The one used at VBC is similar to this, with the exception that they call the processes at the highest level *main* processes. A visualization of these levels is shown in Figure 3.4.

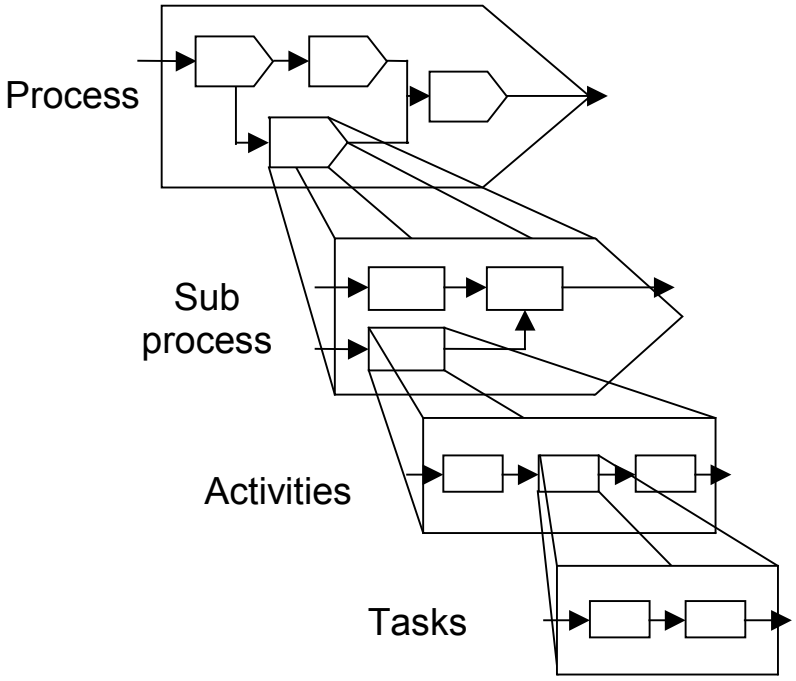


Figure 3.4: The hierarchical levels of a process. (Inspired by Harrington, 1991.)

The activities in a process can be further divided into different categories, depending on what kind of output they produce, that is, whether or not they contribute to the creation of customer value. Harrington (1991) classifies activities in three categories:

- *Activities that create value for the customer*
  These activities are needed to give the customer what they want, and contributes directly to customer satisfaction.

- *Activities that create value for the business*
  The company needs these activities for satisfying the customer, but they contribute only indirectly to customer satisfaction and is therefore not considered valuable by the customer.

- *Non-value-adding activities*
  Unnecessary activities that does not add any kind of value, and can be removed without any consequences for neither the company nor the customer.

Willoch (1994) says that activities that add customer value should be maximized, activities that add business value should be minimized, and non-value-adding activities should be eliminated.

3.4 Company Organization – Functional or Process Oriented?

A functional organization is divided into departments by the knowledge and skills of the personnel. Being organized in functional departments stabilizes the organization, and gives excellent opportunities for the employees to develop special competencies within their area. The risk with being functionally oriented is that since it strives to improve each function from its own perspective, the organization might become sub-optimized (Fors & Lundberg, 2000).

The process organization is distinguished by the organization being considered as a flow of processes creating value for the customer. The functions are subordinated the flow of products or services to the customer. The advantages of this approach are that the customer is in constant focus, and that the organization becomes more flexible. The company might risk loosing its cutting-edge knowledge, since the functional interfaces become blurred (ibid).

Very few organizations today are completely process oriented or functionally oriented. Stalk and Black (1994) uses four different models to visualize the possible organization forms ranging from functional to process oriented (see Figure 3.5). In the picture, the darker figures symbolize the more passive departments or functions in the organization, while the white ones are more active.

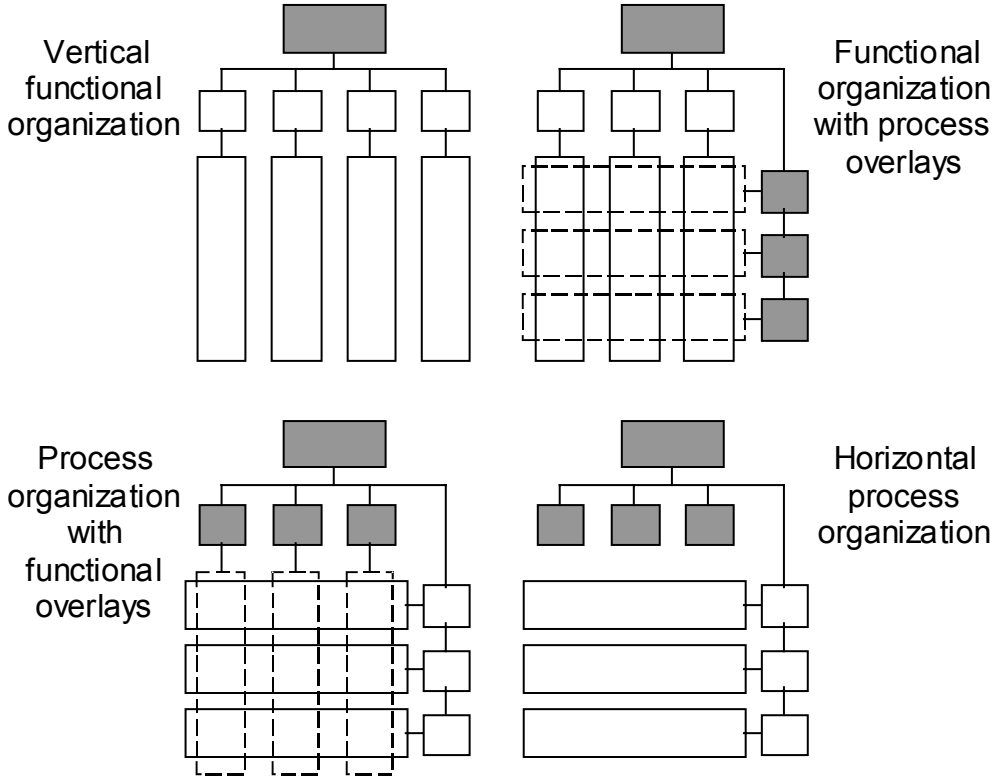


Figure 3.5: Process versus function (Inspired by Stalk & Black, 1994). The grey-marked figures represent the more passive participants in the organization.

Loinder and Rentzhog (1994) imply that if the organization is completely process organized, functional groups should be formed to develop their special competencies.

Harrington (1991) shows examples of the values at two extremes, regarding functional versus process oriented companies. Most companies do not, however, fit in to any of the categories, but lie somewhere in between (see Table 3.1).

Table 3.1: Examples of two extremes (Harrington, 1991).

Focusing on the vertical structure	Focusing on processes
The employees are the problem	The process is the problem
Employed to perform	Coworkers with social needs
Do their work	Help getting things done
Understand their work	Understand how my work fits into the process
Manage individuals	Manage the process
Change the employees	Change processes
There is always a better individual	The process can always be improved
Motivate employees	Break barriers
Manage employees	Develop people
Do not trust anyone	Cooperate towards common goals
Who did something wrong?	What allowed the error to occur
Correct errors	Decrease variation
Short-term economical revenue controls the decision making	Customer focus

3.5 Process Management

Process Management is a systematic method for organizing, managing, and continuously improving the company's processes. Process Management is about managing and looking at the organization as a system of cross-functional processes instead of vertical functions (Egnell, 1994).

The role of Process Management in relation to TQM is according to Melan (1993) that it is a method that provides and integrated, unified approach towards TQM, and provides a sharp focus on the manner in which a business is conducted.

Process Management is said to have been invented by IBM. They look at improvement as a house where management commitment is the foundation, and Process Management is the framework that supports the house and gives it strength (Harrington, 1988).

To succeed with the implementation of Process Management, consideration has to be given to both the culture and the structure within the company. Organizational culture includes values, conduct, and attitudes, while structure refers to systems, regulations, and routines created to manage and facilitate business. Adaptation of the structural parts and a cultural change have to be done simultaneously, otherwise a counter effect can develop which makes the implementation more difficult (Rentzhog, 1998).

Fors and Lundberg (2000) reached some crucial conclusions on what cultural and structural conditions facilitates Process Management:

Cultural

- Management has to be committed
- The purpose of working with processes and Process Management has to be communicated to every employee
- Measurements have to achieve a new role and a new meaning to the employees
- There has to be a general awareness of the visions and goals of the organization

Structural

- Someone has to feel responsible for driving the development within the area
- The processes have to be mapped
- The Process Management structure has to be implemented
- There has to be resources available for improvement work
- There has to be routines and methods to analyze measurement results

It is important to remember that Process Management is not only about process improvement, but also about customer focused management of the organization (Loinder & Rentzhog, 1994). Process Management work is often concentrated on only one of these two aspects, which is not optimal.

For Process Management to work, certain roles must be appointed. Which roles, and how they are defined, tend to differ from one author to another. The roles presented here are based on the system used by VBC, being the thesis customer (Glossary [On-line]).

Process Owner

The process owner is appointed by management, and has the competency to lead and develop the process. This also has to be complemented by an extensive knowledge about the process in question. The process owner is also in charge of the process improvement team for the process he owns. The responsibilities of the process owner are to:

- Define and communicate improvement goals
- Define measurement points
- Assure continuity in the improvement work
- Get process team members committed
- Cooperate with functional managers
- Report continuously to the steering committee

Expert Team / Facilitators
The Expert Team is a group consisting of people with an extensive knowledge of Process Management. They are supposed to train and support the process improvement teams, and help them to get started providing advice and further education. During Process Management meetings and seminars, they function as facilitators. The process owners should be able to consult the Expert Team on any question related to Process Management.

Sponsors
There is one sponsor for each of the main processes, often from management or middle-management. The responsibilities of a sponsor are to support the Process Management work, share ideas, give advice, and break down barriers.

Steering Committee/Change Group
The steering committee shall lead, coordinate, inform and steer the process improvement teams. They also have to resolve conflicts that may develop between the process organization and the functional organization. The steering committee should consist of people from top management, since the group has an extensive decisive power (Harrington, 1991).

Process Team
The team should consist of a chosen group of associates who have a thorough knowledge of the process and work well together as a group. Their task is to develop the process and find improvement areas. If the process involves more than one function, the team should be cross-functional to contain know-how covering the whole process. This team should function as a link between the functions and the process.

Improvement Team/OD Team
When the process team identifies an improvement area, it is delegated to the improvement team to find a way to implement the improvement, and then present this to the process team. The improvement team is in that sense an operative problem-solving team.

3.6 Measurements

Traditionally, measurements are identified according to the functional hierarchy, and performed in the different departments in the organization. This can lead to sub-optimization because it concentrates on improving an individual department, risking that it might be devastating for the organization as a whole. Process Management decreases the risks for sub-optimization, but gives rise to

a need for measures that can be used to evaluate, develop, and improve the processes from a holistic perspective (Fors & Lundberg, 2000).

Measurements are the starting point for improvements, since they create an understanding of the current situation, and help setting goals that states the desired development for the process (Harrington & Harrington, 1995).

Many measures should strictly be seen as summaries of numerous measurements. An example is when customer satisfaction is measured by attitude surveys from many respondents compiled to one single measure (Olve et al, 1997).

3.6.1 Why Measure?

Measurements are discussed in a lot of different contexts, but the dimensions that are usually mentioned when talking about what can be obtained by measurements are (Sinclair & Zairi, 1995a; Forsberg, 1998; Hronec, 1993):

- *Planning, control, and evaluation*
  Measurements help plan and control the organization's activities. Evaluation refers to when measurements are analyzed and used as facts for justifying decisions.

- *Managing change*
  Performance measures can be used to confirm management decisions and initiatives.

- *Communication*
  Facts seem objective and understandable when based on measurements. Information can often be vague, but when said in numbers it is easier to grasp. Also, if people do not use the same definitions, follow the same rules, or have the same boundaries, they can not communicate effectively.

- *Improvement*
  Improvement might be the most important reason for performing measurements in an organization. Measurements are necessary because they enable improvement, since they point out in which direction the organization should be heading to perform better.

- *Resource allocation*
  Measurement helps an organization direct its resources to the most attractive

improvement activities, since it shows where the biggest improvement possibilities are to be found.

- *Motivation*
  Measurements helps setting proper goals in the processes, and goal-setting and motivation are closely related. To be motivating, a goal should be specific, have a time limit, and be challenging but achievable. Another issue relating to motivation is MBO versus Policy Deployment, discussed in Chapter 3.11.

- *Long-term focus*
  Managers are often criticized for focusing on short-term revenues. If set appropriately, performance measures can ensure that managers adopt a long-term perspective.

- *Sensemaking*
  By visualizing improvements by using measurements, the employees can make sense of why they have to perform improvement activities. There is also a clear connection between sensemaking and the "why-reasoning" that Operational Development speaks of (see Chapter 4.5).

- *Learning*
  The relation between measurement and learning can for example be seen in the PDCA-cycle (see Chapter 3.2). If measurements were not used in the Check-phase, the learning in the Act-phase would be non-existent.

Measurements should create employee commitment, and they are to be directed at what is important, like customer satisfaction and quality. The way the results from the measurements are presented should be a support for internal decision making (Jirby, 1992).

A few rules of thumb to accomplish this are (ibid):
- Measure the important things
- Make it simple
- Make it visible
- Ensure participation
- Make sure to give and receive quick feedback
- Strive for common problem solving
- Simplify and modernize the ways of presentation
- Implement and follow-up

- Do not loose the holistic perspective

3.6.2 Performance Measurement and Measures

Performance measurement can be defined as "the process of determining how successful organizations or individuals have been in attaining their objectives" (Evangelidis, in Sinclair & Zairi, 1995c).

Hronec (1993) chooses to define performance measures as the vital signs of the organization, which quantify how well the activities within a process or the outputs of a process achieve a specified goal. Performance measures are often called Key Performance Indicators, or KPI:s (see Chapter 3.8).

Performance measures have to reflect the following (Zairi, 1992):

- The value of time
- Emphasis on continuous improvement
- A quality drive
- Total people productivity

The points above can easily be put in relation to the measurement factors time, cost, and quality chosen by VBC.

Ljungberg (1997) places a great emphasis on the demands placed on a process, since he thinks that these demands are the basis for the measures which are sought. The total demand scheme is complex, as it consists of demands originating from the next process, the final customer, and the strategies and goals of the organization. The demands can be placed on the incoming object, the process, or the outgoing object. Demands on incoming objects should be transferred to the outgoing object of the preceding process, if possible. This to try to avoid control on incoming goods.

3.6.3 Performance Measurement Systems

A measurement system is a necessity for all companies to be able to evaluate their performance. Besides a number of measures, a system contains routines for how to perform the measurements, how to interpret the data, and how the result should be communicated (Fors & Lundberg, 2000). Rummler and Brache (1995) also emphasize the importance of having a total measurement system, not a collection of unrelated and potentially counterproductive measures.

Some general requirements on a performance measurement system can look as follows (Egnell, 2001):
The system shall

- collect current values of pre-defined indicators
- compare current values to historical and calculate trend
- compare current values to goal values
- present the results for each indicator
- distribute the results to all concerned
- make results available to those authorized
- analyze the cause/effect dependencies between different indicators

When companies started to focus more on processes, the measurement systems changed. Lynch and Cross (1995) summarizes the differences between old and new measurement systems in Table 3.2.

Table 3.2: Differences between old and new measurement systems (Lynch & Cross, 1995).

Traditional systems	New systems
Financial focus	Process focus
Local optimization	Global optimization
Fragmenting	Integrating
Incites on an individual level	Incites on a team level

A few examples of current theories in performance measurement are mentioned in Sinclair & Zairi (1995a). The BSC was developed for strategic performance measurement in four different areas; financial, customer, internal business, and innovation and learning. BSC has certainly found its market, but does not in itself provide a complete performance measurement system. It is more of a tool for senior managers to monitor performance against strategic and operational goals. A second model for performance measurement is the so-called performance pyramid, developed in the 1980s. It shows a hierarchy of measures from strategic to operational levels, and allows managers to focus on areas of high leverage. Lynch and Cross (1995) illustration of the performance pyramid can be seen in Figure 3.6. This model also shows how strategic goals should be interpreted from the top and down, while measures should be translated from the operational level and up.

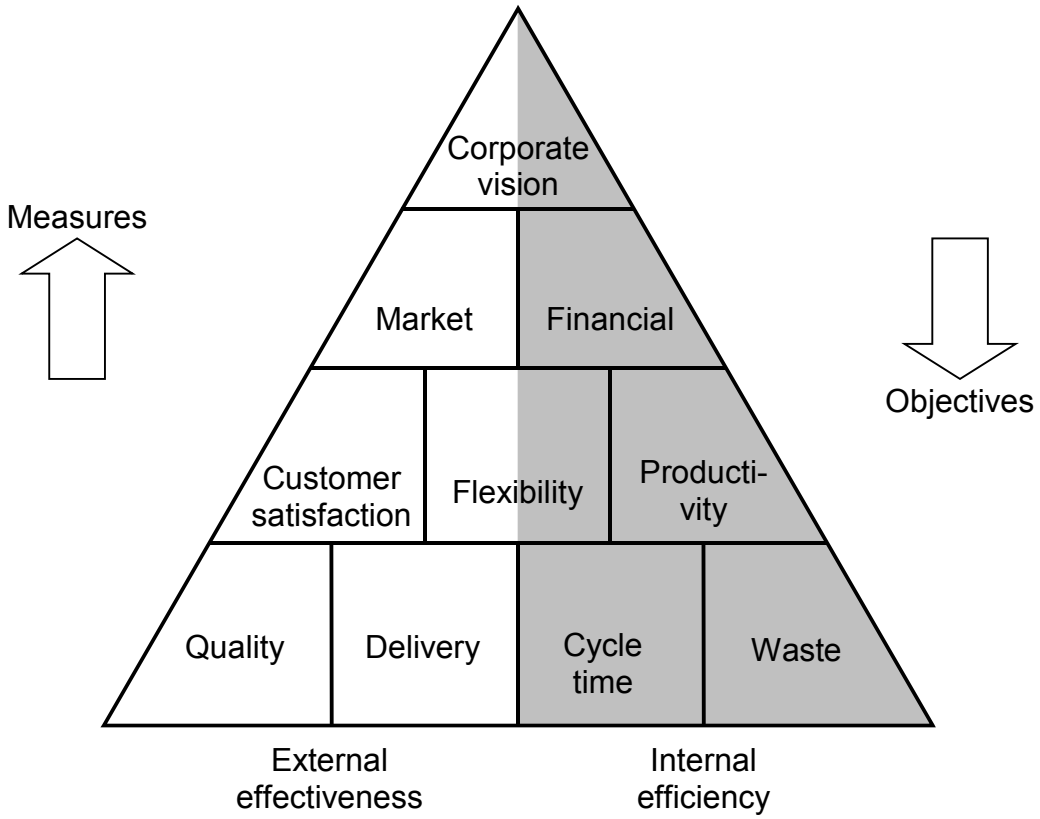


Figure 3.6: The performance pyramid (Free interpretation of Lynch & Cross, 1995).

The model was developed based on three general premises (ibid):

- Activities and strategic goals are linked by cascading the goals down to every part of the organization
- Financial and non-financial information are integrated by using key factors such as quality and time along with cost
- All business activities are focused on customer needs by communicating modified customer requirements backwards in the organization

These premises show the way the performance pyramid is closely connected to Policy Deployment, BSC, and Process Management. Because of this, the performance pyramid might be interesting for VBC in a long-term perspective.

The measurement system must be adjusted with regard to the human component. A few checkpoints are often mentioned in relation to this, which say that a measurement system should be (Forsberg, 1998):

- Understood by all people measured
- Accepted by the individuals concerned
- Compatible with the reward and recognition system
- Designed to offer minimal opportunity for manipulation

In their case study, Sinclair and Zairi (1995b) found a number of facilitators and inhibitors to the development of an effective performance measurement system. Some of these factors can be seen in Figure 3.7.

Facilitators	Inhibitors
• Identify "vital few" measures • Top management commitment • Develop and communicate clear mission/vision • Understand importance of measurements • Use data in continuous improvement	• Blame culture (measurement is used as a stick with which to beat poor performers) • Time/resource constraintsj • Not understanding importance of measurements • Lack of to management commitment • Inherited systems (inertia)

Figure 3.7: Facilitators and inhibitors to the development of an effective performance measurement system (Sinclair & Zairi, 1995b).

3.7 Measuring a Process

To be able to manage and improve processes, it is necessary to perform some kind of measurements.

"If you cannot measure it, you cannot control it. If you cannot control it, you cannot manage it. If you cannot manage it, you cannot improve it."

Harrington (1991)

The opinions of what should be measured and controlled to ensure continuous improvement in a process tend to differ, but according to Melan (1993) and Harrington (1991) the focus should be on three key measures:

- Quality
- Efficiency
- Adaptability

Egnell (2001) presents a model for how measurements in processes can be structured. The model is shown in Figure 3.8.

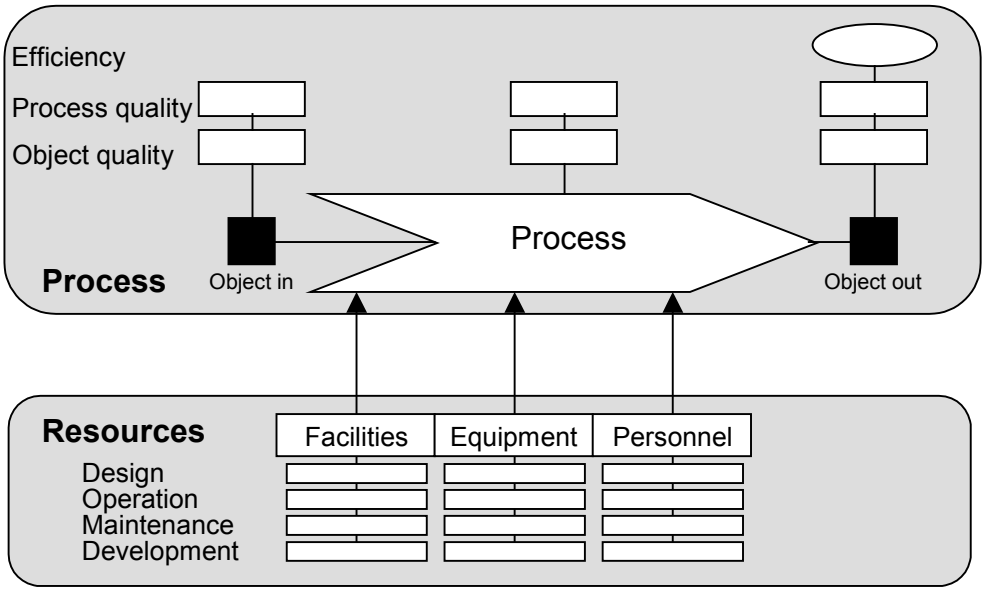


Figure 3.8: Model for measurements in processes (Egnell, 2001).

The importance of identifying proper measurement points in a process is stressed by King and Dickinson (1996) who argue that without timely and informative measures, it is very difficult to control processes, predict outcome, or plan improvements to existing processes meaningfully.

On the issue why to measure processes, Egnell (2001) mentions several reasons:

- To know the performance of the process
- To focus the improvement work on the right issues
- To compare with overall goals and process goals and see deviations
- To see trends
- To motivate staff for improvement work
- To eliminate non-value added activities

Most of these reasons have been discussed, or will be discussed, in this thesis.

Some general advice to keep in mind when designing and implementing a performance measurement system is presented by Zairi (1992):

- *Measure the right things*
  What needs to be measured is what the customer perceives as important, since customer satisfaction should be the primary goal.

