MANAGING PERFORMANCE MEASUREMENT
A study of how to select and implement performance measures on a strategic, tactical and operational level

Anika Rolfsdotter Karlsson

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Abstract

The main purpose of this study is to define important criteria to consider when selecting and implementing performance measures on a strategic, tactical and operational level. The thesis is built around the questions “What to measure” and “How to measure”. Generally within the thesis the question of “what” concerns different frameworks and working procedures that can be used to determine what to measure, while the question of “how” concerns criteria to consider when implementing performance measures, such as how to design measure formulas and targets, how to communicate measures, etc.

The study has been conducted as a qualitative study, where the empirical data has been collected through interviews and by using information material from the case company. The purpose of the case study was to test the theoretical framework. The studied case company was Sandvik Process Systems, a product area within the Sandvik group. The case study was complemented by two minor comparative studies of companies also belonging to the Sandvik group. In total the study comprised interviews with 15 persons within different organizational levels.

Several different frameworks aiming to help organizations to answer the question of what to measure have been developed during the last decades. The frameworks differ more or less, but theorists appear to agree on several matters. My conclusions of the most important criteria to be taken into consideration when answering the question of what to measure is:

- Complement the outcome measures, i.e. the financial measures that show the results from past efforts, by pro-active performance drivers - the measures that drive the future performance
- Ensure linkage between performance measures and company vision and strategic objectives
- Involve the co-workers in the process of developing measures
- Use an overall comprehensive view and methodic approach
- Limit the amount of measures
- Retain the methodic approach – manage the performance measurement system

After answering the question of what to measure there are also a number of important criteria to consider when it comes to how to measure and implement measures into the organization:

- Define measure purposes
- Assign reasonable targets to the measures
- Consider the field of application when designing a performance measure
- Communicate the performance measures
- Specify the measures
Despite attempting to simplify a complicated reality the frameworks aiming to help organizations to select measures are all rather complex. Hence, to develop and implement a PMS (Performance Measurement System) by the book will imply an extensive project for any company. How time- and resource demanding the project will become will differ from one company to another. Thus, a general conclusion of this study is that a company must start out from its own conditions in order for the development and implementation not to become too complex a project, where the organization loses focus and fails to manage the project all the way through.

Companies must consider factors such as the size and complexity of the organization, how the business is controlled and managed as well as the structure and control of an already existing PMS. For large organizations, already possessing a rather unstructured PMS, the best approach could be to look upon the development as a constantly on-going activity in the spirit of continuous improvements, rather than a complex project running over a limited time. A vital success factor is also to communicate the intentions to the whole organization at an early stage. If the whole organization is aware of the intention and the purpose this will facilitate the process of developing and implementing a successful PMS.
Acknowledgements

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Sandviken, February 2008
Annika Rolfsdottir Karlsson
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1 Introduction

This chapter presents the background and the purpose of the thesis. The chapter also contains an outline of the thesis.

1.1 Background

A combination of the increasing competition within the trade and industry, and the fact that information is getting easier to access by means of IT tools, has led to an increased interest for new methods of running and controlling a business. The traditional accounting, i.e. to control the business by means of financial metrics, has been criticized for only focusing on historical facts and not on how the business is doing at the present. Critics like Kaplan and Norton\textsuperscript{1} mean that this could conduce to an incorrect picture of the effectiveness and profitability of a business.

During the industrial age the financial measures were sufficient due to the fact that long-term capabilities and customer relationships not were critical in order to succeed. The industrial age now has turned over to the information age, where information forms a fundamental part within the trade and industry. The possibility to communicate is global and rapid and technology advances fast. In order to compete it is not longer enough to rely solely on financial aspects.\textsuperscript{2} A move from traditional accounting, into a form of control where the business results are measured in several perspectives, is recommended by theorists as well as practitioners. So called non-financial performance measures or KPIs (Key Performance Indicators) are important components in such controlling. Measuring Customer Satisfaction or Delivery Precision are examples of non-financial performance measures.

But what is important to consider when selecting performance measures? Research made in the area of performance measurement implies that the question of what to measure is not easy to answer. Theorists point out the importance of measuring more aspects than the down-right financial and they also sound a note warning for using the wrong measures. It can also be presumed that the needs and purposes of performance measures are different within different hierarchical levels within a business. How can risks for sub-optimizations and conflicting measures be assured if using different performance measurement within different levels and departments within the organization? And how is a set of performance measures to be implemented into an organization in order to become successful?

1.2 Purpose

In the light of the background given above, the main purpose of the study is to define important criteria when selecting and implementing performance measures on a strategic, tactical and operational level. On the basis of the criteria proposed a secondary purpose is also to propose a way of working to develop the existing performance measurement

\textsuperscript{1} Kaplan and Norton (1996)
\textsuperscript{2} Ibid
system used by the case company, so that connections between different levels of performance measures will be ensured.

1.3 Outline of Thesis

Chapter 1 - Introduction
This chapter presents the background and the purpose of the thesis. The chapter also contains an outline of the thesis.

Chapter 2 – Theoretical Framework: How to select and implement performance measures
Within this chapter the sources that form the basis of this study are presented. The main focus within the chapter is on Performance Measurement, which is one of the means of control that can be used within a business. The concept performance management is divided into the questions “What to Measure” and “How to measure and implement measures”.

Chapter 3 - Methodology
Within this chapter the method used to perform the study is presented. Reflections upon the methodology used and the quality of the study are presented within chapter 7.

Chapter 4 – Empirical Findings
Within this chapter the empirical findings are presented. The findings are mainly collected through interviews, but also secondary sources such as the Sandvik Internet homepage and Sandvik Intranet.

Chapter 5 – Analysis of Empirical Findings
This chapter contains an analysis of the empirical findings, i.e. the theories studied are compared to the empirical findings. The first part of the chapter deals with the question of “what to measure” and the second part deals with the question of “how to measure”. The question of how to measure also includes the subject of how to implement performance measures into the organization.

Chapter 6 - Recommendations
This chapter contains recommendations to the case company on how to improve the present PMS. The recommendations are based on the made analyses and conclusions made from the analyses.

Chapter 7 - Conclusions
The chapter presents the conclusions drawn from the analysis that was made in chapter 5. The chapter also contains reflections on the method used to conduct the study and recommendations on future research.
2 Theoretical Framework: How to select and implement Performance Measures

Within this chapter the sources that I have considered relevant to include in this study are presented. The chapter begins with a presentation of the term “Business Control”, which includes a number of different tools for helping an organization to control the business. The main focus within the chapter is on Performance Measurement, which is one of the means of control that can be used within a business. The concept performance measurement is divided into the questions “What to Measure” and “How to measure and implement measures”.

The question of “what” concern different frameworks and working procedures that can be used to determine what to measure, while the question of “how” concern matters such as how to design measure formulas and targets, as well as how to implement a performance measurement system into the organization.

![Theoretical Map]

Figure 1 Theoretical Map

2.1 Business Control

Some form of control is necessary in order to ensure that a business is run in an efficient way. The following definition of “Business