- *Relate process performance to customer needs (internal and external)*
  The voice of the process should reflect the voice of the customer. There are many quality techniques that can accomplish this, like for example Quality Function Deployment (QFD), presented in Bergman and Klefsjö (1995).
- *Determine appropriate measures for different parts of the organization*
  The different parts of the organization needs to measure different things to be able to optimize their performance.
- *Value of measure needs to be compared with cost of producing it*
  Measures have to reflect high leverage points, a cost/benefit analysis can preferably be performed to determine which measures to use.
- *All critical parts of the process must be measured*
  This requires an understanding of the process, creating the ability to determine which parts are critical. Management and control of the process is easier when measuring critical parts.
- *Start with simple measures and progressively use better ones*
  Measurements are easier to accept if the initial efforts are not too ambitious.
- *Distinguish between measures for different purposes*
  Different kinds of employees measure different things. For example, management is more interested in performance management, while workers want measurements considering improvements.
- *Is the measured phenomenon important?*
  The link between the process and measurement has to be strong to know that the right things are being measured. Process mapping can be of great help for achieving this.
- *Do the measurements cover the full scope of operations?*
  It is important that the measurement system reflects the entire company, not focusing only on some aspects of the business.
- *Is the measure accurate?*
  Are the measurements reliable, conducted and calculated in a proper way? This is very important since measurements are intended to lead to action.
- *Are the measurements timely?*
  The measurements have to reflect the present so that decision about the future can be made based on facts.

Olve et al (1997) also emphasizes that the measurements should be conducted evenly all over the organization. One or more of the main processes often tend to become dominant on measurements. It is important that the measures relate to each other, to make it easier to optimize from a holistic perspective.

In connection to Process Management, empirical findings stress the importance of initiating measurements in the process in an early stage of the improvement work (Egnell, 1994).

An inadequate conception of the process functions limits the value of the measurement system very much, and that makes the importance of Process Management even greater (Ljungberg, 1997).

A note should be made to remember to distinguish between assessment measurements and performance measurements. Assessment measurements are used to state how far developed the organization is in a certain issue, for example Process Management at VBC. The process development measurement scale at VBC is called the Volvo Process Implementation Scale (VPIS), and can be seen in Appendix 3. Performance measurements for continuous improvements are of the kind that takes the temperature of the processes, in the day-to-day work.

Olve, Roy & Wetter (1997) talks about measures with a process focus in their book about BSCs. They mention:

- productivity, measured as a quantity in relation to work hours or cost
- quality, measured as the share of acceptable products or customer's opinion
- technical level in relation to the most modern methods
- penetration, how many of the intended users really use the process
- capacity utilization
- delivery time, share of products delivered on time
- queues and waiting times
- share of resources or work hours dedicated to the process

According to Olve et al (1997), these measures should describe the process and its performance, and makes it possible to decide if the process:

- has improved
- is of a generally high standard (enables benchmarking)
- has achieved its goals

3.7.1 Output and Process Measures

A way of sub-dividing performance measures is in object and process measures. To separate the two, Hronec (1993) says that process measures drive a company to improvement, while output measures keep score.

Process performance measures monitor the activities of a process and motivate people within the process. Output performance measures are closely connected

to the result of the process, and report it to management. These measurements are used to control resources, and can be financial or non-financial (Hronec, 1993).

Further, output measurements are often directed towards management, not customers. They are measured "too late" since they are performed when something has already occurred (ibid).

For a process measure to be effective, the people in the process must be able to influence and control the measure. If this demand is fulfilled, process performance measures accomplish five things (ibid):

- Monitor progress
- Anticipate and prevent problems
- Continuously improve the process
- Verify that the right activities are measured
- Motivate people

Hronec (1993) also emphasizes the importance of process performance measures focusing on improvement, not on criticizing people.

Both process and output measures are important to make the performance measurement system optimal.

3.8 Key Factors

The following definitions of Critical Success Indicators (CSI:s) and Key Performance Indicators (KPI:s) by Rockhart tries to summarize what they are and how they relate to each other (Sinclair & Zairi, 1995c).

- CSI:s – the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization.

- KPI:s – the actual measures used to quantitatively assess performance against the critical success factors

Sinclair and Zairi (1995b) found, through their case study, that company KPI:s generally included the following measures:

- Customer satisfaction
- Quality
- Delivery
- Employee factors (such as development and/or satisfaction)
- Productivity

- Financial performance
- Safety
- Environmental/social performance

A possibility that should be considered is to weigh the KPI:s according to performance with the intention to get a fair picture of which factors that influence customer satisfaction the most (ibid).

The model by Sinclair and Zairi (1995c) describes the identifying of key factors in three steps. First, a public mission statement should be developed for the organization. Based on this, the factors critical to the success of achieving the stated mission is identified, being the CSI:s. For each CSI, performance measures, KPI:s, are defined. At least on KPI for each CSI. The KPI definitions should include:

- Title of KPI
- Data used in calculation of KPI
- Method of calculation of KPI
- Sources of data used in calculation
- Proposed measurement frequency
- Responsibility for the measurement process

The model then continues with goal-setting, action plans et cetera. For a complete presentation of the model, see Sinclair and Zairi (1995c).

3.9 Time, Cost, and Quality

The three parameters time, cost, and quality has been chosen by VBC to be what measurements should arise from. Many different authors promote these factors, since they are of a character that all organizations must consider.

Willoch (1994) implies that cost is a factor that is easy to measure, but since cost-adding activities that are part of the horizontal flow often do not get measured, the measurement can be misleading. To prevent this, Willoch recommends using the technique of Activity Based Costing (ABC). This method considers the cost trigged by each activity, instead of focusing on the vertical costs. For further information about ABC, the author recommends the book by Nilsson (1993).

All quality parameters are totally dependent on the customer perspective. Every customer is different and has different standards, why segmenting and differentiation are key words when trying to measure quality aspects (Willoch, 1994).

Time is a very familiar concept, which facilitates its use as a measurement category. An hour is an hour everywhere in the world. Everyone measures time in their day-to-day life, why measuring time units is nothing new. Furthermore, empirical findings prove that focusing on time in a process almost automatically brings improvements in the other two dimensions [referring to quality and cost] too (ibid).

Rise and Wiklund (1992) mean that the factors that should be measured in a process are time, quality, and productivity. This is almost equal to time, cost, and quality, since productivity is often defined as production related to resources used, which is a kind of cost-measure. Rise and Wiklund further suggests that quality is the most important measure, and therefore always has to be measured. To merely measure cost and time is dangerous, when that implies great risk of the improvement work not being customer focused.

Egnell (2001) presents a matrix that shows different suggestions for measurement considering time, cost, and quality (see Figure 3.9).

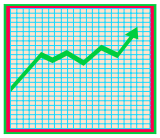
	INTERNAL	EXTERNAL
TIME 	Lead time	Delivery time
COST 	Cost of capital	End price
QUALITY 	Revisions	Complaints

Figure 3.9: Parameter matrix (free interpretation from Egnell, 2001).

In the theories regarding BSC, time, cost, and quality are important factors for identifying measurements within the customer perspective. This is of course influencing the types of measurements that are chosen, for example it is not

good for the product to be delivered as quick as possible, but rather when the customer expects it (Kaplan & Norton, 1999).

Hronec (1993) defines the three categories of performance measures in everyday terms:

- Quality quantifies the "goodness" of a product or service
- Time quantifies the "goodness" of a process
- Cost quantifies the economics of "goodness"

For each category, the recipient defines "goodness"; customers for quality, management for time, and stakeholders for cost. The relation between the measures can be visualized as follows:

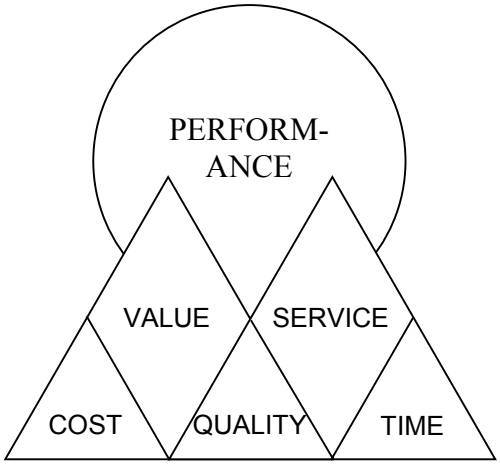


Figure 3.10: Relationships between measures (Free interpretation from Hronec, 1993).

When customers receive a high-quality product to a reasonable cost, they are receiving high value for their money. In the same way, if customers receive a high-quality product very quickly, they believe that they are receiving a high level of service.

A company's output measures should measure time, cost, and quality because they have to manage the expectations of the customer (quality), the demands on their processes (time), and the economics of the organization (cost). All of this has to be done simultaneously to achieve optimal results. Regarding process measures, all the three factors time, cost, and quality are of course measured. It feels more natural to measure all three in a process, while cost is often the sole measure on the output (Hronec, 1993).

3.10 Management by Objectives

Management by Objectives (MBO) is in short a way to combine management responsibility for satisfying the customer, with giving the employees a bigger freedom in their work. It is about less management through detail decisions and more management through clear objectives (Svensson, 1997).

MBO involves (ibid):

- to specify goals for the organization and its parts
- to do follow-ups on goal achievement
- for management to specify *what* is to be done, while the employees decides on *how* it is going to be done

MBO is often focused on revenues and people's performance (Bergman & Klefsjö, 1995), which means that the MBO theory does not fully cover the needs in this project. To get the focus directed more at processes and customer satisfaction, it is preferable to supplement the theory with Policy Deployment. This breaks down the objectives to more specific goals for each process by an intensive dialogue between different levels in the organization (Rentzhog, 1998). If combined, managing processes by objectives and Policy Deployment can be of great support for the Process Management work.

3.11 Policy Deployment

Policy Deployment is based on an organization's strategic goals being concretized and broken down to sub-goals that are easy to measure and understand for employees at all levels of the organization. This has been proved to be a very successful way to drive and focus on the improvement work (Rentzhog, 1998). Policy Deployment is an interactive way of working, which is sometimes resembled with "playing catch", since the preliminary goals are "bounced" back and forth before being finalized (Bergman & Klefsjö, 1995).

Since Policy Deployment focuses on customer oriented goals, it is almost a requirement that the organization, in which it is to be used, is process orientated (Rentzhog, 1998). Even if process orientation involves thinking horizontal, this does not mean that the vertical management in the organization is unnecessary. The two different approaches create improvement goals that can support each other. Rise and Wiklund (1992) implies that the improvement work in an organization should be vertical, horizontal, and local, where management communicates the vertical goals, Process Management is responsible for horizontal (customer focused) goals, and improvement teams decide on the local goals. This can be visualized as follows (Loinder & Rentzhog, 1994):

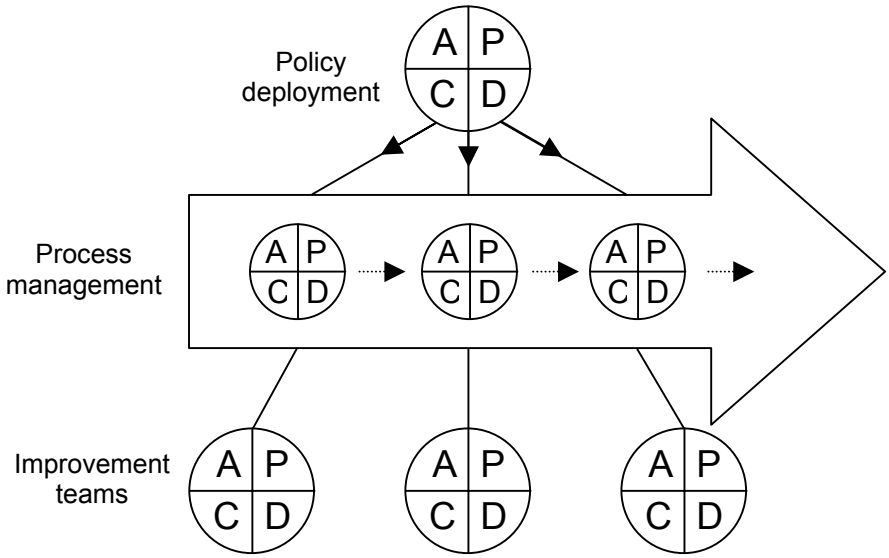


Figure 3.11: Three different approaches on improvement work in an organization. Free interpretation of Rise and Wiklund (1992).

The biggest difference between MBO and Policy Deployment is that MBO concentrates on results, where Policy Deployment also focuses on *how* the goals are to be reached by making action plans. A few more differences between MBO and Policy Deployment are shown in Table 3.3.

Table 3.3: Differences between MBO and Policy Deployment. (Bergman & Klefsjö, 1995).

Management by Objectives	Policy deployment
Focus on people	Focus on processes
Focus on revenue	Focus on customer satisfaction
Top-down management	Two-way communication
Focus on "who?"	Focus on "how?"
Work harder	Work smarter
Find scapegoats	Find improvement areas

There are several similarities between Policy Deployment and Operational Development, which is an organizational approach used by VBC that is further discussed in Chapter 4.5. Both are about communicating the strategic goals to every employee in the organization. Operational Development can in short be called an application of Policy Deployment.

3.12 Goal-setting

It can be hard to set appropriate goals for different measures, but a very usable rule is stated by for example Rampersad (2001). It says that a goal has to be

SMART, meaning Specific, Measurable, Achievable, Realistic, and Time-specific.

When trying to quantify goals there are some things that should be kept in mind (Harrington & Harrington, 1995):

- They should be formulated in terms of what is to be accomplished
- They should have specific deadlines so that measures can be time-referenced
- They should be forcefully formulated
- They should be communicated to all personnel through various media
- They should clearly express the key opportunities which all personnel can relate to
- They should be expressed in understandable and meaningful terms

There are some general guidelines and methods for goal-setting that tries to simplify the task. One technique is called "Half-life", and is used to make the goals realistic. Half-life works as a rule that says that the theoretical minimum of the thing being measured is half the current value. Therefore, the goal can as furthest be set at half the current value. This method only works on measures being minimized, such as deviations, costs, time et cetera, but functions well for keeping the goals from being set too high. There is also a measure called half-life, measuring the time it takes for half the thing being measured to disappear/be eliminated (Hronec, 1993).

3.13 Benchmarking

Benchmarking can be explained as "the search for industry best practices that lead to superior performance" (Camp, 1989). SIQ, the Swedish Institute for Quality, defines it as a method to systematically learn from good role models regardless of industry, and thereby gain knowledge to improve the own organization (SIQ – Benchmarking [On-line]).

Many advantages can be gained by benchmarking. SIQ talks about four main advantages (ibid):

- Enables a comparison with, and a learning from, organizations in other industries
- Creates participation and learning in the organization
- Contributes to offensive and realistic goal-setting
- Gives knowledge of how to reach those goals

There are different kinds of benchmarking, depending on who you compare yourself with. Hollings (1992) mentions four kinds of benchmarking, see Figure 3.12.

Internal benchmarking	Comparing a process with the same process in another place, other department, or another company within the company group
Benchmarking on competitors	Comparing a process with an equivalent process at a competitive company
Functional benchmarking	Process comparison at an organization, recognized for its good practices, which operates within a similar area or performs similar activities
General benchmarking	Process comparison with the best organization regardless of operational area

Figure 3.12: Different kinds of benchmarking (Hollings, 1992).

It does not work just to copy good routines, and then apply them. An extensive analysis has to be performed on the organization, and knowledge of how to covert techniques, procedures, and process solutions to the organization. A prerequisite for this to work is a well developed process thinking, since benchmarking means comparing processes, not products (Bergman & Klefsjö, 1995).

The benchmarking process can be divided into six steps: Plan-Search-Observe-Analyze-Adapt-Improve (Watson, 1992). This method is closely related to the PDCA-cycle described in Chapter 3.2.
A more detailed description of the different steps can look as follows:

- Plan – Understanding the process and measure important factors
- Search – Find a suitable organization to compare with
- Observe – Study the process ability at the other company and analyze gaps
- Analyze – Decide on causes for the differences in the processes
- Adapt – Choose the best action and modify to the environment
- Improve – Implement the action and measure the modified process

During the observe phase, a questionnaire can be of good use to be prepared for an actual visit to the benchmarking company. These questions have to be relevant, understandable, and asked in a logical sequence. It should also be possible to answer the whole questionnaire in a reasonable amount of time (Watson, 1992).

An important method for information gathering when doing a benchmarking, is to personally visit the company and meet with their representatives, but benchmarking can also be done through examining published reports, talking to customers, or analyzing products (Sandholm, 1995).

4 Company Description

This chapter gives an overarching view of Volvo Bus Corporation, its history and organization. Some company specific methods and approaches relevant to the thesis are also presented.

4.1 History

VBC is the world's second-largest manufacturer of heavy buses and coaches. The range comprises complete vehicles, chassis and bus bodies. Volvo also offers transport system solutions for metropolitan traffic, leasing, financing and service contract maintenance (Corporate Information, [On-line]).

It all started in 1924, when Assar Gabrielsson and Gustaf Larson decided over a dish of crayfish, that they would start up car manufacturing in Sweden. Said and done, 1927 series production of cars was initiated. A year later, the production was expanded to include trucks, and before the end of 1928, buses were made by assembling bus bodies on truck chassis. However, the executive director of the company at the time decided that Volvo would not manufacture complete buses, only bus chassis. This decision was made in order to enable a higher degree of customization. In the year of 1934 the first bus chassis were manufactured in the Gothenburg plant. This did not mean that they stopped building buses on truck chassis, actually – it is still done today on some models (Olsson, 2001).

The 1950s were a successful time for the Volvo Bus Division. It started out with the mid-engine chassis called "the pancake", and then, in 1955, Volvo pioneered the use of turbo charged coach engines. During an expansive phase in the 1960s, the bus division contributed vitally to the success of AB Volvo. In 1968, AB Volvo Buss was established, still subordinate to AB Volvo. After this, a remarkable international growth began. Buses were still manufactured in the shadow of trucks, and it remained so until 1977, when the Borås factory was built (ibid).

Starting after the Borås establishment, Volvo Buss went back to building complete buses. In the year of 1981, they acquired the company Höglunds in Säffle, which is now called Säffle Karosseri AB. Soon after this, in 1983, VBC was founded, as a true subsidiary to Volvo Group. It was still closely tied to Volvo Trucks though, VBC did not have their own place in the Volvo Group board until 1995 (ibid).

In parallel to all this, further acquisitions were made, and VBC is today a global company, as can be seen in Figure 4.1.

Figure 4.1: A map over production facilities used by Volvo Bus Corporation. (Source: Internal presentation material.)

4.2 Organization

As mentioned earlier, VBC is a part of the Volvo Group. The Volvo Group also contains Global Trucks, Construction Equipment, Marine & Industrial Power Systems, Aero, and Financial Services. An organizational chart can be seen in Appendix 4:1.

VBC consists of different business regions covering the different continents. It has two main functions, Global Product & Industrial Development (PID) and Global Purchasing. The area investigated by this thesis is mainly within PID. A VBC organizational chart is enclosed in Appendix 4:2.

There are many different departments within PID, and since the processes investigated runs through most of these departments, they are affected by this thesis. Appendix 4:3 contains an organizational chart over PID.

4.3 The Volvo Way

The Volvo Way (1999) is a summarizing document that states the values, corporate culture, and the basic principles that Volvo Group lives by. It also contains Volvo's vision, mission, and short-term goals.

The Volvo Group has three core values, quality, safety, and care for the environment. These values are timeless and should be integral elements for the organization, the products, and the manner in which the employees work (Core Values [On-line].

Regarding the corporate culture, the CEO Leif Johansson has adopted three words that he thinks should permeate the general attitude at Volvo. These are energy, passion, and respect for the individual. According to Mr. Johansson, this will lead to goals being reached more rapidly, in a manner that conforms to Volvo's values (Johansson, 1999).

4.4 Global Development Process (GDP)

The Global Development Process, better known as the GDP, is a way of describing the activities required to change or create a new product. This is a well-described process that consists of a number of phases and gates. All projects run through this process, and the GDP is thereby to consider as a standardized operation procedure (GDP Guide, 2000). The different parts of the GDP are showed in Figure 4.2. The relevance of this process to the thesis will be seen in reference to the request process (see Chapter 5.2.1).

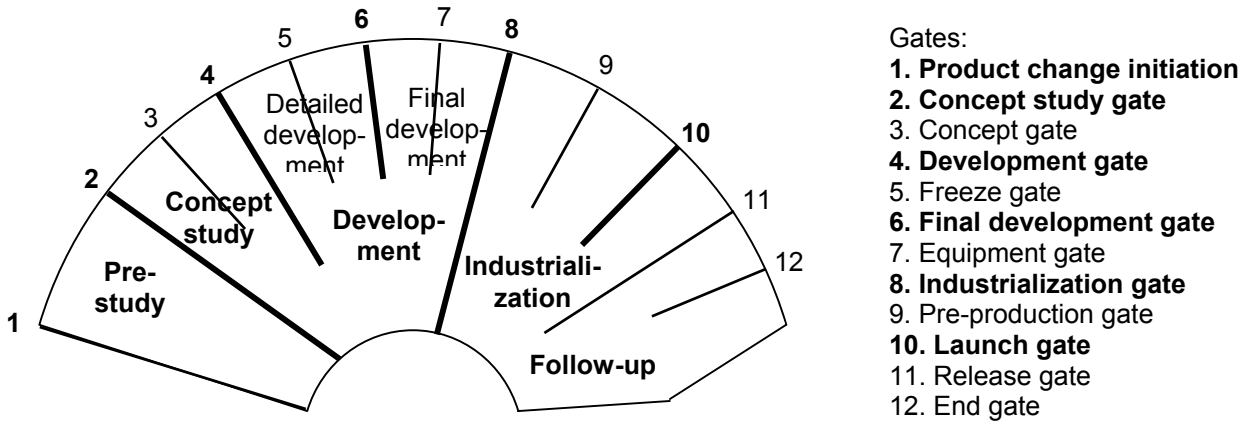


Figure 4.2: The GDP (Source: Internal material).

For a more detailed description of the phases and gates in GDP, see Appendix 5.

4.5 Operational Development – the Power of Why

Operational Development (OD) is Volvo's secret weapon for engaging everyone in the organization in the company's strategic challenges (Bacon, 2000a). By communicating the main goals of VBC, and demanding action, managers on every level has to analyze in which way their department can contribute to the achievement of these goals.

In practice, this is done by creating a why-reasoning basically supposed to express why the department exists, and in which way they contribute to fulfilling the overarching goals. The resulting document will contain strategies, threats and opportunities, and the main focus of the department. This is communicated to the OD teams, which can be either cross-functional or functional in its structure, and an action plan is created to stipulate what will be done by the OD team to reach the goals (Sanderson, 2001).

The procedure for working with OD contains a number of major steps (Bacon, 2000b). It starts out with getting the top management commitment. After that, the strategic focus is to be created. This is the most important step, since it has to be something every employee can relate to, and it also has to be measurable and understandable. The strategic focus shall be the most important issues for the company/department/group in the coming 6-18 months. The OD-teams then meet once every other week, discussing strategic issues, goals and result follow-ups. The group action plan is reviewed and revised and new activities are planned. "What has happened in our environment, internal and external, that will affect us?" Every six months, there is a review seminar with all OD groups, where they report their results and experiences from the past six months. Sometimes, these seminars can initiate a major shift in strategic focus, which influences the groups' work in radical way. This idea of having everything out in the public is important in OD (Bacon, 2000b).

A way of summarizing OD is that it is a process of strategic reasoning with the employees about what is happening in the world, in the industry, amongst the competitors and customers, and why these things are important. It is a matter of making the company's position and future a personal matter for each individual.

4.6 Process Management at Volvo Bus Corporation

The Process Management mission for the entire Volvo Group reads (Process Management Mission, [On-line]):

"The corporate capability to change and to be competitive require main business processes of world class. The main processes deliver primary values to the final customer.

The generic main processes are;
- *Product Development (PD)*
- *Sales to Order (StO)*
- *Order to Delivery (OtD)*
- *Delivery to Repurchase (DtR)*

Continuous development of these processes is a basic requirement to keep up with competition and to reach a leading position.
Volvo shall be a process-oriented company and manage its processes."

Process Management and Operational Development is supposed to work closely linked to each other. They complement each other, since Process Management provides the horizontal integration by its holistic operational view, while OD secures vertical integration by communicating the organizational goals through the entire organization. Management needs input from the Process Management work to be able to set appropriate goals with a clear process focus. OD is then used to communicate these goals, which are later going to be used in process measurement. It is therefore a mutual dependency, and the strategies are also of mutual assistance to each other.

5 Empirical Work

This chapter describes the practical work, what went according to plan and what turned out different. The empirical work is divided into interviews, process studies, benchmarking, and practical testing.

5.1 Interviews

To get a better view of the different conceptions of Process Management within VBC, personal interviews were conducted. A number of employees were selected, on recommendations from the thesis supervisor at VBC, to get an overarching picture covering all different main processes and functions. A standardized questionnaire was used to make the interviews structured, and the questions were of an open kind, which means that no answer alternatives were given. The questions were mainly about definitions within Process Management, but did also regard the previous attempt to implement Process Management in the organization. The purpose of asking about that was to find out what went wrong, so that the same mistakes would not be made again. The interview questionnaire is shown in Appendix 6:1.

Nine interviews were made, during the course of two weeks. They covered different departments, as well as different job positions. The outcome of these interviews is presented in detail in Appendix 6:2, which is a direct rendering of the respondent's answers. An analysis of the interview material is then made in Chapter 6.1.

5.2 Process Studies

5.2.1 The Request Process

The request process had relatively good prerequisites for being chosen as one of the pilots. A consultation agency has done an extensive mapping of the process, and different tools facilitating the tasks included in the process have been developed.

The request process is in big parts based on the GDP-procedure (see Chapter 4.4), since the process contains some of its gates. An understanding of GDP is therefore of major importance. This way of incorporating GDP and Process Management is quite good, as the methods are suitable for linking together.

There are fortnightly process meeting held for the request process, which are functioning satisfactory. They are still in crucial need for a Process

Management facilitator to be present, but there is no lack of motivation in the team.

The purpose of the request process is to deliver new products paid by the maintenance budget. This means market adaptations, cost reductions, weight reductions et cetera, collectively called Product Modification Requests (PMR:s). The definitions within the process has been defined and documented. The process starts when a need for a product change is identified. The initial input is a submitted E-form with a Product Modification Request, that has been trigged by market requirements, the product plan, the VBC Businessplan, or technical development. The different product lines in VBC supply this input.

The main activities in the process are then:

- Prestudy
  The requests are investigated, and a selection is made of what request should be further examined
- Concept study
  Requirements such as resources, material et cetera, are stated and a project description is created
- Development
  Preparations for an initial production start are made, and tests are conducted
- Industrialization
  Production is prepared for series production of the modified product, quality is checked, and instructions updated
- Follow-up
  Series production is started, and the modification launch project is evaluated

The process map for the request process is attached in Appendix 7.

The end of this process is when production and market is prepared to sell, produce, and maintain the new product. The output that is to be delivered from the process is modified features, product documentation, ISA (Initial Sample Approval) components, prepared production, and product ready for market. The customers for this output consist of production, part suppliers, bodybuilders, market, service, and the end customer.

The goal for the request process is to reach level 3 of the Volvo Process Implementation Scale during the first half of the year 2002.

5.2.2 The Quality Report Process

The quality report process has been used as a pilot when the Quality Department was developing the guidelines and support package for Process Management implementation. That meant that it had really good prerequisites for being chosen as a pilot process for this thesis.

The quality report process is a fairly small process, which summarizes and presents the quality situation in the company in an understandable format. There are currently no process team meetings, since the quality report is covered when team meetings for the entire quality process are conducted. Continuous work meetings are also held specifically for the quality report, where process related questions could be brought up if needed.

The purpose of the process is to produce a document that provides the VBC organization with a continuously updated view of the quality performance of the VBC products as well as operations. The process starts with the quality manager planning the report according to customer needs. The input needed for the process is data from measurements, which are supplied by Service, Product Development, Market support, and production. The main activities in the process are:

- Data collection
- Compilation
- Analysis
- Distribution

The process output is, of course, the quality report. There are three parts of this output; the actual report, a presentation material, and material requested by the VBC Board. Hence, the customers are the Quality Board, management teams, quality managers, and the VBC Board. The process ends when the report is distributed to its customers.

The process map for the quality report process can be seen in Appendix 8.

The objective for the process is to have reached process development level 3, according to the VPIS, within first half of year 2002.

5.2.3 The Product Problem Process (PRP)

The PRP is a pilot for implementing Process Management within VBC, which means that an increased focus has been placed on the process, as well as more support. However, the PRP team began working with Process Management much later than the request process, thus has not reached as far in the

implementation. The consequence of this was that some additional work had to be done to be able to use the process as a thesis pilot, regarding definitions, maps et cetera.

The product problem process, also called the quality journal process, describes the current quality situation in the company. This is done by keeping a record of the complaints relating to poor quality coming in to the company, mainly by warranty errands. These complaints are called MQR:s, market quality reports, since they come in from the marketing department. They are then investigated, and a QJ (quality journal) item is opened if action is to be taken. The way in which these items are handled constitutes the product problem process. The process team meetings for the PRP have just started up, but the team seems to have good prerequisites to succeed in their work.

The purpose of the PRP is to provide the VBC organization with a continuously updated view of the quality situation on the market, take corrective action, and implement solutions. The start of the process is when a product problem has been found on the field, making the customer dissatisfied. The input to this process is therefore complaints regarding the field quality of the buses made by VBC. These complaints are submitted by the marketing department, because that is where the customers turn for warranty claims, making the marketing department the sole supplier. The main activities in the process are:

- Opening of new QJ item
- Investigation and prioritization
- Design
- Implement change
- Prepare market

The output from the PRP is almost the same as for the request process (see Chapter 5.2.1), with a focus on product documentation. The customers is in this case the same as the suppliers, meaning the market department, since they are the ones requesting a product change and also supplies the data which enable the change. The end of the process is when the quality problem is solved, and the QJ item dropped.

A sketch of the flow in the process can be seen in Appendix 9.

The objective for the process is the same as for the other Process Management pilots, to have reached process development level 3 according to the VPIS, within first half of year 2002.

5.3 Benchmarking

5.3.1 Plan

The planning phase of the benchmarking consisted mainly of developing the preliminary guidelines, since they constitute the process that was going to be compared. The checklist suggested by Watson (1992) about what to consider when planning a benchmarking was used, but some adjustments had to be made because the investigated process was of such a special nature.

5.3.2 Search

The search for a suitable company to benchmark was done in a simple manner. One internal benchmarking and one general benchmarking were to be performed, and the company within Volvo Group that is most successful in the area is Volvo Aero, which made the internal benchmarking an easy choice. The general benchmarking was more of a challenge, but on recommendations, SSAB Tunnplåt in Luleå was chosen.

5.3.3 Observe

SSAB

The external benchmarking was performed at SSAB Tunnplåt in Luleå. General facts about the company can be found in the Benchmarking Partner Analysis (see Appendix 10). SSAB has taken on a little different approach to process work, but is still very prominent on process measurements.

SSAB defined the purpose of measurements as a way to show the ability of the process to achieve the planned results. The reason for defining it like this was to emphasize the link between performance of the processes and measurements. In addition to this, they also measure the environmental influence originating from the processes.

Their reason for performing measurements is, besides the above mentioned, to gain information for improvement analyses, to identify improvement areas for MBO, to use it as basis for management review, and because it is demanded by the quality system ISO 9000 and the environmental system ISO 14000 by which they are certified.

SSAB did not have any specific factors that they always measure, but measures regarded as generally interesting are cycle time, capacity, and environmental factors.

A group was formed when starting to implement performance measurements, dedicated only to this task, and they developed a method for how to identify and implement measures. This method consists of nine steps, and looks as follows:

- Appoint a responsible person for measurement and follow-up
- Decide on the expected performance of the process
- Identify measurement points for the process where this can be measured
- Decide on:
  - where the result should be analyzed
  - measurement method
  - measurement interval
- Choose report format
- Perform measurement
- Document the result
- Analyze the result
- Use the analysis for improvement actions, basis for management review et cetera

Before this method can be performed, the process has to be mapped. This can be an extensive task, depending on how detailed a level the mapping is planned to reach. SSAB started to map their processes a couple of years ago, but is still working with it on a sub-process level.

The process maps are used as a tool for finding suitable measurement points in the processes, according to the process orientation theories. SSAB does not work actively with a Process Management/orientation implementation, but is clearly working in that direction. Right now, there are no process owners, so the ones responsible for the measurements are management and the earlier mentioned performance measurement group. They also involve people working in the processes to state their opinion of the measures.

One thing that SSAB tries to emphasize in their work with measurements is to have a clear boundary between process and output measurements. Their focus lies on process measurements, and they try to communicate the meaning of process measurements to all their employees.

The customer perspective is of major importance for SSAB. When identifying performance measures, they strive to connect these to customer demands and expectations. SSAB is very prominent on this matter, and has succeeded to

implement a customer focus throughout the organization, regarding both internal and external customers.

What factors to measure is process specific, but time measures tend to include many other aspects, and is therefore often measured. Cost factors seem to be more questionable, since they are of a defensive nature, and focuses more on revenues than customer satisfaction.

When the measures are decided, goals have to be set. SSAB works according to the SMART-principle, which implies that a goal has to be specific, measurable, achievable, realistic, and time-specific. The goal-setting tool used by SSAB is called "the target board" and is developed on basis of the BSC. It consists of three different perspectives, the own business, the employee perspective, and the customer perspective. The goals are formed with regard to all three perspectives, and are then cascaded down through the organization to a department/group level. Earlier, they even had goals on an individual level, but that was found to be too detailed. This tool is also used for setting the goals for different measurements, and another aspect to consider when setting goals for measurements is that the measurement goal has to be realistic with regard to the expected performance defined earlier.

Today, some support and management processes are measured, but not nearly all. The idea is that every process are going to be measured, and the same method for identifying measures should be used for operational as well as support and management processes.

When the measurements have been performed, someone is responsible for the follow-up. In association to a meeting of some kind, the measurements are then analyzed, and the results discussed. The minutes from this meeting are inserted in the business system, for everyone to see. During the internal revisions, that are performed twice a year, the measurement analyses are checked.

SSAB's intranet is used for many purposes, where one is to communicate the overarching goals of the organization. The also publish news, and different kinds of records and goal achievements.

An important aspect of implementing performance measurements in the organization is, according to SSAB, to forget all the old measures and procedures that might have existed, and start from a whole new origin. The goals have to be realistic and they also have to be set with regard to existing capacity.

Volvo Aero Corporation (VAC)
VAC was in capacity of best practitioner of Process Management in the Volvo Group, a natural choice for internal benchmarking. General facts about the company can be found in the benchmarking partner analysis in Appendix 10.

The role of measurements in Process Management is according to VAC a very important one that can not be enough emphasized. The measurements are used as a reference for planning improvement activities, and for goal formulation. It is not always easy to find measures that are not only easy to measure, but also relevant for the company. VAC has, for example, had problems with finding suitable measures for the Product Development process in their business area Aerospace Components, since their partner companies do most of the product development within that area.

VAC bases their way of identifying measures mainly on the theory by Ljungberg (1997), who talks about how measurements should be derived from the demands placed on the process or product. These demands can come from either the next process (an internal customer), the final (external) customer, or from the strategies and goals of the organization.

The process team for the process in question is responsible for identifying suitable measurements. As help for doing this, they have the process map, their own process methodology, and material constructed by Ljungberg. The VAC process methodology consists of measurement guidelines, VPIM, instructions for process mapping, and different kinds of fill-in forms.

When it comes to goal-setting, VAC uses their management process, which they consider very good, for setting goals on all levels. The process consists of three loops that should all be completed for a goal to be properly implemented. The first loop is about creating overall visions for the level in question. The next loop involves setting goals and sub-goals, creating action plans, and resource planning. Follow-ups, analyses, and corrective actions form the third loop.

VAC has worked with Process Management since 1992, and have measurements implemented in all processes, both main and support/management processes. They use the same procedure for implementing measurements on all processes, and that works in an adequate manner.

VAC does not have any officially stated criteria for good measures, but there is a general awareness of what demands a measure should fulfill. Some mentioned demands are:
- The measure has to be relevant
- The current position of the measure must be known (or easy to find out)
- It has to be possible to set a realistic goal for the measure

A strategy has to be carefully prepared for each measure to make the measurements meaningful.

Lead time of some kind is measured in all processes at VAC. Other than that, they do not have any specific factor that always has to be measured, but time, cost, and quality is of course often suitable and important to measure.

Regarding follow-up and reporting, VAC has a special form for reporting measurement results, called a process status report. On this form, the process teams have to write the current position, the goal, and expected date for goal fulfillment for each performance measure. This is then presented to the process sponsor four times a year. The status report form used by VAC is presented in Appendix 12:1. Each business area within VAC also does internal follow-ups of measurement results. An additional follow-up is done on the measurements related to quality by the quality council, where action plans have to be presented if the goals have not been reached.

The seven quality control tools is sometimes used for analyzing measurement results, but it is not a standardized working procedure.

VAC uses both process and output measurements, but the responsibility for output measurement lies on the functional units. The process measurements and the output measurements are therefore not connected, but both are still performed to a high extent.

5.3.4 Analyze

The analyze-phase of benchmarking mainly revolves around finding performance gaps between the own process and the process of the benchmarked company. These gaps are best identified by constructing a business performance comparison (Watson, 1992), where major issues are discussed and compared between the companies. The business performance comparison can be found in Appendix 11. This comparison might differ from

the standard comparison sheet recommended by Watson (1992), since the process studied is not of an operational nature.

The analysis shows that the companies in general do not have as much definitions and documentation as expected. Also, both VAC and SSAB has got structured methods for goal-setting, which suggests that development of a goal-setting routine is needed.

All three companies have placed responsibility for identifying suitable measurements on different persons, even if these persons are closely related to each other. Regarding follow-ups and reporting, the methods tend to differ. VAC and SSAB agrees on the importance of follow-ups and standardized reporting methods, but they have chosen different ways to go about this. VAC seems to be more consequent in their way of reporting and following up the measurement results.

None of the companies uses any kind of transformation to be able to compare different processes. This supports the findings from this thesis about processes being to complex to try to transform into one single measure (see Chapter 6.2). They do all, however, use BSCs in one way or another, which acknowledges the continued growth of this method. It should be remembered though, that this technique does still have drawbacks.

The next step in the benchmarking process was to study the gaps to find out if there are some interesting differences that should be further examined for a possible implementation in the VBC process.

5.3.5 Adapt

A number of issues have been found through the benchmarking that can be used to make the thesis's guidelines better and more complete.

- The method used by SSAB for implementing performance measures are going to be altered to fit VBC, and then added to the guidelines
- The status report used by VAC are, with some adjustments, going to be suggested as a reporting method for measurement results at VBC
- A suggestion for how goal-setting should be done are going to be developed for VBC, on account of the fact that both SSAB and VAC had structured methods for this
- The decision about not creating a measurement transformation was confirmed, since neither SSAB nor VAC had any such transformation, or thought thereof

5.3.6 Improve

The benchmarking has to be followed up by continuous monitoring of process performance to evaluate the results of the implemented changes in the process. This can be done by mapping the historical trend for the measurements concerning the change by constructing diagrams. For VBC, these diagrams can be of usage percentage for the VBC Status Report, conformance perception of the method for implementing performance measurements (see Appendix 1:1) et cetera.

The core of the improve-phase of benchmarking is that it has to be investigated if the change made a positive difference or not. This phase is equivalent with the Check-phase and the Act-phase in the PDCA-circle described in Chapter 3.2.

5.4 Practical testing

The practical testing of the preliminary guidelines was crucial for confirming the usefulness of the method in reality. A specific procedure for testing the guidelines was developed, based on the method for implementing performance measures presented in Appendix 1:1. Emphasis was placed on identifying suitable measures, since that is the major purpose of the thesis.

5.4.1 The Request Process

Specific answers to the testing procedure questions regarding the request process can be found in Appendix 13:1.

According to the testing procedure, the first task is to appoint a person responsible for measurements in the process. This choice is often made between the process owner and the team leader, and in this case the team leader seems to be more appropriate, because the process owner is responsible for more than one process and is therefore ruled out.

The next step was to find suitable measures, which is the greatest task in the testing procedure. First the wanted position for the process was examined, to make sure that the measures would contribute to achievement of this state. Then, a look at the example list in Appendix 1:2 provided a number of measure suggestions that was to be evaluated according to the measure features described in Appendix 1:3. The evaluation resulted in a ranking of how good the measures were, and based on that, the following measures in the request process was chosen:

Time –	Process –	**Delivery time to customer**
	Output –	**Lead time**
Quality –	Process –	**Percent of on-time deliveries**
	Output –	**Perception/Expectation**
Cost –	Output –	**Actual PMR cost/Planned PMR cost**

It is very important that the measures reflect both time, cost, and quality. The chosen measured was compared to the definitions in Appendix 1:4 to see that those measures really measure the right things. The chosen measures were then examined against the process wanted position again, making sure that nothing mismatched. In this case, the cost factor had not been considered in the process wanted position, which meant that the cost measure had to be chosen without regard to the overall economical goals of the organization.

For this process, expected performance and made-up measurement figures could not be created, due to lack of process performance knowledge. However, measurement points and measurement methods could be decided without bigger problems. The measurement interval is highly process specific, and because the request process has a relatively long lead time, most of the measurements can not be performed very frequent.

The analysis of the measurement results might very well be done by the team leader, and then presented at the request process meetings. The chosen measures are of such kind that they do not require discussion and the analysis is very simple to perform. The analysis should be both short- and long-term, showing recent improvements/impairments and trends versus goals.

All chosen measures for the request process appeared to fit in to the VBC Status Report, why no other report format had to be used for this process. For a partially filled in status report for the request process, see Appendix 13:2.

The data log used for PMR:s is a good help when performing the measurements. Almost no extra work has to be done, but the results can be directly read from the log. Customer satisfaction, of course, requires a little extra effort. For this kind of measure to work, the customers have to be willing to participate in surveys, sacrificing their own time.

The follow-up can suitably be done in the process team, and further on reported to the Change Group, accompanied with suggestions for improvements that are to be decided on by management.

The testing of the request process resulted in a few minor changes, but other then that, the method seemed to work satisfactory.

5.4.2 The Quality Report Process

Answers to each procedure point regarding the quality report process are submitted in Appendix 14:1.

The person suggested to be responsible for the measurements was the process owner. The reason for this was that the process in question is quite small, why the process owner was a more reasonable choice, since the team leader has such a limited role in this situation.

The wanted position for this process is summarized in one statement, concerning the number of days in which the report is to be published. However, this statement can be interpreted to cover both time, cost, and quality. That is very important, since all those three factors are needed to be able to identify suitable measures that contribute to the overall goals. Assisted by the example list (Appendix 1:2), a number of possible measures was identified and then checked according to the measure features (see Appendix 1:3). After this checking, two measures were excluded due to lack of appropriate features. Three measures were then chosen amongst the remaining ones:

Time –	Output –	**Lead time**
Cost –	Output –	**Total life-cycle cost**
Quality –	Output –	**Aesthetics perception vs expectation**

The measures that were chosen for the quality report corresponded well to the definitions of time, cost, and quality. The measure lead time was chosen, and specified by the definition in Appendix 1:4. The cost measure of choice was somewhat strained, but is still not contradictory to the definition, but rather an interpretation of it. Aesthetics as a measure of quality is very much in line with the definition, if not equal to it. It is also clearly customer focused, and therefore it complements the other measures well, since they are only indirectly customer focused. The only drawback with the chosen measures is that they are all output measures, meaning that there is no measure controlling the performance of the process, unrelated to the outcome.

Measurement points were chosen, and then a measurement method and interval in these points were selected. The question of where to analyze the measurement results was then discussed, but since it is such a small process, the interest for the results demanded by management seemed to be fairly small.

However, when the process starts to function properly, the demand for the quality report will probably increase. Therefore, it was decided to analyze the results within the process team, since they need to know what the customers like and dislike to be able to improve the report, and thereby increase the usage. As a part of the follow-up, the results should be presented to the Change Group. This is important to get management to commit to the work with the quality report, showing that it makes a difference, hence creating an increased demand for the report.

The limited size of this process enabled the estimate of its expected performance. After that, realistic and achievable goals were set for the chosen measures. A filled in VBC Status Report can be found in Appendix 14:2. To test the method even further, a possible outcome was made up and diagrams showing trend was created. This part of the method was originally placed before the decisions about measurement points, methods, and interval. The testing of the quality report process showed that setting the expected performance before knowing where and how to measure was impossible, so the order was changed.

To summarize the testing of this pilot process, its limited size was a good thing, since it enabled a deeper testing which lead to major changes in the implementation method.

5.4.3 The Product Problem Process

A full version of the answers to each part of the testing can be found in Appendix 15:1.

The responsibility for the measurements within the PRP should be placed on the process team leader, since the PRP owner owns more than one process. The process wanted position has not yet been stated, but is to be created as soon as possible. That made the testing harder to perform, and the outcome may not be as solid as it should have been if the overall goals for the process would have been stated. The measures extracted from the example list in Appendix 1:2 did not show very good results when being tested according to the measure features (Appendix 1:3). Three measures were excluded, and many measures were found to have the same characteristics, making the choice more limited. Three measures were chosen, one from each main area; time, cost, and quality.

Cost –	Process –	**Actual cost vs budgeted cost**
Time –	Output –	**Lead time**
Quality –	Output –	**Perception vs expectation regarding design**

The chosen measures were compared to the factor definitions in Appendix 1:4, showing good compliance. The measures contained both process and output measures, which gave a good balance to the measurements. It was hard to decide on suitable measurement points, since they do not have a process map, and the process knowledge was not extensive enough to know natural points where the different measures are already documented in some way. When the measurement points had been set, the measurement intervals were also decided upon. A filled in VBC Status Report for the PRP can be seen in Appendix 15:2.

The PRP has a dedicated team assigned, who helps solving problems in the design phase. This team was considered a good forum for analyzing the measurement results, although the process team should do so too. This takes a good amount of coordination to avoid doing the same work in different places. Still, both teams should be involved in the analysis to make it as good as possible. Since the process is of great importance for the company's reputation, an increased management focus is currently placed on the PRP. Top management at VBC wants continuous reports on the number of unsolved QJ items, and the measurement results should therefore be followed up at the Change Group meetings, and further reported to the Vice President of VBC.

Even though the PRP has received special attention lately, the Process Management work has not reached very far. Because of that, there was not a lot of documentation available when doing the testing of this process. An expected performance could not be estimated, and thereby not the goals for the measures either. The testing of the PRP lead to one change in the guidelines, when it was found that none of the three tests showed a need for a specific report format for output measures. Hence, the suggestion to find an alternative report format for output measures was removed from the guidelines. The need for an exact definition of what is to be measured was also discovered, why it was included under the task "decide on measurement method". The PRP testing did also confirm information stated earlier in the thesis.

6 Analysis

The analysis compares the data from the empirical work to the existing theories. The analysis turns the procedure around, using theory to build general conclusions.

6.1 The Empirical Work

The interviews all pointed in a similar direction. All respondents talked about the problem with allocation of resources for Process Management work, and they also mentioned the lack of knowledge on the subject, and thereby also the need of education and training. Many of the respondents argue the importance of communicating *why* Process Management should be implemented, which might imply that the why-reasoning promoted by OD really has influenced the employees' thinking.

If a comparison is made between the respondents on the same positions, or members in the same groups, there were a tendency of disagreement on several issues. The Expert Team, for example, is manned with a lot of strong wills, sometimes striving in different directions. This can be explained, however, by the fact that they at that point hadn't been in the current team form for very long. The process owners all agreed on the fact that their main responsibility is to drive the development of the process with the purpose of satisfying the customer, but the ways they go about the task tend to differ. The perceptions of Process Management seemed to be somewhat "process dependent", meaning that people employed within the same process had more corresponding views than people in general. The purpose of implementing Process Management got different answers from every respondent. Everyone answered from their own perspective, which can be a good thing when considering that the purpose is supposed to motivate the employees to work with Process Management. The top manager considered Process Management a way of managing the company, while the sales manager emphasized the potential of increasing profitability by working with Process Management. People involved in manufacturing saw it as a way of learning from each other, always using the best practice for all activities. An issue also regarding the purpose is that people often focus on Process Management as a tool for improvement work. By not considering the company-managing part of Process Management, the work is often directed to a few parts of the organization. Thereby, the comprehensive view and the connection between the processes are lost.

The respondents are relying heavily on the Quality Department for help and support in their Process Managing work, since there are not enough knowledge

about Process Management in the organization. The lack of knowledge can lead to a misdirected allocation of resources, why education and training should be held in the near future to avoid unnecessary waste.

The benchmarking gave many useful ideas and warnings. VAC had chosen to separate process and output measurements, which might be dangerous. By connecting process and output measurements, problems in interfaces can be prevented. This is and important issue, since the interface area is the most frequent source of problems. The guidelines are constructed in a way that allows them to be used for only process measurement if that is preferred. Benchmarking can also be of good help when setting goals, since it gives an idea of what is a realistic goal in general in that particular line of business. There are many different theories for how to conduct a benchmarking, and the approach chosen in this thesis proved to be very suitable for the purpose, when it contributed considerable to the construction of the guidelines.

6.2 The Guidelines

This thesis mainly involves performance measurements for continuous improvements, as opposed to assessment measures. The thesis work was supposed to result in guidelines for how to find suitable day-to-day measurement points in the different processes, hence not a method for process development.

It is of major importance to limit the amount of measures and goals to the vital few. If too many measurements are conducted, the main focus is often lost. The recommended number of measures in this thesis is:

For main processes 3 – 5 measures
For sub processes 5 – 8 measures

If this number of measures for some reason is exceeded, a follow-up should unconditionally be held after 6-12 months, where the least useful measures are eliminated. A follow-up could be done anyway, evaluating the chosen measures to see if they are measuring things that are important and relevant for the process/product.

The reason why a different amount of measures is suggested for main and sub processes is that sub processes are smaller in size than main processes, and therefore, more measures can be used without getting results that point in different directions.

It is important to have a flexible measurement system, which can be easily adapted if customer requirements change. Both measures and goals could become necessary to exchange, depending on in what way the customer's needs and wants change.

The possibilities for comparing different kinds of processes appeared to be very limited, because of the great variety of process natures. The alternatives that were found was to either find a few key measures that could be measured on every process and compare those, or to compare percent of goal fulfillment by dividing the current measurement value with the stated goal for the measure. It is very hard to find key measures that are measurable with the same conditions in every process, and based on that, percent of goal fulfillment was found to be a better way of comparing processes.

6.3 Shortcomings

Some obstacles occurred when conducting the tests of the chosen pilot processes. There were often problems when trying to collect the necessary data, either it was hard to find someone able to answer questions, or the data was not available at all. That slowed the work down considerably, and the problem was not properly resolved, but some kind of compromise was reached.

It is fully understandable that it is not very easy to time a thesis work completely with the work done at the employing company. All and all, the timing was relatively good. The only real problem was that for one of the Process Management pilot processes, the guidelines were used before being tested. Later on, when the testing was done, some changes had to be made which lead to some confusion in the process team.

The purpose of the thesis could have been expanded considerably, if there had not been the time constraint. There are many sides of this subject, why the guidelines could have been made more extensive and detailed. However, considering the limited size of the thesis, it can still be used with good profit when implementing performance measurements in a company.

7 Results

The result chapter presents the result of the thesis work, being the different parts of the guidelines. Recommendations for how to use the guidelines in the best way possible are also given.

7.1 The Guidelines

The guidelines contain a few crucial parts that will facilitate the actual practical work, and create an increased understanding of *why* it is important to measure. By using these guidelines, it will be easier to understand why time, cost, and quality are the factors of interest, and how they can be measured in the best way in the process in question. They will also give examples of measurements for help and inspiration. A schematic picture of how the guidelines are constructed can be seen in Figure 7.1. The actual guidelines can be found in Appendix 1.

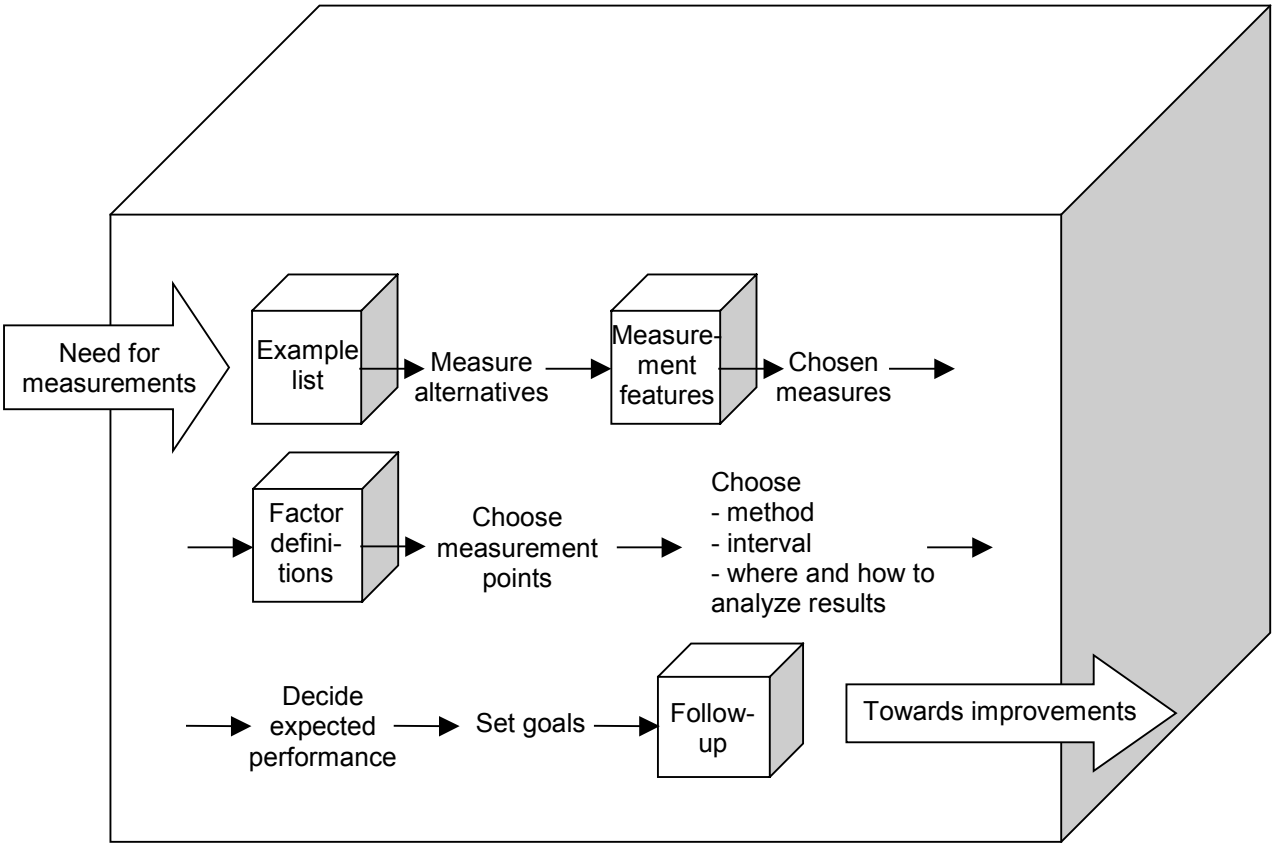


Figure 7.1: A schematic picture of the guideline structure.

Figure 7.1 demands some further explanation. The boxes symbolize the different parts of the guidelines. The big box is the first part, the method for

implementing performance measures. The small boxes are the other parts of the guidelines, which are included in the method and therefore placed inside the big box. It all begins with a need for implementing measurements, and when the whole procedure has been carried out, the process work can go on towards finding improvements in the processes.

The connection between the guidelines and MBO can seem somewhat unclear at this point. What the author is trying to achieve with the guidelines can be resembled with the PDCA-circle, mentioned in Chapter 3.2. Further explained, the method should work like an ongoing spiral, getting closer and closer to the goals that have been set. When measures are chosen that contribute to the overall goals, measurements are conducted. The follow-up of the measurements is then crucial for the MBO-part. By analyzing the measurements in a thorough way, the improvement work can be focused on the right issues. In the long run, that is what manages the process/product towards its objectives.

Method for Implementing Performance Measurements
Appendix 1:1 contains a generic method for implementing measurements in processes and on outputs. This method was not a part of the initial guideline draft, since the scope of the thesis does not really include the entire content of the method for implementing performance measures. However, an extensive need for this to be documented was discovered while doing research for other parts of the guidelines, so a decision was made to include it.

The method is not very profound, but should be able to function as a rough guide when starting to implement measurements.

Examples
The examples in Appendix 1:2 are intended to be an inspiration when trying to find appropriate measures. It is not said that these are the only suitable measures, or that the ones in the table are applicable to all processes and/or products.

VBC has decided to measure time, cost, and quality, and Appendix 1:2 is constructed with the intention to make sure that all factors are considered when identifying measures. The examples are assorted in a table, which can be used in two ways. Either, an already identified measure can be classified by following the table from the right to the left, or a measure can be identified by following the wanted classes from the left to the right.

Measure Features
The measure features that are presented in Appendix 1:3 are supposed to be of help when deciding whether or not a measure is suitable for measuring performance. Certain requirements have to be fulfilled for a measure to be fit for use, while other features are recommended, but not necessary.

Appendix 1:3 also contains some general pointers, which can be useful when trying to choose measures.

Factor Definitions
Appendix 1:4 contains definitions of the three main factors time, cost, and quality. These definitions are intended to guide the reader in the right direction when in doubt of what these basic factors really mean, and what measures should be used to quantify them.

Follow-up Procedure
In Appendix 1:5 a suggestion can be found on how and where to follow up on the measurement result. At VBC, there are different forums on different levels of the organization, suitable for discussing various aspects of the measurements.

An important aspect of the follow-up is that it will be more effective if the responsible persons have to explain and motivate the target deviations. This approach can often result in a bigger effort being made to reach the goals. Another issue is that is has to be made sure that the feedback regarding the measurements really reaches the parties concerned, or otherwise the results will not improve.

The procedure for follow-up that is suggested is specific for VBC.

Report Format
This thesis suggests a report format called the VBC Status Report. This form includes the following facts:

- Who holds the different positions within the process organization
- Which measures are used and the goals set for them
- Where the process is in the Volvo Process Implementation Scale, and future assessment goals
- Which goals have been reached since the preceding meeting

The form can also be used for output measures, where the different fields considering processes is filled out with the process that delivers the output in

mind. The VBC Status Report can be seen in Appendix 12:2. It is important that the report does not contain to many measures. How many measures that is appropriate to have depends on the size and the hierarchical status of the process.

7.2 Setting Goals

It is not always obvious what goals should be set for the chosen measures. The goals should of course strive in the direction given by the superior objectives, but to quantify them is not easy.

This thesis suggests that goals should be set after the decision on expected performance has been made. If the technique "Half-life" (see Chapter 3.12) is to be used, this order has to be followed. Otherwise, it is not a necessity to set expected performance first, but it is still recommended since the goals tend to be more realistic if the current performance has been evaluated.

It is not optimal to start measurements before the goals for the process and/or output have been set. The aim of the measure has to be known for the measurements to be meaningful. An improvement of 25% can seem very good, but if the goal is to improve by 500%, it is not so revolutionary any more. The situation can sometimes demand that the measurements are initiated before the goal-setting but it should, as a general rule, be avoided.

7.3 Recommendations

The guidelines consist of five parts, which can be used separate or as a package. The first part, the method for implementing performance measurements, assumes usage of the following four parts. Therefore, it has to be used together with the other parts. The fifth part, about follow-ups, is specifically written for VBC, which makes it hard to use in a general context. All other parts are generally applicable and suitable for separate usage.

The first part indirectly describes how to use the guidelines, but is not very detailed regarding each part. The idea is that the method for implementing performance measurements can be used as something to start out from, and then the method can be adapted according to the specific wants and needs of that case. Part two, the example list, is meant to be an inspiration when choosing measures, but can also be used to categorize already chosen measures. The third part, the measure features, is preferably used when possible measures have been identified, to decide if they are acceptable when it comes to wanted features in a measure. The factor definitions that follow can be used totally separate from Process Management work if needed. They were created because

of the confusion of ideas around many concepts used daily in the organization. The definitions of course also fills its place in the measurement work, the chosen measures have to be checked against the definitions, assuring their validity. The follow-up procedure in part five is company specific, but can be used as a guide and a reminder of the importance of measurement follow-ups. In addition to these five parts of the guidelines, there is also the VBC Status Report, which is a suggestion for how to report the measurement result in an understandable way. Other forms can also be used for this, but this is a simple and easily used way to go about it.

The author recommends that the goals should be set in close connection to deciding the expected performance of the process/product. It is not necessary to set expected performance for every measure if the process knowledge is very good within the process team, but it is still strongly recommended to enable a realistic goal-setting. It is also recommended to set a date for the goals, to make sure that the goals are in line with the SMART-principle, discussed in Chapter 3.12.

8 Discussion

This chapter includes an evaluation of the methods used with regard to reliability and validity. It also contains general discussions about the thesis work, the company, and the theories. Finally, some suggestions for future work are given.

The deductive research approach that was chosen had a high validity, since the situation analysis really contributed to the forming of the hypothesis, being the guidelines. If the situation had not been analyzed through interviews, the method for implementing performance measurements had not been included in the guidelines. That method has proved to be a very important part of the guidelines, and many users will probably be dependent of it to be able to use the other parts of the guidelines. The reliability of the deductive research was not as high, when a situation analysis is hard to keep objective. It is also not sure that the hypothesis created would not differ depending on who conducts the research, on the contrary, it would probably be different.

The main part of the data collection done in this thesis has been quantitative. That is not very strange, bearing the subject Process Management in mind. It can be labeled as “soft” quality, why it is natural not to collect “hard” data. However, the reliability can be considered quite high for the data collection in general, even if it mainly consisted of interviews. Most parts of the data are based on common conceptions, and did therefore not require a lot of personal interpretations. The validity was a bit worse, when the data collection often lead to a variety of other subjects being discussed, instead of the one in question.

The investigation method of use was the pilot process testing, which was done according to a pre-defined testing procedure. That increased the reliability of the investigation, making it more independent of the person performing the testing. The guideline changes that were made, after finding improvement possibilities through the testing, showed that the right issues were investigated. The method clearly changed for the better after the testing. Hence, the validity was considered high for the investigation method.

The process work within VBC is to a great extent focused on improvements. Even if that is a major part of Process Management, other parts such as process mapping is sometimes neglected to get to the improvements as soon as possible. The order for implementation activities regarding Process Management that is suggested by VBC can be seen in Figure 8.1. To jump

straight to improvements can often be a disservice, since the process maps, measures, and wanted position for the process are of great help when the improvement work is started. Another side of the same coin is that there should be a general awareness of Process Management within the company before the pilot process implementations are started. That helps breaking barriers and facilitates co-operation between functions and departments. It is all about knowing *why* a new approach is taken.

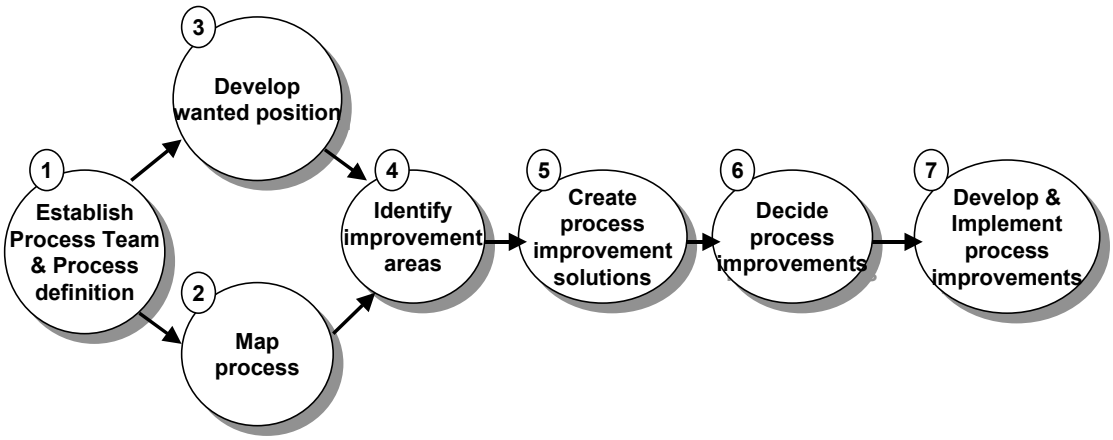


Figure 8.1: A schematic view over Process Management implementation at VBC (Source: Pilot Process Guidelines; internal presentation material).

Another aspect that might lead to problems when implementing Process Management is that it seems to be difficult for the employees to separate the assessment measures from the performance measures. It is not emphasized enough that the VPIS is about process development, and not process performance, which can cause confusion in some cases.

A problem in the long run is that the employees do not feel enough management support regarding the implementation of Process Management. There is not sufficient demand for results, and it should be more strongly communicated that resources are to be set aside to work with this issue. Another resource aspect is the constant struggle to get resources allocated to work that gives long-term results, as opposed to "fire fighting". In January 2002, a publication was distributed within VBC called "the Turnaround" which urged an increased focus on short-time revenues. It also said that long-term objectives had to stand back in favor of activities leading to quick improvements of profit and cash flow (The Volvo Way, 2002). It still says that VBC are to work with Process Management to secure quality, but it is not very apparent. The main focus is still on short-time improvements, which might obstruct the Process Management implementation work.

The guidelines developed in this thesis do not involve the concepts CSI and KPI, previously mentioned in Chapter 3.8. The reason for this is that Critical Success Indicators was considered to be to overarching to be suitable for measurement. It would therefore just have been confusing to involve KPI alone, without mentioning CSI.

A reflection was made concerning care for the environment as a core value. It is not communicated very strong within the company, but it is still an important value in today's competitive market place. It is not a simple factor to measure, since it does not fit naturally into any of the three measurement compartments, time, cost, and quality. The author would still recommend that the environment factor should be considered in some way, say as a Critical Success Indicator, to create credibility for the core values in general.

Whether or not to keep the functional organization's strong influence when working with processes is a decision that takes some careful consideration. An organization might be shaken in its grounds if the step to become a vertical organization is taken overnight, and the result can be a hesitant approach to the future. On the other hand, if the functional organization is still very powerful when implementing Process Management, the process owners might encounter problems when trying to make decisions on issues regarding a functional manager's area. An often suggested solution for this is to make the functional manager a process owner, but it is not recommended in this thesis since there is a big risk of responsibilities being confused. Whichever way is chosen, it is important that the functional manager and the process owner cooperate well to facilitate the process work.

An expression that leavens all through quality-related issues is customer satisfaction. It is the center of TQM, as well as an important focus when implementing measurements. This forms a clear linkage between TQM and measurements, being the process thinking. The whole concept of quality is also totally dependent on the customer's point of view.

8.1 Conclusions

In the purpose, it was stated that the guidelines should be generally applicable, thus being usable on all processes in the company. For this to be verified, it was tested on three processes, meant to be representative of the whole spectrum of processes at the company. If process categories are to be considered, the pilot processes only covered the operative processes and the support processes. No management process was tested, and therefore there might be some doubt of whether or not the guidelines can be considered general. Theoretically seen, the

lack of management pilot processes should not be a problem. The guidelines were proved to handle both operative and support processes without problems, and since many parallels can be drawn between support processes and management processes, the guidelines should be able to handle management processes too. Some examples of the similarities between support and management processes are that they are both providing support to the operative processes, and that they both really consist of functions that in their turn include many different processes. The different size of the pilot processes implies that the guidelines can be used on processes at all hierarchical levels, from overarching main processes to detailed sub processes.

The concepts reliability and validity have been mentioned several times through the thesis, and when summing up, both the reliability and the validity of the thesis is high enough to be able to trust the results and use them with confidence. All work involving personal interpretations means a risk of loosing reliability, but it is still often necessary to use research methods such as interviews, where this can happen. It is also important to remember that even though validity has to be considered, discussions outside the subject can often lead to new knowledge that can contribute to the work.

The result of the thesis, the guidelines for managing processes by objectives, was really needed at the company. That gave the work a certain weight, which made the thesis feel important. If used at all performance measurement implementations from now on at Volvo Bus Corporation, the guidelines will ensure a solid measurement system being created.

8.2 Suggestions for Future Work

The author considers it to be of major importance to implement standardized operating procedures regarding Process Management as soon as possible. The different ways to handle issues like process mapping slows down the implementation and obstructs cooperation across functional borders. The guidelines and support package developed by the Quality Department is clearly a step in the right direction, but it is still not communicated strongly enough and it has not been anchored in the organization yet.

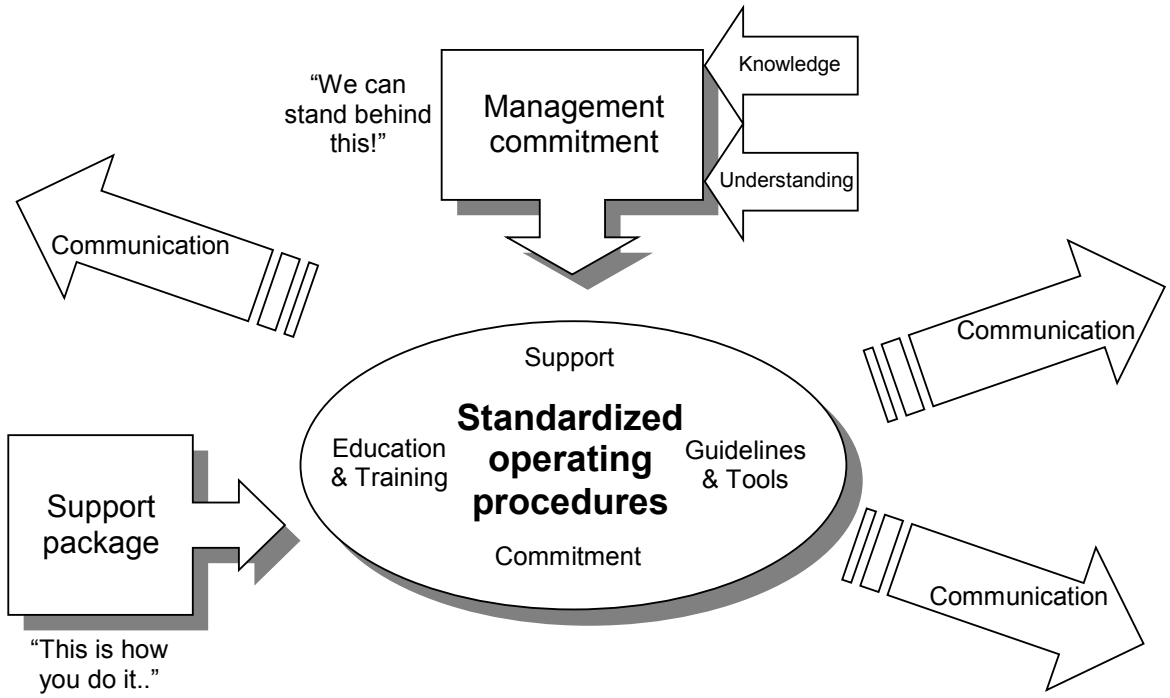


Figure 8.2: Standardized operating procedures for Process Management.

Figure 8.2 shows how standardized operating procedures could be designed for Process Management at VBC. The required input is management commitment, and of course a support package supplying the instructions and procedures used. For management to be able to commit to the approach it takes knowledge and understanding, making them believe in Process Management. The standardized operating procedures should consist of support and commitment, provided by management. It should also contain education/training and guidelines/tools enabling the employees to act in the right manner. This procedure should be available for every employee to take use of, but it takes a massive communication to create awareness about Process Management, and what aids are available to help implement it. This procedure approach can of course be used on other work procedures too, even if it was developed considering Process Management.

In the future when Process Management is fully implemented, there should still be follow-ups done to make sure it continues to function accordingly. Nilsson (1991) suggests doing continuous process audits, in the same manner as quality audits are often done. A process audit reviews:

- Whether or not the process organization is suited to its purpose
- If the limitation of the processes in the company is appropriate
- That every process has an owner

- That process work is done considering
  – establishment
  – function
  – coordination
  – a general understanding of process demands
  – measurements and follow-ups
  – continuous improvements

The seven quality control tools can often be of good use when analyzing measurements. These tools are currently not used to any greater extent, why it is encouraged to increase the usage in the future. Some of the tools can also be of assistance when trying to find problem sources or improvement areas.

A conclusion made in this thesis was that a transformation to be able to compare processes could not be developed considering the current purpose and limitations. It can however be suggested that processes can be compared by calculating a percentage of goal fulfillment. If this comparison is to be done, it is important that all goals are set according to the same principles, not giving advantages to processes with lower set goals. Otherwise, this is a very simple method to estimate process performance in relation to other processes.

It was earlier stated that the terms CSI and KPI were not to be used in this thesis, and that statement stands. However, as a recommendation for future work, it can be suggested to replace the term “wanted position” for a process with Critical Success Indicators. That is a more suitable term for the overarching goals for the process that should reflect the overall company goals. As a natural consequence of this, measurements can be called KPI:s to be consistent in the denominations.

If a definite decision is made to follow the performance pyramid, discussed in Chapter 3.6.3, it can be very useful. It combines Policy Deployment with Process Management, and is therefore very suitable for VBC considering their efforts regarding OD and Process Management. It also takes both internal efficiency and external effectiveness into consideration, which is important when trying to get a balance between processes and output.

When the measures has been thoroughly implemented, a diagram should be created to see the trend in each measure, and also how they affect each other. For suitable areas these diagrams can also contain control limits, making them work like statistical process control charts. This will give additional

information about what deviations can be considered random, and which ones that have discernible causes.

Finally, the natural next step after developing guidelines for managing processes by objectives is to identify and prioritize improvement areas in the processes. The best way to go about this is to construct guidelines similar to these, containing the best manner to go about that. Developing the processes in the right direction – aiming for world class.

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APPENDIX 1

Guidelines for Managing Processes by Objectives

Volvo Bus Corporation

Method for Implementing Performance Measurements

Prerequisites:

- Process map(s) for the process
- A dedicated team
- Knowledge about the process
- Earlier measurement results and product statistics being available, if there are any
- Employees from the process being available for answering questions and giving advice

Procedure:

1. *Appoint a responsible person for measurement and follow-up*
   This person can for example be the team leader or the process owner.
2. *Identify suitable measurement areas for the process and the output, with the help of Appendix 1:2, 1:3, and 1:4.*
   These measurement areas should be of such kind that they support the process vision, and the overall goals of the company.
3. *Identify suitable measurement points in the process and/or on the product depending on what measures are chosen*
   Where are the chosen measures most appropriately measured?
4. *Decide on:*
   - measurement method
   - measurement interval
   - where and how the result should be analyzed
   Some measurements can not be measured more often than once a year, while others are suitable for weekly measurements. There is also often more than one possible way to measure, why the method must be decided on in advance. Here, the exact definition of the measure should also be decided. There is also the question of analysis. Should the results be handled within the process team, or is another forum more suitable? There are many different methods available for analyzing measurement data, such as the 7QC tools, but should they be used?
5. *Decide on the expected performance of the process, and the expected standard of the product*
   The expected process performance and product standard has to be set in compliance with the current situation, not based on "should-be" results. The expected performance is to be used as a help to set realistic and achievable goals.
6. *Choose report format*
   The report format suggested for process measures in this thesis is the VBC

Status Report, see Appendix 12:2. Regarding output measures, another form of report should be chosen.

7. *Perform measurement*
   The measurements should be conducted as decided upon in point 5.
8. *Document the result*
   Depending on which analyze forum and which report format is chosen for the result, the documentation might vary. The case can often be that the results are documented in minutes from the meeting where it was discussed, or else, if the VBC Status Report is used, that constitutes the documentation.
9. *Analyze the result*
   The results should be analyzed in accordance to what has been decided on in point 5.
10. *Use the analysis for improvement actions, as a basis for management review et cetera*

Goal Setting

The goals for the measures chosen in point 2 should be set somewhere between point 5 and point 7.

The important thing is that expected performance is decided upon before the goals are set, because that enables a more realistic goal-setting.

The actual measurements should not begin until the goals for the chosen measures have been set. There is no use measuring if you do not know where you are aiming.

Example list

Factor	Type of measure	Area	Subject	Measure
Cost	Process	Financial		Actual cost compared to budgeted cost
		Operational		Capital employed
				Capacity utilization in percent
				Maintenance cost per unit produced
		Strategic		Total unit cost
	Output	Financial	Profitability	Profit per unit sold
				Profit in percent of sales
		Operational		Cost of defective products
		Strategic		Total life-cycle cost
				Cost of defective products
Time	Process	Management commitment		Share of hours spent working on strategic areas
		Built-in quality: Do it right the first time		Time spent on re-dos
		Flexibility	Response to product or volume changes	Time to market
		Produce to demand		Mean time in stock
		Customer and supplier relations		Delivery time from supplier
				Delivery time to customer
				Time to question respons
		Process path		Cycle time
				Queues and waiting time
				Share of waiting time related to total cycle time
				Setup time in relation to cycle time
	Output	Process path		Lead time
Quality	Process	Customer satisfaction		Perception in relation to expectation
			Reliability	Percent of on-time shipments
				Mean time between failures
		Flexibility		Number of product options
				Degree of delegation

Factor	Type of measure	Area	Subject	Measure
Quality		Efficiency/Productivity	Production related to resources used	Units produced per work day/week
				Units producted per employee
				Waste reduction in percent per year
		Supplier relations	Accessability	Mean time to response from supplier
			Reliability	Percent of on-time deliveries
		Employee development, well-being and satisfaction	Absenteeism	Absence percentage
			Training	Hours per year and employee spent on training
				Turnover
				Number of improvement suggestions per employee
	Output	Customer satisfaction	Perceived quality	Perception in relation to expectation
			Performance (primary characteristics)	Number of complaints per year/month
			Features (secondary characteristics)	Number of complaints per year/month
			Conformance	Degree of expectation fulfillment
			Durability	Number of complaints per year/month
			Serviceability	Number of complaints per year/month
			Aesthetics	Perception in relation to expectation
		Customer satisfaction relative to competitors		Rating of customer perception
		Market share		Percent of market
		Customer indicators	Complaints	Number of complaints per year/month
			Customer retention	Percent of customers that comes back
		Market responsiveness		Sales within first year in relation to expectance

Factor	Type of measure	Area	Subject	Measure
Quality		Product and service quality		Warranty costs per year
				Defect percentage
				Mean time to repair
				Mean lifetime for the product
				Percentage of products reaching the expected life length
		Company specific effectiveness indicators	New markets	Number of new markets identified per year
			New technology	Degree of innovation
			New products	Number of new products/modifications created per month/year
		Supplier quality and supplier development		Number of certified suppliers (according to chosen standard)
		Design	Fitness of use	Perception in relation to expectation
		Environmental quality, occupational safety and health, and regulatory compliance	Attributes	Checklist against standards (number of yes/no answers)
		National and community well-being	Fitness to market	Degree of conformance

Measure Features

The following checkpoints are intended as help for determining whether or not a measure is suitable for measuring performance in a process. The checkpoints are generic, and can be applied on any kind of performance measures, independent of what factor they measure. For coming up with a measure to check against the measure features, the examples in Appendix 1:2 are recommended for inspiration and ideas.

The basic requirements are of the kind that has to be fulfilled. That means that the answer has to be "yes" on all basic requirements, or the measurement can not be used at all. It is recommended that at least half the answers under "other requirements" are positive, but it is not obligatory for proceeding with the measurement.

Finally, there are some pointers that can be of good help for measurement identification work in general.

Basic requirements:	yes	no
• Is the measure practically measurable and quantifiable?	☐	☐
• Does the measure provide relevant information and generate some kind of value?	☐	☐
• Are the employees able to influence what is measured?	☐	☐
Other requirements:		
• Is the measure easy to understand?	☐	☐
• Can the measurements be used to find improvement areas?	☐	☐
• Are the measurements connected to vision, businessplan, and work tasks?	☐	☐
• Does the measure evaluate operation procedures/product standards?	☐	☐
• Are the measurements customer focused and adjusted according to their wants and expectations?	☐	☐
• Are the measurements able to determine whether or not a change lead to improvement?	☐	☐

	yes	no
• Are the measurements able to give fast and accurate feedback?	☐	☐
• Are the measurements flexible and easy to exchange?	☐	☐
• Do the measurements engage the employees?	☐	☐
• Are the measurements easily communicated throughout the organization?	☐	☐
• Are the measurements of such kind that they do not stimulate or promote manipulation?	☐	☐

Pointers:

- The measurements should be able to indicate that the organization is working in the right direction
- Measurements should be developed by the process owner or the team leader, assisted by the process team
- Measurements should be perceived as a helpful tool by the employees
- Measurements should help evaluating the employees' competence, attitudes, and values
- It is very important not to include too many measures in the measurement system
- A good way to prohibit problems in functional interfaces is to choose parameters that cross functional borders
- The measurement system should not contain more than 5-8 measures
- The measurement system should contain both financial and non-financial measures

Factor Definitions

The following document defines the meaning of the factors time, cost, and quality. This definition is done to be of general support when identifying performance measurements in the different processes at VBC. Use of the definitions combined with the measure features will guide the process owners to choose performance measurements that provide relevant information regarding time, cost, and quality.

Time

Time is a function of the speed of the organization. How fast can the organization be responsive to outside influences, either through customer orders, a change in competition, or a change in the environment? This category measures the "goodness" of the process.

Time can be measured from many different perspectives. A few principles that should be followed to optimize the time factor can look as follows:

1. Management must be committed and drive process improvement. This leads to a more efficient use of resources, thus less time is wasted.
2. Quality must be built into the process – "Do it right the first time". Less reworking lead to time savings.
3. Flexibility of the process should be increased through setup-time reduction and multiple tasking of people and equipment. This leads to a better utilization of resources.
4. Companies should produce to demand, not to budget or inventory. If done, no time is wasted due to unnecessary production.
5. Better relationships with customers and suppliers (both internal and external) improve a company's understanding of their wants and expectations and simplify the interaction in interfaces and/or boundaries. Problems in interfaces and boundaries are very common, and are big time thieves.
6. The focus is the process; the process path should be kept short and simple. Often, activities are repeated or done without reason. Eliminating these activities can cut lead-time.

Cost

Costs are the financial performance measure – the money spent on the people, processes, or organization. This category measures the economics of "goodness".

There are three different kinds of cost measures:

- Financial measures: Historical financial information that is used to report, compare and review
- Operational measures: Financial information that is used to run the business on a day-to-day basis
- Strategic measures: The cost information that is needed to make decisions that will have long-term effects on the company

Table 1: The different cost measures compared regarding required precision, timing, and focus (Hronec, 1993).

	Financial	**Operational**	**Strategic**
Required precision	Low	High	Low
Timing	Monthly/Yearly	Daily	Occasionally
Focus	Historical	Actual/Current	Future

Quality

Quality is the way customers define it. From a performance measurement standpoint, quality means that the products or processes meet and exceed the wants and expectations of the customers. This category measures the "goodness" of the product or process in the eyes of the customers – internal and external.

When performance measures regarding quality are to be identified, it can be of great help to go by the criteria set for a quality system. For example, the Malcolm Baldrige National Quality Award or ISO 9000 can be used to create appropriate standards. To summarize one of them, the Malcolm Baldrige National Quality Award, the criteria focus on how well a company achieves the following results:

- Customer satisfaction
- Customer satisfaction relative to competitors
- Market share
- Customer indicators such as complaints and customer retention
- Market responsiveness and cycle time
- Product and service quality
- Internal quality, productivity, waste reduction, and asset utilization

- Company-specific effectiveness indicators such as new markets, new technology, and new products
- Supplier quality and supplier development
- Environmental quality, occupational safety and health, and regulatory compliance
- Employee development, well-being, and satisfaction
- National and community well-being

Other definitions of importance

Lead time is the time from when a need has been identified until the need has been fulfilled. Used as an output measure.

Cycle time is the time it takes to complete all activities in a flow, so that the resources are free to initiate another flow of activities. Used as a process measure.

Customer satisfaction = $\frac{\text{Perceived performance}}{\text{Expected performance}}$

Product quality is the quality of the product in relation to expected standards.

Supplier relation is an expression for the effectiveness in the distribution channel.

Suggested Follow-up Procedure

To make a follow-up as effective as possible, the results obtained should be reported back to management, who gave the original directives. The analyses will also be better performed if the reason for not obtaining goals has to be reported to management. Based on this, the author suggests the following routine for follow-ups of measurement results within VBC.

For Main and Sub Processes

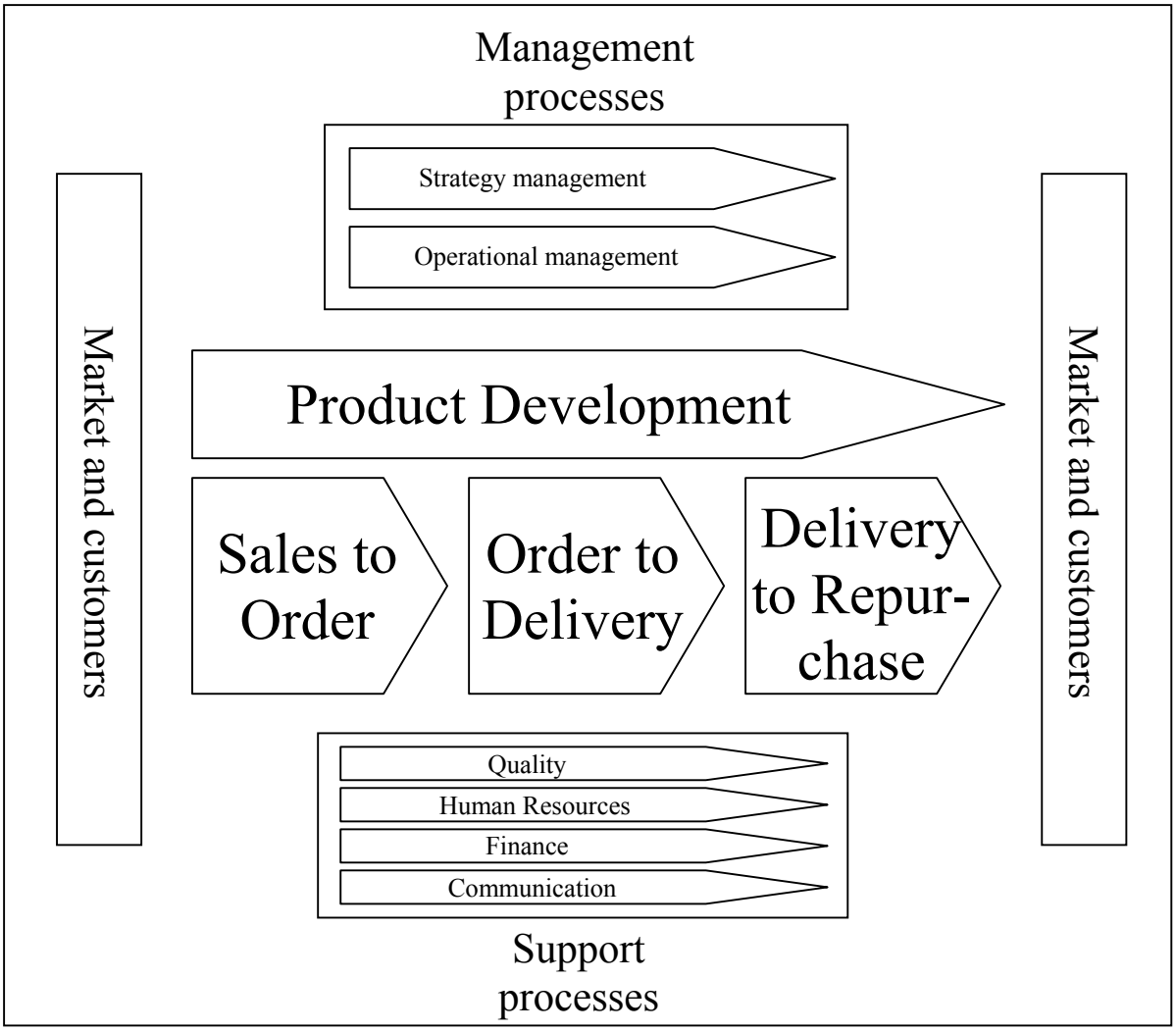
Forum:	Change group
Responsible person/role:	The process owner
Interval:	Every other month
Purpose:	Report from the process team measurement analysis Show how the process contributes to fulfillment of overall goals Facilitate cross-functional cooperation Resource allocation
Tasks:	Update on process performance using the VBC Status Report Explanation for non-obtained goals Resource assurance Feedback to process team
Forum:	The main process team
Responsible person/role:	The person appointed as responsible for measurements in the main process/the sub process owner
Interval:	Fortnightly
Purpose:	Analyze the measurement results Review goal fulfillment Identify improvement areas
Tasks:	Complete the VBC Status Report Give feedback/rewards to process employees Make action plan for problem solving/appoint problem solving teams Report to Change group

For Sub Processes

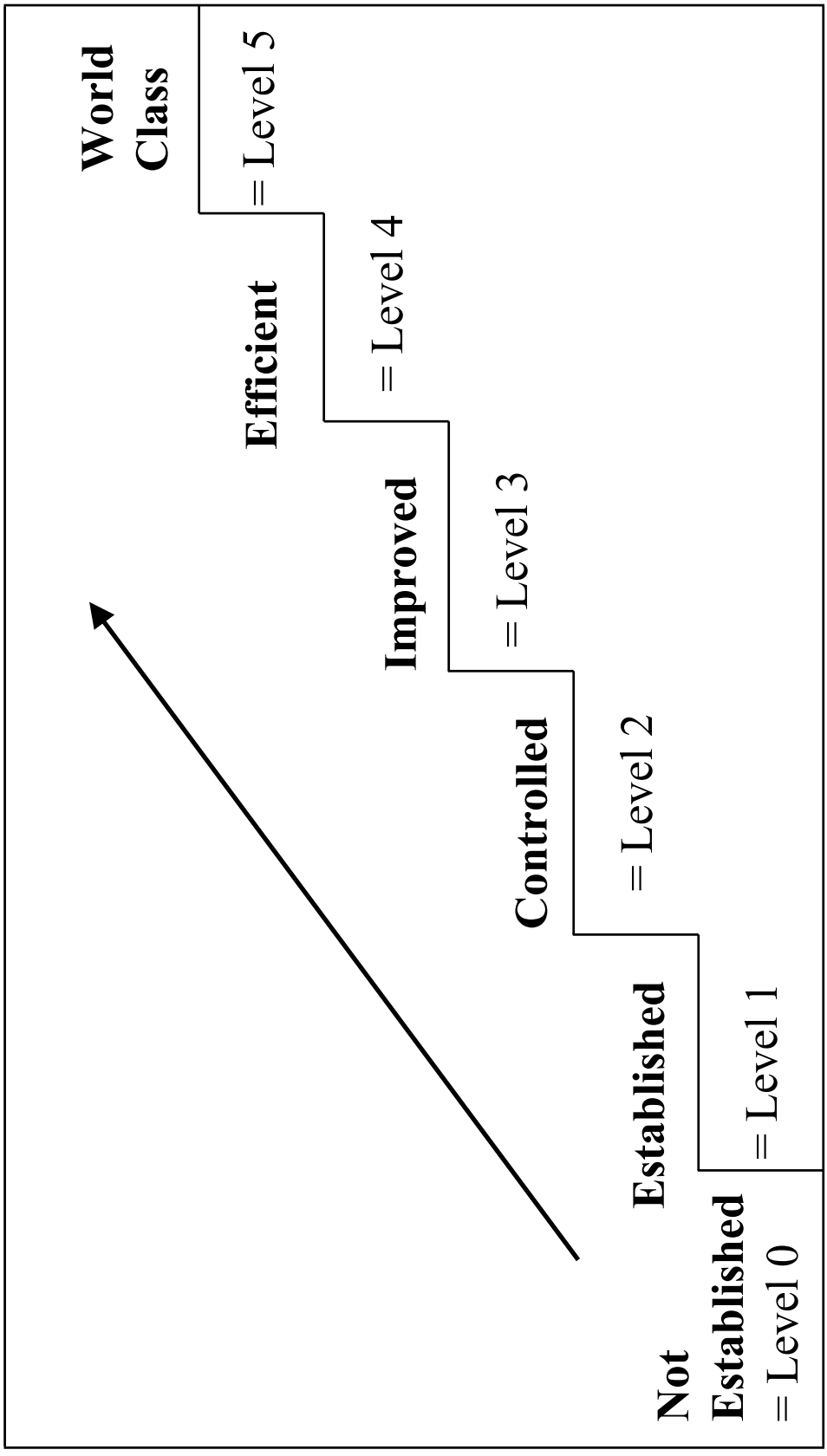
Forum:	The sub process team
Responsible person/role:	The person appointed as responsible for measurements in the sub process
Interval:	Fortnightly
Purpose:	Analyze the measurement results Review goal fulfillment Identify improvement areas
Tasks:	Complete the VBC Status Report Give feedback/rewards to process employees Make action plan for problem solving/appoint problem solving teams Report to main process team

Observe that this procedure only includes the purpose and tasks for performance measurement follow-ups. There are many more issues to discuss that relates to processes and process management, as for example process assessment plans according to the VPIS, but they are not included in this proposal.

Main Processes at VBC

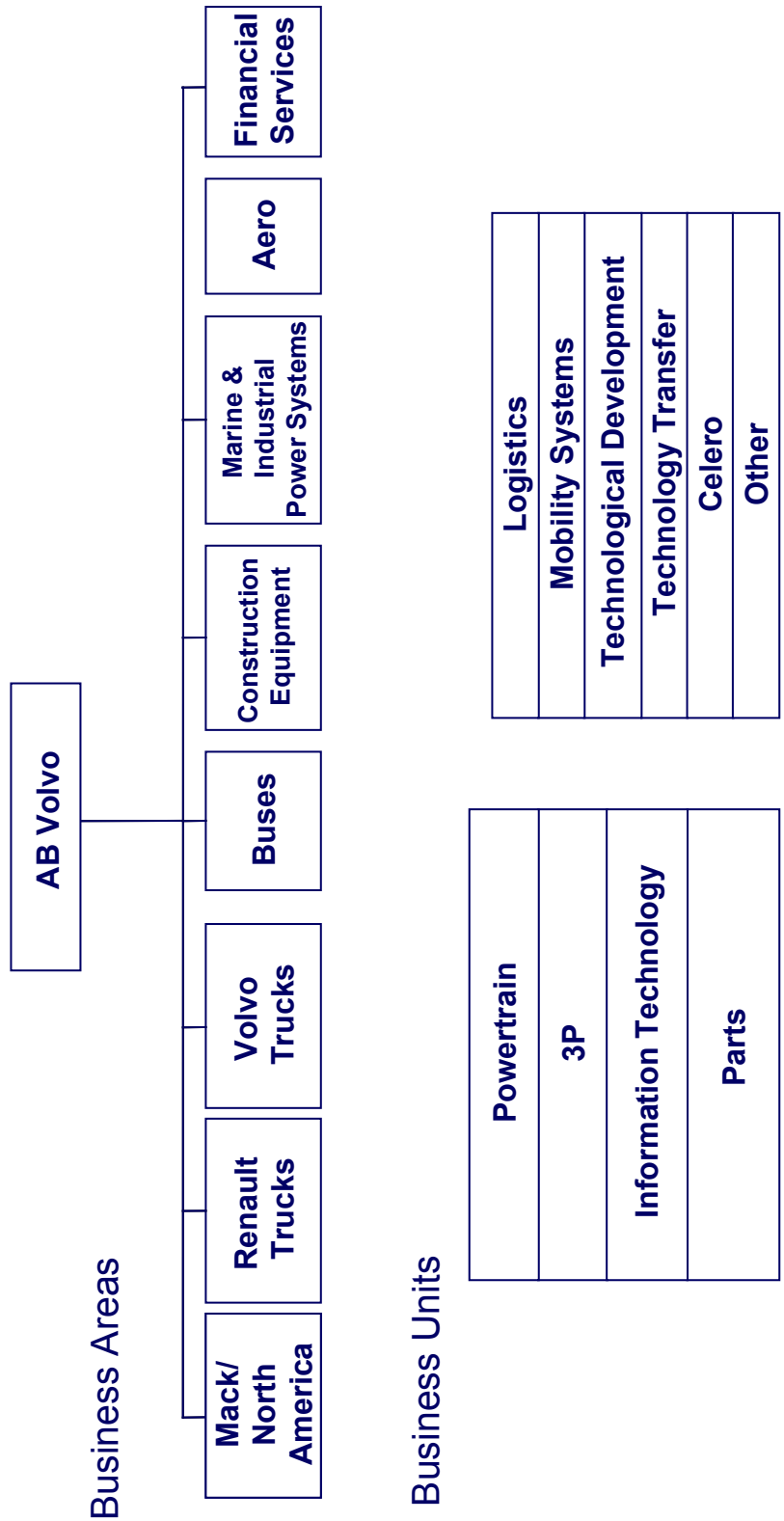


The Volvo Process Implementation Scale

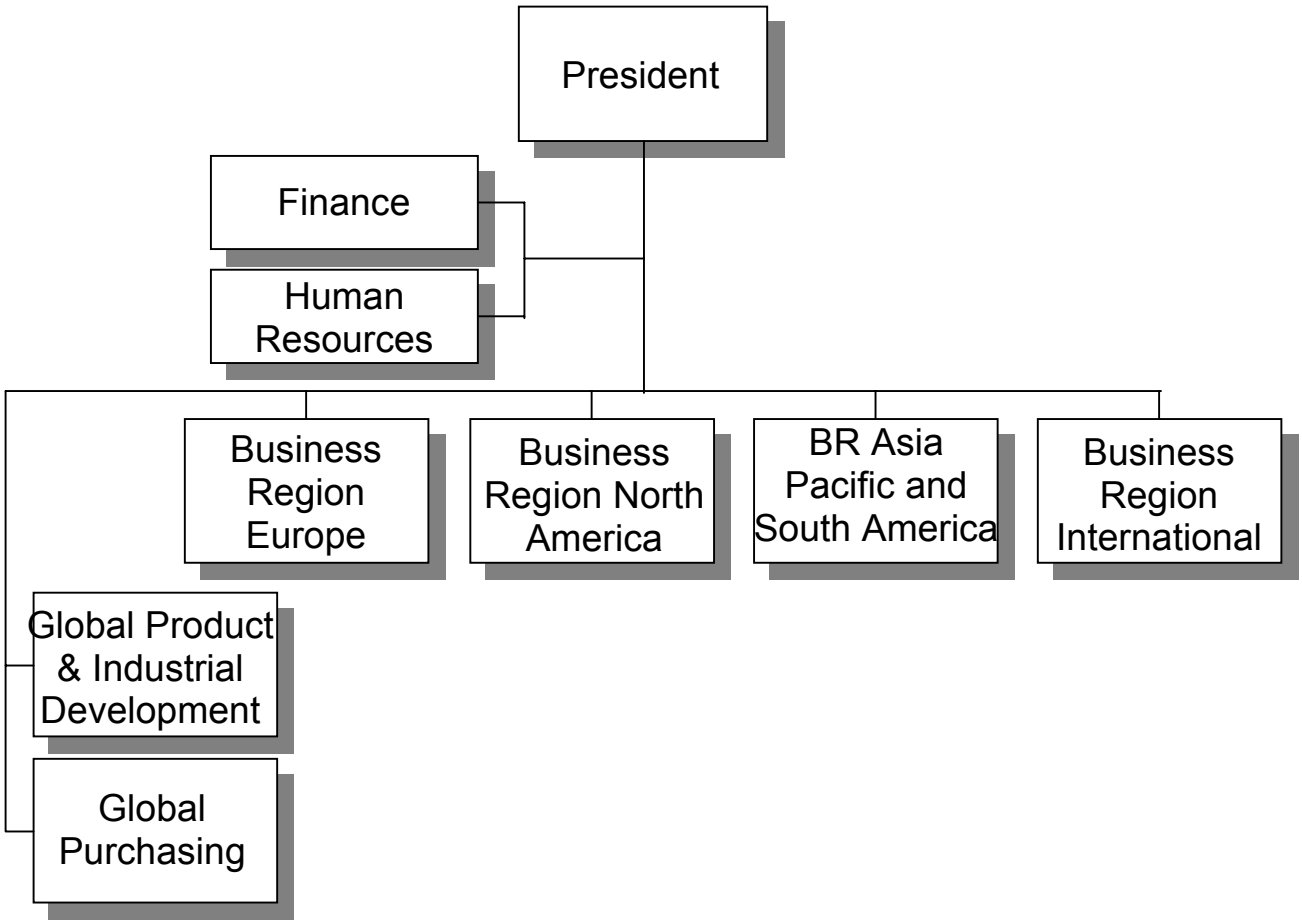


Level	Status	Description
0	Not Established	The Process is not described, mapped or manned with resources. A systematic change work has not been initiated.
1	Established	A Process directive has been established.The Process is described, mapped and manned. Surveys which corresponds to the customers demands have been initiated. Development and Performance objectives have been established for the process.
2	Controlled	Level 1 +.The Process is worked to according to documentation. Development and Performance objectives for the process have been established and signed off. The process improvement work has been initiated. The process input and output is systematically measured and controlled.
3	Improved	Level 1,2 +.Improvements have been made to the process as well as planned improvement work.The surveys shows noticeable improvements of the process. Plans for developing the process to a “To be” status have been developed. Benchmarking activities have been initiated.
4	Efficient	Level 1,2,3 +.Most performance objectives are fulfilled. Clear measurable improvements can be shown.The development of the process is done in a systematically and prioritized way, established plans for the process are followed. Facts from benchmarking activities are utilized.
5	World-class	Level 1,2,3,4 +The process is one of the top ten in the world. It is continuously improved in order to hold its world class status.

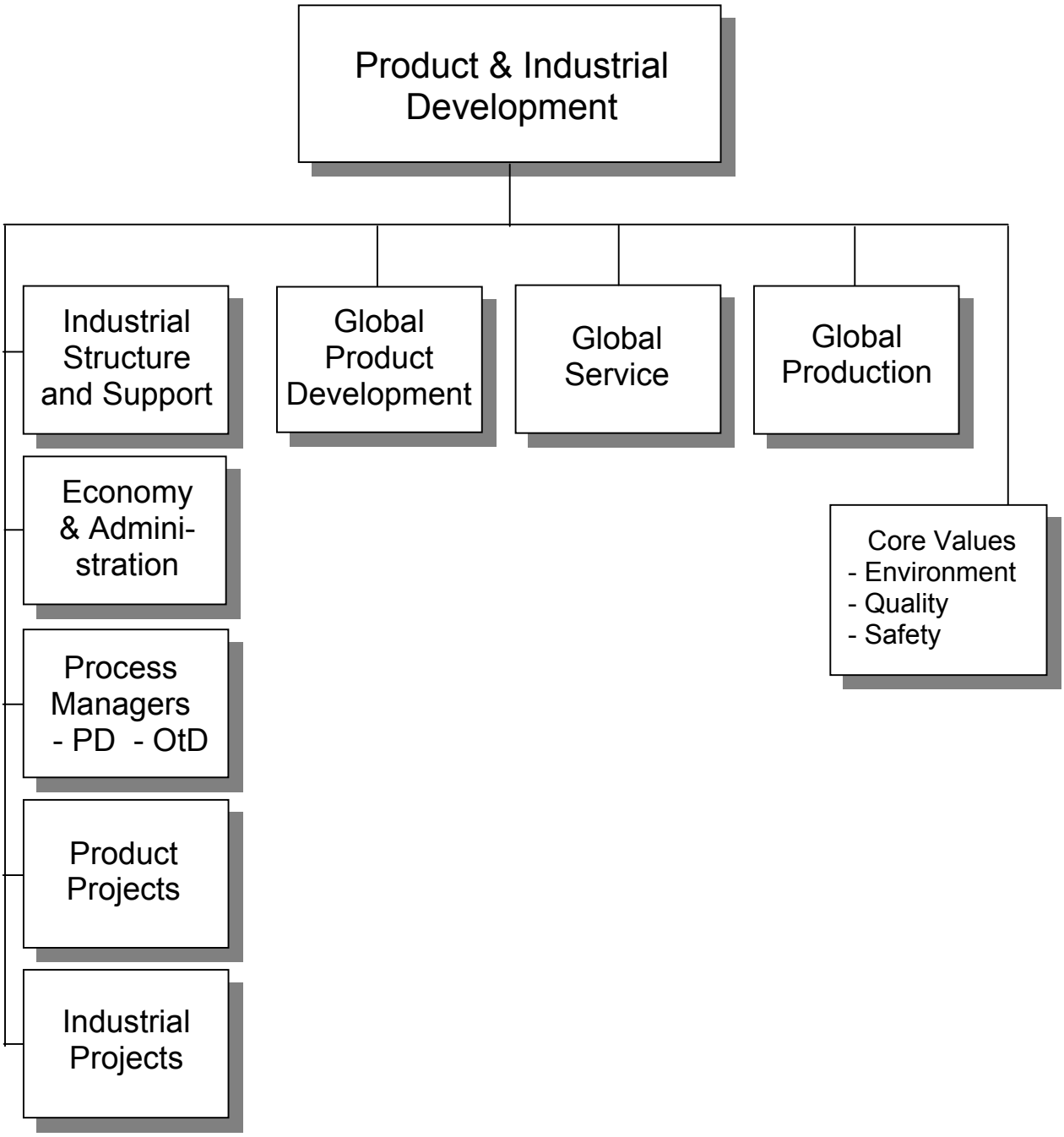
Organizational Chart of Volvo Group



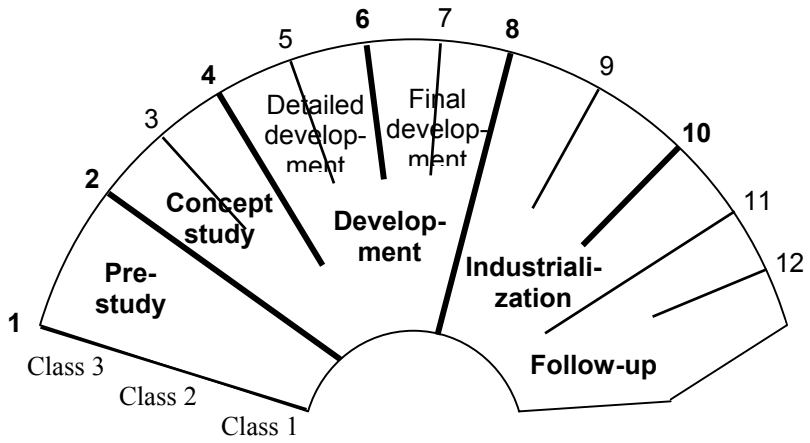
Organizational Chart of VBC



Organizational Chart of PID



The Phases and Gates of the GDP



Gates:
1. Product change initiation
2. Concept study gate
3. Concept gate
4. Development gate
5. Freeze gate
6. Final development gate
7. Equipment gate
8. Industrialization gate
9. Pre-production gate
10. Launch gate
11. Release gate
12. End gate

Different Project Classes

The lines in the fan shaped figure above are of three different lengths. That is because there are three different project classes in the GDP.

- Class 1 does not require any new design or testing, but include only administrative changes, and is therefore placed closest to the middle of the circle. It only passes gate 2 and 8.
- Class 2 projects concern existing products for which a new engineering design is required. Projects in class 2 pass gate 2, 4, 8 and 11.
- Class 3 is for new products or major changes to existing products. These projects go through all gates in the GDP.

The Phases and Gates

Gate 1: Product Change Initiation
A need for a product change has been created due to changes in the market, the industrial system or legal requirements.

Pre-study
The product modification request is developed into preliminary project prerequisites. Then a plan for the concept study is established and the planning for the entire project is started.

Gate 2: Concept Study Gate
- ✓ Decision documents are ready for Concept Study decision
- ✓ Resources are assured for Concept Study

Concept study
The design concept is chosen, and a general packaging is made of areas that have long lead times.

Gate 3: Concept Gate
- ✓ A full-scale concept model has been developed
- ✓ The product design concept has been selected
- ✓ The packaging concept has been defined within long lead time areas
- ✓ The requirement specification has been created for concept gate
- ✓ A Chief Project Manager (CPM) has been appointed

Concept study continued
The project prerequisites are broken down to more specified goals, earlier experiences are studied in so-called White books. Key components are identified and a project assurance plan is made, containing all important activities throughout the project. A test plan is prepared, and finally a project description is created that describes how the project should be carried out.

Gate 4: Development Gate
- ✓ Decision documents are ready for Development decision
- ✓ A test plan has been established
- ✓ The full-scale model has been updated
- ✓ Packaging concept has been defined in all areas
- ✓ Steering group and project organization has been determined and fully equipped
- ✓ Component projects are synchronized with vehicle project
- ✓ Decision on advanced engineering projects[1] are included
- ✓ Key components are identified
- ✓ Resources are assured for detailed development

Detailed Development
All surfaces and packaging are ready to be frozen, thus they may not be changed later on. Competitive components are analyzed and legal requirements checked.

Gate 5: Freeze Gate
- ✓ Digital Shape Model (DSM) frozen
- ✓ A-status packaging has been approved
- ✓ Competitive component analysis has been performed

[1] Advanced engineering projects are separate projects for creating new technological solutions.

Detailed development continued
All parts concerned are defined and suppliers for key components are chosen. Preparations for manufacturing and after market are started. Other projects that are to be implemented have to be in phase with the project.

Gate 6: Final Development Gate
- ✓ Decision documents are ready for Final Development decision
- ✓ Part records are ready
- ✓ Possible carry-back items has been identified
- ✓ Key component suppliers has been selected
- ✓ Detailed packaging has been approved
- ✓ Documentation is ready and updated
- ✓ Prototype vehicle is operational
- ✓ Manufacturing and assembly preparation has been started
- ✓ After-market preparation has been started
- ✓ Resources assured for industrialization and follow-up
- ✓ Component projects are synchronized with vehicle project

Final Development
Orders of parts with long lead times are prepared. Is there a need for training material for After-market and/or Production?

Gate 7: Equipment Gate
- ✓ Ready for procurement of tools and equipment with long lead times
- ✓ Packaging has been verified
- ✓ Vehicles/components are ready for testing
- ✓ Need for training material has been assessed

Final Development continued
All remaining suppliers have to be selected, and orders prepared. Synchronization with other projects has to be assured once again. Does the product comply with the requirements?

Gate 8: Industrialization Gate
- ✓ Decision documents are ready for Industrialization decision
- ✓ Development testing has been approved
- ✓ All suppliers has been selected
- ✓ Documentation is ready and updated
- ✓ Part status verified to be ready for Industrialization decision and tool ordering
- ✓ Component projects are synchronized with vehicle project

Industrialization
Tools and production equipment are bought, and personnel ready for low-volume production. After-market is prepared for series production. All new parts must be manufactured to see that everything works as planned.

Gate 9: Pre-Production Gate
- ✓ Documentation is ready and updated
- ✓ Initial sample test has been approved
- ✓ Production start is prepared
- ✓ After-market is prepared to provide service, parts, and training at series production start

Industrialization continued
Production/product quality has to be approved. Can series production start as planned?

Gate 10: Launch Gate
- ✓ Product quality has been approved
- ✓ Fit and finish against drawings is final and approved
- ✓ Production is ready to phase in new/phase out old components and systems

Industrialization continued
All parties involved participate in the product release sign-off to be sure that the product is really ready for series production. The product release must be specified for each market.

Gate 11: Release Gate
- ✓ Product release signed off

Follow-up
A White book is created where the experiences from the project are documented to help future projects. There has to be an action plan for all possible remaining problems. Responsibility is handed over to the line organization.

Gate 12: End Gate
- ✓ All quality targets has been reached
- ✓ Project responsibility has been handed over to the line organization
- ✓ White book is completed

Questionnaire

- What's your role

- in the organization?
- in the Process Management work?

- What do you thereby consider to be your responsibilities?
- Do you think that you have had enough education and training in the area to perform your tasks?
- Do you feel that management are giving support and commitment for the implementation of process management?
- What do you consider to be a function, a department, and a process?
- What is process management to you?
- What do you consider to be the purpose of implementing Process Management? What should we accomplish?
- How do you look at the future for VBC?
- Do you think that using guidelines a/o a toolbox can lead to a successful implementation of Process Management through the entire organization? If not, what does it take?
- What kind of aid do you need to perform your part?
- Do you feel that there is a problem in allocating/getting access to resources for the Process Management work?
- General thoughts on Process Management?
- Are any of "your" processes assigned to be a part of the pilot project? In that case which one(s)?
- Is there a process map for your process?

Interviews

This is a direct rendering of the interview respondents' answers, and therefore, the statements made are not facts but the respondent's personal opinions. For the interview questionnaire, see Appendix 6:1.

Interview 1

According to the Senior Vice President of VBC, the process management work is all about doing the right things at the right time. An organization needs rules and routines, and process management is the best way to go about this matter. The respondent, who functions as a sponsor for two main processes and a support process, defines as his role to make sure that the process owners stay motivated and competent, and that they have an improvement plan to work with. He also demands results from his process teams, and a forum that is used to discuss this in is the so-called Change Group where, amongst others, the process owners and the sponsors participate.

The situation at hand makes it a harsh environment for implementing Process Management. One problem that managers are constantly concerned with, is where to get the resources to make the process work function satisfactory. There are two sides of the resource issue, the economical resources, and the human resources. Dealing with human resources is a matter that takes great delicacy. The employees have to be managed with clear directives, but still they have to feel motivated and really understand why the task has to be done. It is hard to prioritize process management work, since so much energy has to be invested in it, and it does not give an immediate effect but a middle-long to long term improvement. The risk is that the organization tend to focus on "fire fighting" to solve the short-term problems.

As of right now, the implementation of Process Management at VBC focuses on the organizational issues, and the practical work is partially left behind. This is just a temporary situation, though. Process Management has many aspects, and it is hard for the organization to cover everything at once. The concentration just happens to be at organizational issues right now, but everything is going to be covered.

Management support and commitment is of vital importance for implementing Process Management. Today, this is not as good as can be expected at VBC. Management does not yet have a common focus and are not working in the same direction. Action must be taken to correct this before a company wide implementation can work properly.

Interview 2

A Quality Engineer at the department for Product Development agreed with the Senior Vice President on many issues. She is involved in the implementation of process management as a leader of the process improvement team meetings for a sub-process to Product Development. She also functions as the link between Product Development and the Quality Department.

The department for Product Development has a very vague conception of Process Management, what it means and why it should be used. There is also a lack of training and education, which might lead to misdirected work proceedings. The only tool the team is using today is the Volvo Process Implementation Scale (see Appendix 3), which is a good help for the implementation, but not sufficient by itself. To the respondent, the purpose of using Process Management is to see the holistic picture and how it is connected by workflows. It gives the employee a bigger responsibility, and facilitates continuous improvements. The guidelines and the toolbox that are to be developed are going to be a big help for implementing Process Management, but what is even more important is to get management to show support and commitment. Without management backing up the resource allocation and demanding results, no one is going to fully commit to their assignments.

For process management to work, the Quality Engineer identifies four major needs:

- Trained Process Management facilitators
- Management commitment
- Communication of advantages obtained by using Process Management
- Extensive education and training

All employees of the organization must reach an understanding of Process Management, and why it is important. The best way to accomplish this is through communication and education, which must be acknowledged and supported by management.

The management within the department of Product Development does have knowledge about Process Management, but the priorities are elsewhere. The decision routes in upper management are not clear, and when top management does not communicate their message strongly enough, it does not get spread in the organization. The resource allocation problem exists here too, but there is a motivation within the department to

work with processes, and fortnightly Process Management meetings are conducted.

Interview 3

A former quality manager at the department of Product Development says that they did not know how to apply the principles of Process Management the last time they tried to implement it. Management were not very supportive, and did not demand results strongly enough. This combination, together with the declining economical situation, made the implementation come to nothing. Another insight provided by the respondent is that many of the middle managers have been working at VBC for a long time and they are used to working in a certain way. Therefore they can find it difficult to adopt the concept of process work, and if they are not convinced, their subordinates will probably not be either. It is a matter of priorities.

The respondent sees as the main purpose with Process Management to learn to balance the need for resources and the actual access to resources. It can not be forgotten to set aside resources to handle "fire fighting", or else the resources meant to work with Process Management will be forced to handle the acute errands instead. He also emphasizes the need for clear interfaces within processes, since it is very important to identify areas of responsibility for the employees.

The problem with assigning resources to Process Management seems to exist everywhere in the organization. This is fairly understandable though, considering the situation the company faces today. The general knowledge about Process Management is not sufficient. Management has to communicate the benefits of Process Management, or else it will not be prioritized. Goals and objectives have to be clearly defined on every level of the organization. A problem for VBC is that it is hard to measure functions that affect the customer, because the lead-time is relatively long, approximately a year. It can therefore take a couple of years to get feed back on the products, which in many cases makes it meaningless. One solution to this problem is to try to find internal measurement points that still measures things that are important to the end customer.

Interview 4

The facilities in Gothenburg do not have any kind of manufacturing, this is done partly in Borås, chassis, and then completed with a body in one of the various plants across the world that handles this (see the map in Figure 4.1). Therefore, the main process Order to Delivery does not exist in Gothenburg, so an interview with the person who handles process

development in Borås was conducted. His responsibilities is to keep the work with processes alive, to develop the existing processes, and to try to find synergies between similar processes in the different production plants around the world. He thinks that the knowledge about Process Management in the organization is quite sufficient, when Process Management for him is all about mapping processes and finding areas for improvement originating from these maps.

He defines as the main purpose of Process Management to put focus on the activities in interfaces and to manage and develop processes. It is a tool for Operational Development. Too much focus on the implementation of Process Management should be avoided. According to the respondent, everyone will learn the techniques once you start to work with it.

One of the reasons why the last implementation did not succeed could have been that management was replaced right then, and did not really have a genuine interest of the issue at the time. The process owners were motivated and willing to work with Process Management, but since management prioritized other things, the process work was left behind. The new approach to start the implementation on selected pilot processes is not optimal for the OtD-process, because of the many different routes that a product can take.

The respondent regards the Volvo Process Implementation Scale as a helpful tool to implement process thinking in the organization, but suspects that it can lead to management demanding results on paper rather then in reality. He is also skeptical to too much detail control in the processes, he wants the process maps to contain roles, activities, and a timescale – nothing more.

Access of resources is not a problem in his work today, but if Process Management is made too big of a deal, and too many teams are appointed, resource allocation is going to become a problem. Right now, the only problem is to find a time for the process team to meet that suits everyone, since the members are from all over Europe.

The most critical issue regarding the OtD-process right now is the accuracy of the input from preceding processes. There are often problems in the interfaces between processes, what one process considers their outgoing object is not what the next process considers their incoming object.

Interview 5

The manager of Global Production, who also functions as the process owner of the OtD-process, believes that his responsibilities as a process owner is to develop the process, by identifying important aspects, deciding on measurement points, and focusing on what is important to the customer. Knowledge about Process Management is not very wide spread in his department today, but he believes that a "hands-on" approach together with suitable assignments will be the best way to bring in the process thinking in the organization. This, of course, has to be used in parallel with general Process Management education and training, and the different roles and responsibilities have to be clearly stated. As of right now, there is a confusion on responsibilities that prevents the implementation of Process Management to function properly.

The respondent feels that management shows varied levels of commitment. There are many different opinions on what Process Management means, but the general interest for the topic seems to have increased.

The purpose of Process Management described by the process owner of OtD is to develop work routines and systems that can be used by many. A lot of unnecessary work can be avoided by learning from each other. Big parts of the production process can be standardized worldwide by benchmarking the most successful factory on a sub-process level. With a long-term perspective, even external benchmarking can be performed to reach world class.

The Volvo Process Implementation Scale is a good and useful tool in the respondent's opinion, but more knowledge and help on how to use it is needed. He would like to see a checklist/template for measuring where in the scale the process lies.

Resource access is a general problem, but OtD is starting to get a decent level on the process work. They already have a benchmarking work method, they are standardizing according to best practice, and they have an OtD-team including all of Europe. The risk, according to the respondent, is that of over-administration, which makes people's engagement decrease. Right now, a problem is that the different processes are not in synch in the process work. If they were more in the same phase, an increased understanding for each other's situation would facilitate cooperation and mutual learning.

Interview 6

One member of the Expert Team, from Product Development, expresses the need of education explaining *why* Process Management is important. For one on an overarching level reaching every employee, and then in detail to the people directly involved in the implementation work. There has to be a common perception of roles, interfaces and definitions to avoid misunderstandings in the process work. One example is the responsibilities of a functional manager and a process owner. It is possible for one person to have both roles, but then the roles and their responsibilities have to be very clearly defined. If the roles are separated, there is a big possibility of conflicts, since the process owner is allowed to decide on things that are part of the functional manager's area. This can be avoided if clear definitions are stated from the beginning.

The experiences of the respondent shows that working with processes are common in two situations; when prospering, or when in crisis. To make process work a part of the daily work, she suggests that Process Management should be a constant issue on for example department meeting agendas. Management also has to demand results to make something happen.

The purpose of Process Management is, according to this member of the Expert Team, to manage and steer the organization in an effective manner, regarding resources and goals. This leads to repetitive activities and double work being eliminated, and an efficient and well-organized work routine being created. The guidelines and toolbox that are being developed to support the Process Management implementation is clearly needed, but management has to show a bigger demand for this, or else there is a risk of priorities being directed elsewhere. Management could also demand that each department should reserve a certain amount of man-hours for Process Management work.

Interview 7

The deputy manager of the Product Development department implies that there is knowledge about Process Management in the organization, but it is just spread among a fortunate few. The guidelines and the toolbox will be a good help for spreading the knowledge, provided that the employees understand why they need to learn this.

The respondent feels that management is interested in Process Management, but the priorities sometimes tend to be focused elsewhere. As have been stated in earlier interviews, "fire fighting" is a big resource thief.

For Process Management to work, education and training for everyone is a must. The main objective for this is to try to make everyone understand *why* it is important to use Process Management.

Interview 8

The process owner of DtR, sees it as his responsibility to develop the process towards world class, and to make the process more efficient. The purposes of Process Management are in his opinion:

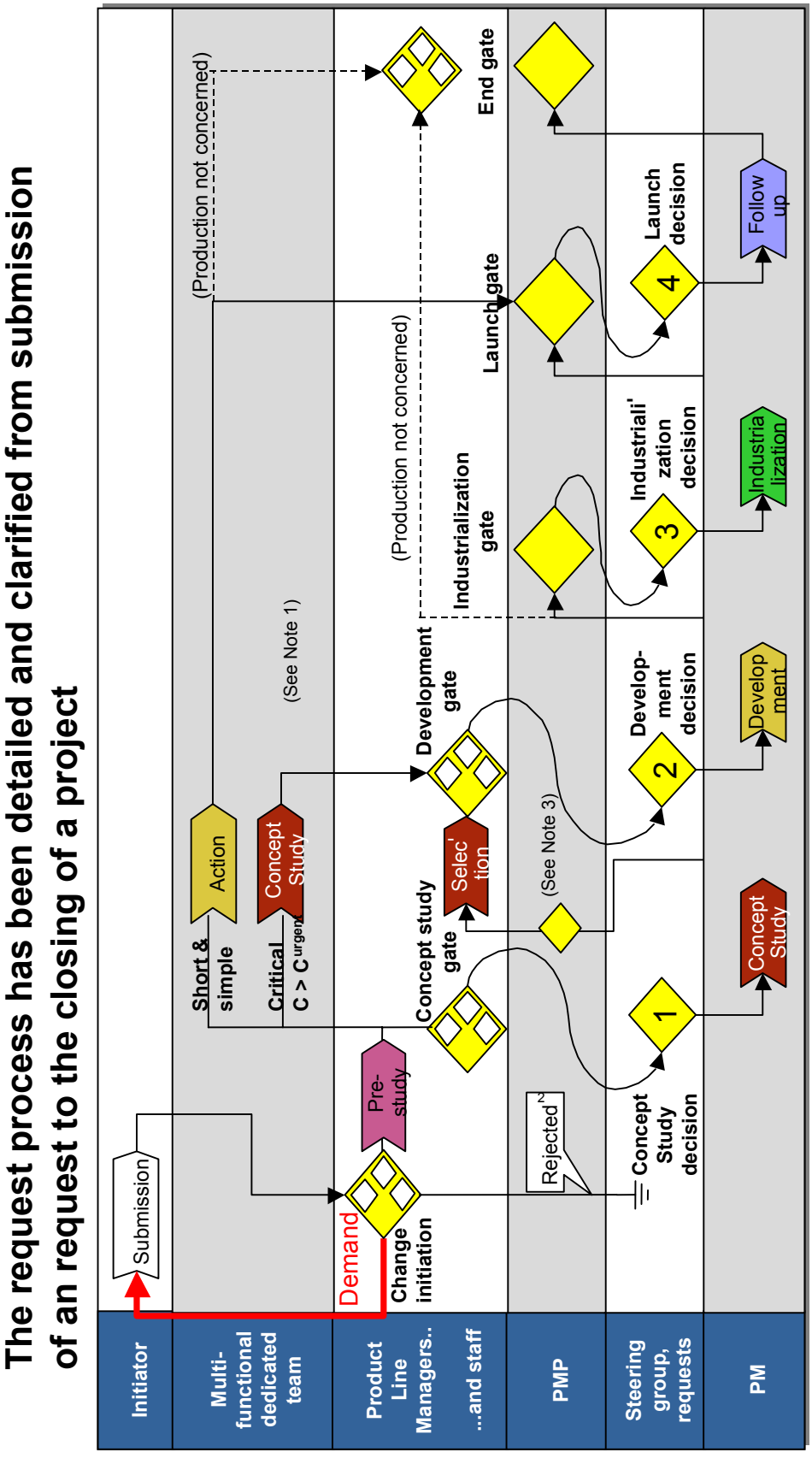
- to be more efficient regarding lead time and cost
- to work smarter
- to waste less resources
- to gain synergies between processes

Interview 9

The process owner for StO defines the responsibility of a process owner to be to develop the process in order to satisfy the customer. The delivery is according to him, a crucial part of the process. There is not enough motivation today to work with processes, and since the sales organization is very focused on profit, it is hard to show where the pure profits are in process work. They are afraid of all administrative details, which would practically disappear if Process Management worked as intended.

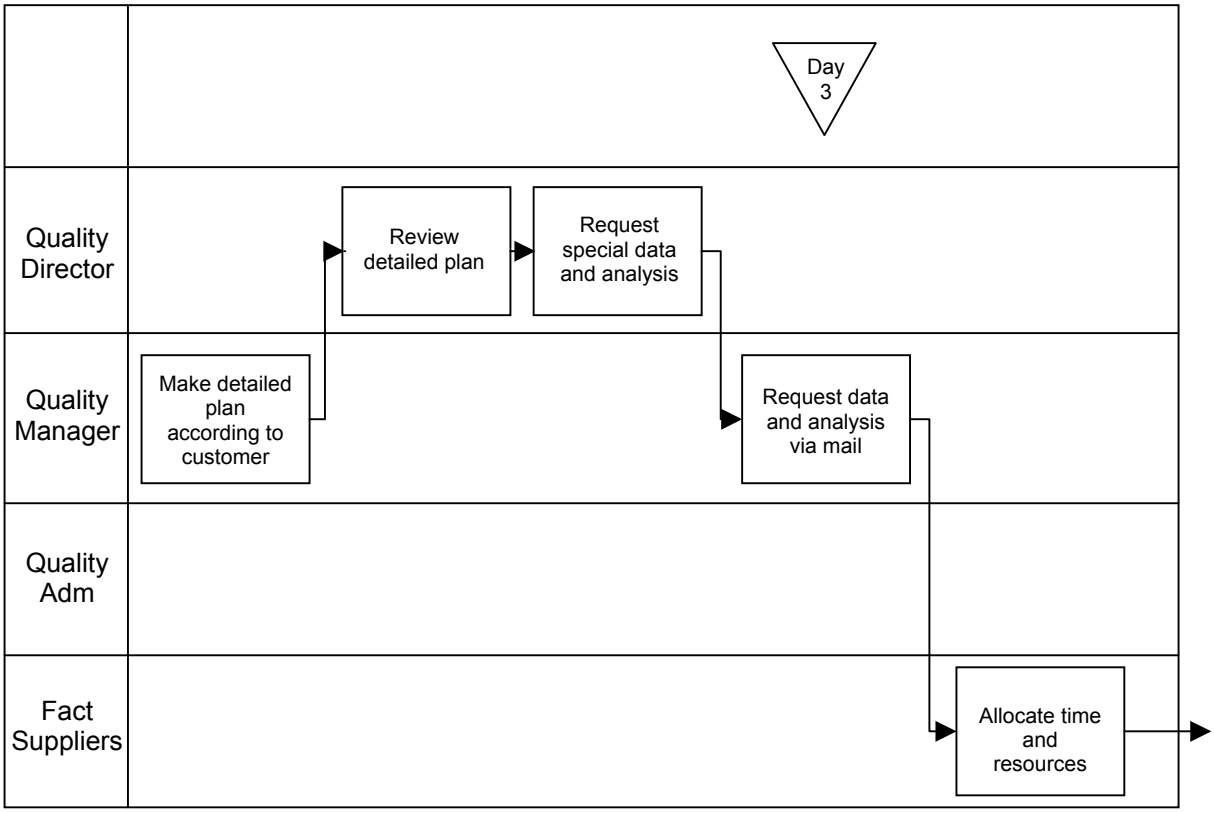
To this respondent the purpose of Process Management is to increase profitability, and more specific return on capital employed. Increasing customer satisfaction is also a big part of this. He emphasizes the importance of customer loyalty, and implies that Process Management would lead to higher quality sales persons.

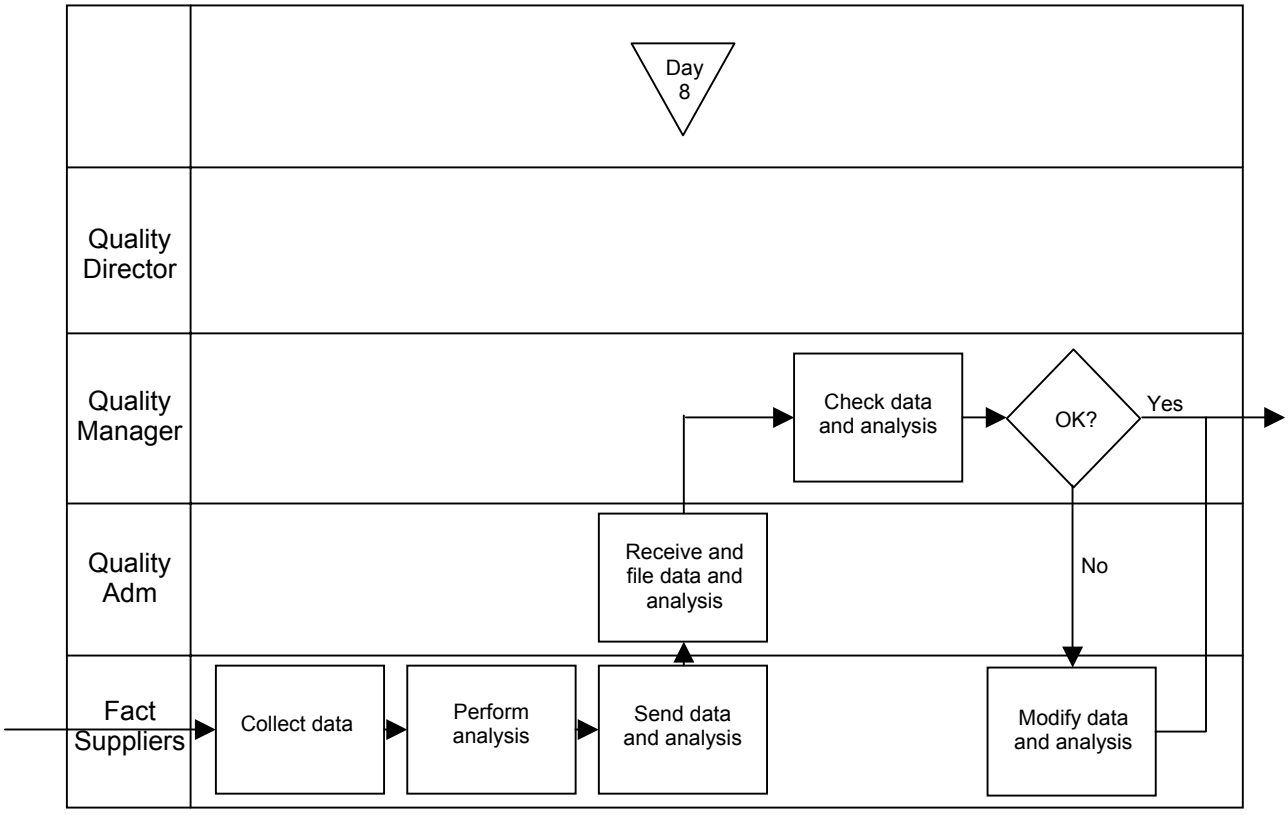
Request Process Map

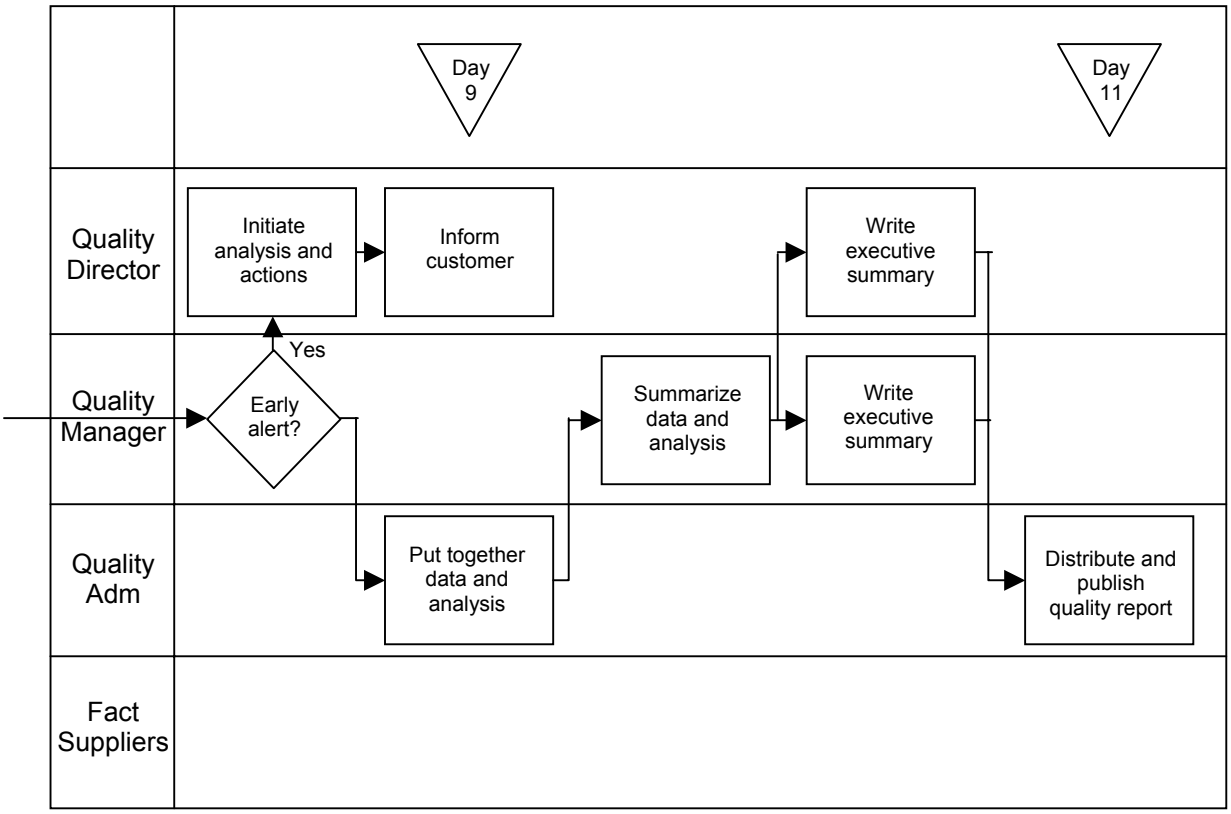


1 Steering Group requests checks and validates the decisions of the PL Managers for Critical
2 Rejected requests can be sent back to initiator, be sent to Product Planning, be sent to AEC
3 Before getting Development decision, projects need to inform and get OK from PMP.

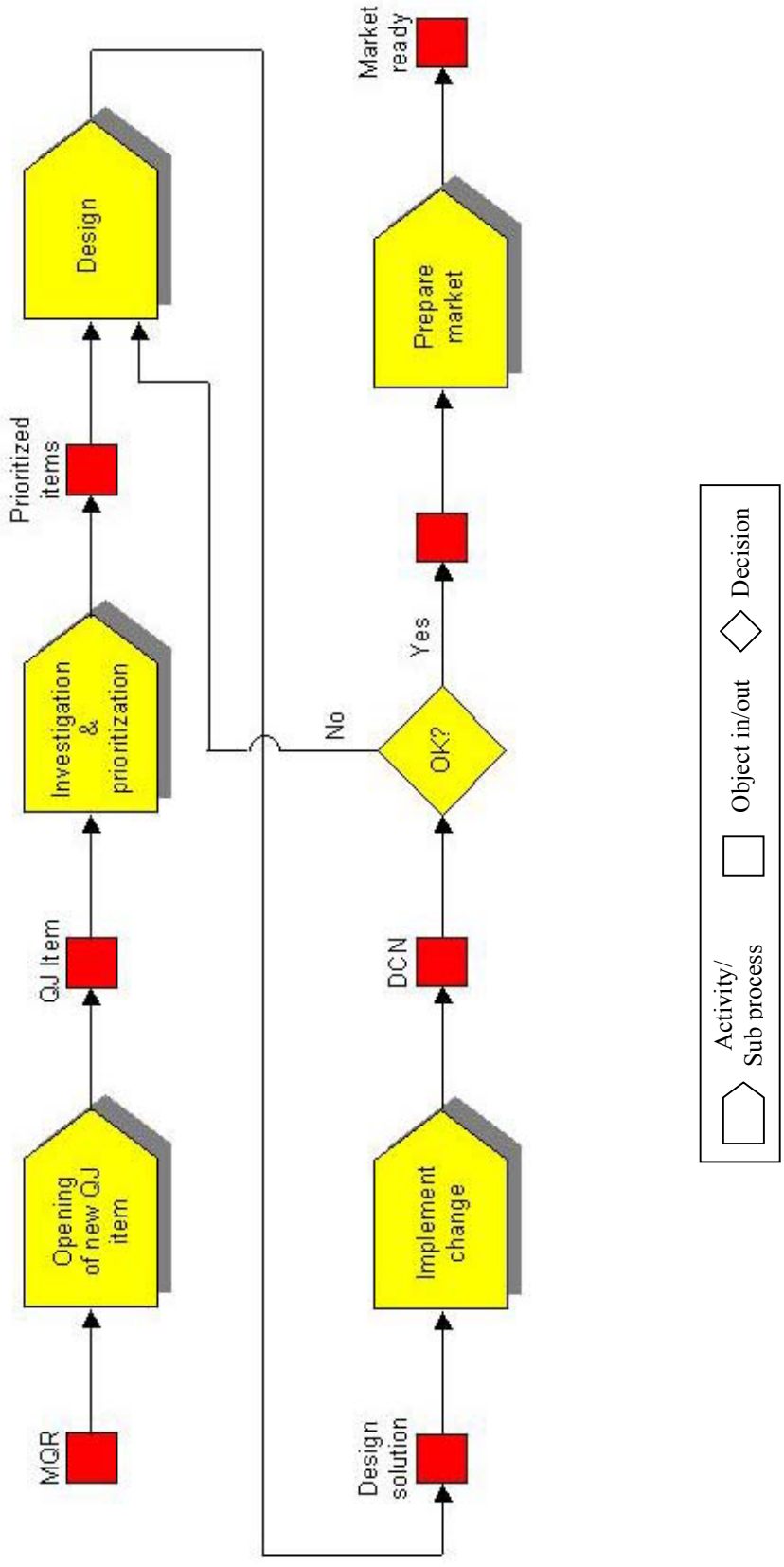
Quality Report Process Map






Day 9
Day 11
Quality Director
Quality Manager
Quality Adm
Fact Suppliers
Initiate analysis and actions
Inform customer
Write executive summary
Yes
Early alert?
Summarize data and analysis
Write executive summary
Put together data and analysis
Distribute and publish quality report

Flow Chart for the Product Problem Process



Benchmarking Partner Analysis

Measure	Volvo Buses Corporation	Volvo Aero Corporation	SSAB Tunnplåt
Company turnover	17187 Msek	10,73 Msek	9,5 Msek
Number of employees	10124	4240	4000
Ownership of business	Public stock	Public stock	Public stock
Industry focus	Bus chassi and complete buses	Aircraft industry	Steelworks
Organization structure	Functional organization with process overlays	Functional organization with process overlays	Functionally oriented
Type of manufacturing	JIT	-	Batches
Company formality	Semiformal	Semiformal	Informal
Employee participation	Medium	Medium	Good
Communication	Medium	Good	Good
Core competencies	Industrial production of bus chassis	Material techniques and manufacturing methods	Leaders that takes care of employees and let them evolve according to the company's and their own wishes

Business Performance Comparison

Measure	Volvo Buses Corporation	Volvo Aero	SSAB
Is the company implementing process management?	Yes	Yes	No, not at the moment.
Are the processes mapped?	No	Yes	Yes
Are the maps used for identifying measures?	-	Yes	Yes
Is there a structural method for identifying suitable measurement points?	No	Yes	No
Is there a method for implementing measurements?	No	No	Yes
Are the measurements focused on any specific factors?	Time, cost, and quality.	Lead time (+TQC)	No, though time is considered of great importance.
Who is responsible for measurements in the processes?	The process owner	The process team	The performance measurement group and management
Are there a specific method for setting goal for the measures?	No	Yes, the management process	The "target board"
Type of follow-up and reporting of measurement results?	-	Status report, presented at meetings	Meetings and intranet
Measurement analysis (e g 7QC)?	-	Yes, but not standardized	No
Does any kind of measurement transformations exist?	No	No	No
How are the important definitions documented?	Glossary on the intranet	Not at all	Not at all
Are balanced scorecards used?	On some projects	Yes, for each business area	As a basis for the "target board"

VAC Status Report

Statusrapport för processer

Huvudprocess*:** ***Datum:

Processägare*:** ***Teamledare:
Processponsor*:** ***Mötesfrekvens:
***Processteam*:**

***Direktiv*:** ***Processkarta*:**

A. Utvecklingsmål:

	Ej beskr.	Beskriv.	Faststt.	Förbättr.	Effektiv	Världs klass
Förslag						
Egen bedömn.						

B. Prestationsmål:

Mått	Nuläge	Mål	Tidp

C. Resultat uppnådda sedan föregående mätning:

D. Uppstartade delprocesser:

Delproc.	Direktiv	Karta	Proc.äg.	Utv.mål?	Prest. mål

VBC Status Report

Status Report for Processes

Process name:	Date:	Process map:
Process owner:	Team leader:	Process sponsor:
Meeting frequency:	Facilitator:	

Process owner signature

Process Team Members:

Assessment objectives regarding the Volvo Process Implementation Scale

	Level 1: Established	Level 2: Controlled	Level 3: Improved	Level 4: Efficient	Level 5: World Class
Suggestion (year/date)					
Result (ok/not ok)					

Performance objectives

Measure	**Goal**	**Current position**	**Finish date**

Results achieved since last meeting

Testing of the Request process

1. **Suggest a person/role to be responsible for measurements**
   Anna Lindström, team leader

2. **Try to find suitable measures for the process/product**
   – look at overall company goals, process vision etc
   Wanted position for the request process:
   * be sufficiently **efficient** to ensure that decision making is fast and consistent
   * deal **reliably** with market requests to secure delivery precision
   * a selection process and execution process that is **controllable**
   * high **quality output** from the process
   * open **communication** and possibility to monitor progress for all requests
   * **flexibility** to be able to adjust to customer needs and give satisfied customers

   – start out from the example list
   Based on the example list, these are the measures that can be suitable for this process:

Factor	Type of measure	Area	Subject	**Measure**
Cost				-
Time	Process	Flexibility	Response to product or volume changes	Time to market
		Customer and supplier relations		Delivery time to customer
		Process path		Share of waiting time related to total cycle time
	Output	Process path		Lead time
Quality	Process	Customer satisfaction		Perception in relation to expectation
			Reliability	Percent of on-time shipments
		Efficiency/ Productivity	Production related to resources used	Units produced per work day/week
		Supplier relations	Reliability	Percent of on-time deliveries
	Output	Customer satisfaction	Perceived quality	Perception in relation to expectation
			Conformance	Degree of conformance

– check with measure features

Time to market:	Basic requirements – 3 yes
	Other requirements – 6 yes
Delivery time to customer:	Basic requirements – 3 yes
	Other requirements – 8 yes
Waiting time/cycle time:	Basic requirements – 3 yes
	Other requirements – 7 yes
Lead time:	Basic requirements – 3 yes
	Other requirements – 7 yes
Perception/Expectation:	Basic requirements – 3 yes
(process)	Other requirements – 6 yes
On-time shipments:	Basic requirements – 3 yes
	Other requirements – 7 yes
Units produced per week:	Basic requirements – 2 yes
	EXCLUDED
On-time deliveries:	Basic requirements – 3 yes
	Other requirements – 8 yes
Perception/Expectation:	Basic requirements – 3 yes
(output)	Other requirements – 6 yes
Degree of conformance:	Basic requirements – 3 yes
	Other requirements – 5 yes
	EXCLUDED

– Make a balanced choice of measures according to information obtained

Chosen measures:

Time –	Process –	**Delivery time to customer**
	Output –	**Lead time**
Quality –	Process –	**Percent of on-time deliveries**
	Output –	**Perception/Expectation**
Cost –	Output –	**Actual PMR cost/Planned PMR cost**

– look at factor definitions, making sure that TQC really are measured, and that they are measured in their right context

Time – OK

Corresponds to the definition in Appendix 1:4.

Cost – Not OK

There is no part in the process wanted position that regards costs involved in the process, and therefore no cost measures can be suggested in connection to the process wanted position.

Quality – OK

Corresponds to the definition in Appendix 1:4.

Suggested cost measures for the request process, although *not related to the process wanted position*, is:

Process measures:	Actual cost related to budgeted cost
	Mean cost of PMR:s
	Cost of non-value adding activities
Output measures:	Actual PMR cost related to planned cost
	Cost of wrong deliveries

– look at overall company goals and process vision again, making sure that the measures chosen comply with these

Chosen measures OK, with the exception of the cost measure that does not correspond to the process wanted position.

3. **If possible, decide on expected performance**

   Process knowledge not extensive enough to state expected performance of the measures of choice.

4. **Use the process map to identify measurement points in the process where the measurements are easiest to conduct**

   Delivery time to customer can be measured internally from when the initial decision has been made until the issuer of the E-form gets the answer.
   Lead time can be measured between development gate and end gate.
   On-time delivery can be measured in one of the following places:
   - P release
   – SP start

   Customer satisfaction in terms of perception related to expectation, can be measured either on internal or external customers.
   The actual cost should be compared to the planned cost when the PMR reaches end gate.

5. **Suggest a measurement method and write a short description of why it was chosen and how it works**

   Delivery time to customer – get date for change initiation from data log and compare to date when the issuer got the answer
   Lead time – summarize input from data log
   On-time delivery (yes/no) – compare original plan with actual date in data log
   Customer satisfaction (perception/expectation) – perform internal or external customer surveys
   Actual PMR cost/planned PMR cost – compare costs in calculation

made in the Capacity Planning Tool

6. **Suggest a measurement interval, and motivate it**
   Delivery time to customer – monthly, to be able to adjust according to results
   Lead time – quarterly, to see trends
   On-time delivery – monthly, enough PMR:s have to be delivered to make a basis for analysis
   Customer satisfaction – yearly, it is hard to demand more information from customers
   Actual/planned cost – monthly or quarterly, depending on how many PMR:s that are completed

7. **Suggest where and how the results should be analyzed, with respect to the prior decisions in 1, 5 and 6**
   The measurement results are suitably analyzed by the responsible person for the measurements in the request process, and then presented and discussed at the request process team meetings. The analysis should at least consist of comparison to prior results, and a diagram showing trend and measure objectives.

8. **Suggest goals if expected performance is decided on, otherwise point out in which direction the measure strives**
   Delivery time to customer – should be minimized
   Lead time – should be minimized
   Percent of on-time deliveries – should be maximized
   Customer satisfaction measured in perception/expectation – should be 100% or higher
   Actual cost/planned cost – should be 100% or less

9. **Choose a report format (probably the VBC Status Report), and start to fill it in. For output measures, only suggest report format**
   See Appendix 13:2.
   All chosen measures were suitable for placement in the VBC Status Report.

10. **Write a "possible outcome" about how it would have worked if the measurements were actually conducted. If expected performance was decided, use made-up figures**
    Because the data log is of such great help, the measurements should be conducted without problems. A problem can turn out to be lack of resources, especially for the responsible person to analyze the results.

11. **Suggest a follow-up procedure, stating where and how often the measurements should be discussed**
    The analysis should initially be presented at the next request process team meeting. Then the process owner should present this to the Change Group once every other month, or as often as the measure allows.

12. **Write a summary of the testing, and draw conclusions of whether or not the concept needs to be revised**
    The testing was conducted without any bigger obstacles, but a number of small changes were made. It was confirmed that good process knowledge is needed to find suitable measures. A clearly stated wanted position is also required as a guide for prioritizing areas in which to measure.

    Note: This test was done prior to the Q-report test, why the order of the points does not correspond to neither the testing procedure nor the test of the Q-report, since a change was made after that.

VBC Status Report for the Request Process

Status Report for Processes

Process name:	Date:	Process map:
The request process	2002-01-24.	Issue 1

Process owner:	Team leader:	Process sponsor:
Lars-Eric Ericsson	Anna Lindström	Per Svantesson

Meeting frequency:	Facilitator:
Fortnightly	Mats Johansson

Process owner signature

Process Team Members:

Lars Jönsson, Fredrik Carlsson, Ulf Andersson, Bengt Swedenfeldt, Roger Rosberg, Jan Carlsson

Assessment objectives regarding the Volvo Process Implementation Scale

	Level 1: Established	Level 2: Controlled	Level 3: Improved	Level 4: Efficient	Level 5: World Class
Suggestion (year/date)			June 2002		
Result (ok/not ok)					

Performance objectives

Measure	**Goal**	**Current position**	**Finish date**
Delivery time to customer			
Lead time			
Percent of on-time deliveries			
Customer satisfaction (perception/expectation)			
Actual PMR cost/planned PMR cost			

Results achieved since last meeting

Testing of the Quality Report Process

1. **Suggest a person/role to be responsible for measurements**
   The process owner.

2. **Try to find suitable measures for the process/product**
   – look at overall company goals, process vision etc
   The VBC Quality report is based on global information and available 8 working days after reported month. The report is looked upon as important for decision-makers.

   – start out from the example list
   Based on the example list, these are the measures that can be suitable for this process:

Factor	Type of measure	Area	Subject	**Measure**
Cost	Process	Financial		Actual cost compared to budgeted cost
	Output	Strategic		Total life-cycle cost
Time	Process	Built-in quality: do it right the first time		Time spent on re-dos
		Flexibility	Response to product or volume changes	Time to market
		Process path		Queues and waiting time
	Output	Process path		Lead time
Quality	Process	Customer satisfaction	Reliability	Percent of on-time shipments
		Supplier relations	Reliability	Percent of on-time deliveries
	Output	Customer satisfaction	Conformance	Degree of expectation fulfillment
			Aesthetics	Perception in relation to expectation

   – check with measure features
   Actual cost vs budget: Basic requirements – 3 yes
   Other requirements – 5 yes
   EXCLUDED
   Total life-cycle cost: Basic requirements – 3 yes

	Other requirements – 7 yes
Time spent on re-dos:	Basic requirements – 3 yes
	Other requirements – 6 yes
Time to market:	Basic requirements – 2 yes
	EXCLUDED
Queues and waiting time:	Basic requirements – 3 yes
	Other requirements – 8 yes
Lead time:	Basic requirements – 3 yes
	Other requirements – 9 yes
On-time shipments:	Basic requirements – 3 yes
	Other requirements – 8 yes
On-time deliveries:	Basic requirements – 3 yes
	Other requirements – 8 yes
Expectation fulfillment:	Basic requirements – 3 yes
(conformance)	Other requirements – 6 yes
Perception vs expectation:	Basic requirements – 3 yes
(aesthetics)	Other requirements – 7 yes

– Make a balanced choice of measures according to information obtained

Chosen measures:

Time – Output – **Lead time**

Cost – Output – **Total life-cycle cost**

Quality – Output – **Aesthetics perception vs expectation**

– look at factor definitions, making sure that TQC really are measured, and that they are measured in their right context

Time – OK

The time measure lead time corresponds well to the time and the lead time definition in Appendix 1:4.

Cost – OK

Total life-cycle cost measures the cost of people and process, which is also rendered in “factor definitions”. The measure can be considered both strategic and operational, even if it is more of a strategic measure.

Quality – OK

This measure resembles the actual definition of customer satisfaction, and is therefore a very good measure for quality, which is customer focused.

– look at overall company goals and process vision again, making sure that the measures chosen comply with these

The chosen measures do not conflict with the process wanted position,

even if they exceed the wants expressed in that statement.

3. **Use the process map to identify measurement points in the process where the measurements are easiest to conduct**
   The lead time for the quality report can be measured in days from the first day of the month to the day of distribution.
   Total life-cycle cost can be measured when the report is distributed, by calculating the amount of man-hours used to produce it.
   Aesthetics are most appropriately measured in the middle of the month, when the customers have had a chance to read it and estimate how pleased they are with the structure.

4. **Suggest a measurement method and write a short description of why it was chosen and how it works**
   Lead time is easily measured by just noting the date of distribution for every month.
   Total life-cycle cost does take some extra work, because the people involved in the process has to keep a log of the hours spent on working with the quality report, but it is still not a complicated measure.
   The aesthetic perception and expectation is decided by the process customer. That means that it has to be measured by doing a survey each month, which puts a demand on the customer. To avoid discontent, it can be done very simple, by just sending out an email asking the customers to rate the report on a scale from 1 to 10, where 10 is the best rating.

5. **Suggest a measurement interval, and motivate it**
   Lead time – once a month, since that is report interval.
   Total life-cycle cost – once a month (report interval)
   Aesthetics perception/expectation – once every other month, to demand as little as possible from the customers

6. **Suggest where and how the results should be analyzed, with respect to the prior decisions in 1, 4 and 5**
   The results should be analyzed by the process team, the current equivalent being the Quality Department. This is the right forum, because they need to learn what they need to change in the report to make the customers satisfied, and also how to improve the process to make it more efficient, regarding both time and cost.

7. **If possible, decide on expected performance**
   Lead time – The lead time from the reported month to the release date

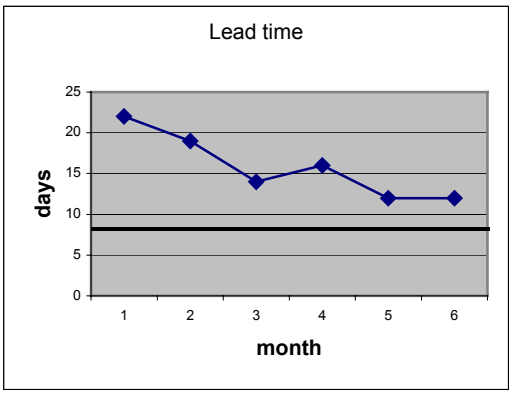
for the report was expected to be 15 days using the resources currently allocated to the task.
Total life-cycle cost – The amount of man-hours currently spent on the quality report was estimated to 40 hours.
Aesthetics (perception/expectation) – Based on the limited knowledge of where and why the report should be used, the grade 4 out of 10 was anticipated.

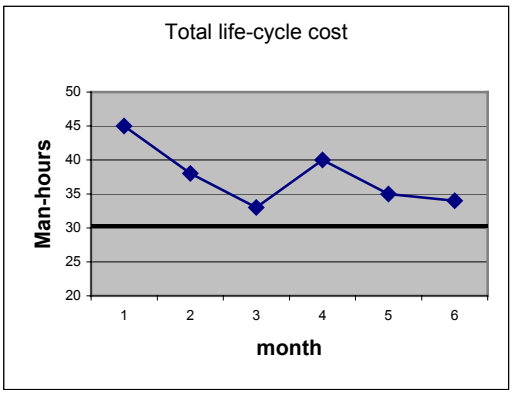
8. **Suggest goals if expected performance is decided on, otherwise point out in which direction the measure strives**
   Lead time – To deliver the report within the first eight days of the month. To be reach within 2002.
   Total life-cycle cost – To manage a 25% cost reduction (reduction of man-hours) within two years.
   Aesthetics – To get a mean rating of 7 out of 10 within two years.

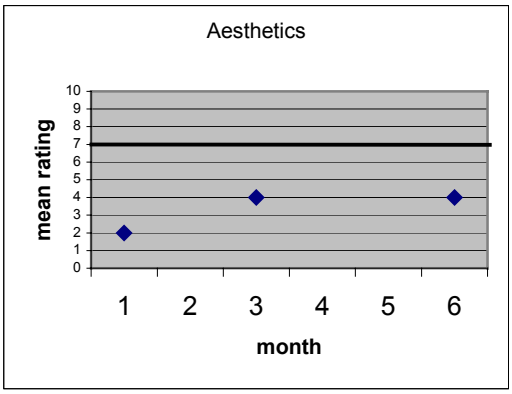
9. **Choose a report format (the VBC Status Report), and start to fill it in. For output measures, only suggest report format**
   See Appendix 14:2.
   All chosen measures were suitable for placement in the VBC Status Report.

10. **Write a "possible outcome" about how it would have worked if the measurements were actually conducted. If expected performance was decided, use made-up figures**

Measure	jan	feb	mar	apr	jun	jul
Lead time	22	19	14	16	12	12
Total life-cycle cost	45	38	33	40	35	34
Aesthetics	2		4			4







11. Suggest a follow-up procedure, stating where and how often the measurements should be discussed

The results should be presented primarily to the Change Group, after being discussed within the process team. This process is very special, since it constantly has to strive to justify its own existence.

12. Write a summary of the testing, and draw conclusions of whether or not the concept needs to be revised

This testing had not been able to perform, if the method had not been changed during the conduct. The need for change was discovered thanks to the possibility to predict expected performance. A couple of major changes were made, mainly consisting of a change of order in the different points presented in Appendix 1:1, Method for Implementing Performance Measurements.

VBC Status Report for the Q Report Process

Status Report for Processes

Process name:	Date:	Process map:
Quality report process	2002-01-31.	Version 1.

Process owner:	Team leader:	Process sponsor:
Beine Mårtensson	Mats Johansson	Per Svantesson

Meeting frequency:	Facilitator:
Fortnightly	

Process owner signature

Process Team Members:

Beine Mårtensson, Mats Johansson, Camilla Sanderson, Anna Lindström

Assessment objectives regarding the Volvo Process Implementation Scale

	Level 1: Established	Level 2: Controlled	Level 3: Improved	Level 4: Efficient	Level 5: World Class
Suggestion (year/date)			jun-02		
Result (ok/not ok)					

Performance objectives

Measure	**Goal**	**Current position**	**Finish date**
Lead time	8 days	15 days	dec-02
Total life-cycle cost	30 hours	40 hours	dec-03
Aesthetics	7/10.	4/10.	dec-03

Results achieved since last meeting

Testing of the Product Problem Process (PRP)

1. **Suggest a person/role to be responsible for measurements**
   The team leader, Henning Pipkorn.

2. **Try to find suitable measures for the process/product**
   – look at overall company goals, process vision etc
   The wanted position of the process is not stated as such, but the goals for the process can be summarized as follows:
   * Mean lead time for an MQR should be 26 weeks
   * The fault frequency should be ≤ 6,5 per month during the first year of use for chassis
   * Unplanned stops should be eliminated
   The two later goals are not optimal, since they are more directed towards what happens with the buses on the field, then what the process as such is supposed to handle.

   – start out from the example list
   Based on the example list, these are the measures that can be suitable for this process:

Factor	Type of measure	Area	Subject	**Measure**
Cost	Process	Financial		Actual cost compared to budgeted cost
		Strategic		Total unit cost
Time	Process	Built-in quality: Do it right the first time		Time spent on re-dos
		Flexibility	Response to product or volume changes	Time to market
		Process path		Cycle time
				Share of waiting time related to total cycle time
	Output	Process path		Lead time
Quality	Output	Customer satisfaction	Conformance	Degree of expectation fulfillment
		Design	Fitness of use	Perception in relation to expectation

– check with measure features

Actual cost vs budget:	Basic requirements – 3 yes
	Other requirements – 7 yes
Total unit cost:	Basic requirements – 2 yes
	EXCLUDED
Time spent on re-dos:	Basic requirements – 3 yes
	Other requirements – 5 yes
	EXCLUDED
Time to market:	Basic requirements – 3 yes
	Other requirements – 8 yes
Cycle time:	Basic requirements – 3 yes
	Other requirements – 8 yes
Share of waiting time:	Basic requirements – 3 yes
	Other requirements – 6 yes
Lead time:	Basic requirements – 3 yes
	Other requirements – 8 yes
Expectation fulfillment:	Basic requirements – 3 yes
(conformance)	Other requirements – 5 yes
	EXCLUDED
Perception vs expectation:	Basic requirements – 3 yes
(design)	Other requirements – 8 yes

– Make a balanced choice of measures according to information obtained

A lot of these measures were connected to each other, like for example time to market and lead time, which measure the exact same thing. Cycle time is also almost the same, but includes a few more times (see the definitions in Appendix 1:4). Some parallels can also be drawn regarding the conformance and design measures, which both can be said to measure that the right product modification has been implemented and the problem solved.

The measures that have been chosen for this process, with that in mind, are:

Cost – Process – **Actual cost vs budgeted cost**
Time – Output – **Lead time**
Quality – Output – **Perception vs expectation regarding design**

– look at factor definitions, making sure that TQC really are measured, and that they are measured in their right context

Cost – OK
The cost measure reflects the financial purpose of a company, to keep the costs as close to the budgeted forecast as possible.

Time – OK
Measuring lead time is a classic, and it is in this case also the measure that is closest connected to the process goals.
Quality – OK
The quality measure is, as it should be, directly customer focused. The only problem is that it requires input from people outside the process, in this case even outside the company. This should be avoided if possible, but direct customer input is also a very valuable source of information.

– look at overall company goals and process vision again, making sure that the measures chosen comply with these
As mentioned earlier, the only process goal really related to the process is the first one, regarding lead time. Lead time is therefore chosen as a measure, but the other goals are harder to transfer into performance measures for the PRP. However, the quality measure should at least be able to tell if the PRP delivers the right solutions to the quality problems, and if so, the other two goals for the process should be able to achieve.

3. **Use the process map to identify measurement points in the process where the measurements are easiest to conduct**
   The cost for every QJ item is noted in the Capacity Planning Tool (CPT), and the measure can therefore easily be compiled there.
   The process lead time can easily be measured since it is already kept track of in the log for QJ items.
   To measure how satisfied the customers are with the design solutions, measurements have to be conducted outside the process, by asking the customers/end customers directly.

4. **Suggest a measurement method and write a short description of why it was chosen and how it works**
   The actual and budgeted cost can be measured by looking at the budget and compare that to the figures in the CPT.
   The lead time for the QJ items can also be found in the CPT, and is measured from the day the MQR comes in from the market department to the date when market are ready for the new/modified product.
   Customer satisfaction regarding design has to be measured by letting them fill in a customer survey, preferably an electronic one.

5. **Suggest a measurement interval, and motivate it**
   Cost comparison – once a year, since that is the interval the budget is

constructed for.
Lead time – calculate a mean every six months, it is no use doing it more often since the mean lead time should be 26 weeks.
Design – hand out a survey for every completed item.

6. **Suggest where and how the results should be analyzed, with respect to the prior decisions in 1, 4 and 5**
   All measures should be discussed at the process team meetings, and at the QJ meetings with the dedicated team conducted once a month.

7. **If possible, decide on expected performance**
   No expected performance could be stated, due to lack of process knowledge.

8. **Suggest goals if expected performance is decided on, otherwise point out in which direction the measure strives**
   Cost – the quota actual/bugeted should be 100% or less.
   Time – the mean lead time should be 26 weeks or less.
   Quality – the expectation and perception should be as close as possible.

9. **Choose a report format (probably the VBC Status Report), and start to fill it in.**
   All measures were suitable for the VBC Status Report, and a filled in status report for the PRP can be seen in Appendix 15:2.

10. **Write a "possible outcome" about how it would have worked if the measurements were actually conducted. If expected performance was decided, use made-up figures**
    The lead time, that is already measured, would continue to be way too long, and the actual cost is probably too high due to the long lead time and many stops in the process. The results of the customer survey would be interesting though, when it is probably not known how well they satisfy their customers today. The measurements should not cause any trouble, except for maybe some grunting from customers having to fill out a survey.

11. **Suggest a follow-up procedure, stating where and how often the measurements should be discussed**
    After being analyzed in the process team and at the monthly QJ meetings, the results should be presented to the Change Group. Partly for being a pilot for Process Management, but as an important process for product quality too. The communication between the QJ

meetings/dedicated team and the process team has to function very well, enabling synergies to develop. As of right now, the number of QJ items is in focus by top management, why the measurement results also should be communicated to the Vice President directly.

12. Write a summary of the testing, and draw conclusions of whether or not the concept needs to be revised

One change was made when testing the PRP. It was found that the output measures were suitable for placement in the VBC Status Report in all three pilot processes, and therefore the suggestion to find a different report format for output measures was removed. Due to lack of process knowledge, the testing was not optimal, but was still possible to perform. The limited input showed how important it is to have a clearly stated wanted position for the process, and a process map makes it easier to find measurement points. On the other hand, not being able to perform an optimal test verified some other statements that had been made in the thesis. The measures must be more exactly defined somewhere during the implementation, and after this testing, it was decided to include that in the measurement method decision.

VBC Status Report for PRP

Status Report for Processes

Process name: PRP	Date: 2002-02-11.	Process map: To be constructed
Process owner: Lars-Eric Ericsson	Team leader: Henning Pipkorn	Process sponsor: Peter Jansson
Meeting frequency: Fortnightly	Facilitator: Beine Mårtensson	

Process owner signature

Process Team Members:

Lars-Eric Ericsson, Henning Pipkorn, Stig Öhman, Pernilla Fjordstrand, Stefan Eriksson, Pelle Engelbrektsson, Kenneth Jällbrink, Mattias Larsson

Assessment objectives regarding the Volvo Process Implementation Scale

	Level 1: Established	Level 2: Controlled	Level 3: Improved	Level 4: Efficient	Level 5: World Class
Suggestion (year/date)			jun-02		
Result (ok/not ok)					

Performance objectives

Measure	**Goal**	**Current position**	**Finish date**
Actual vs budgeted cost			
Lead time			
Design, perception vs expectation			

Results achieved since last meeting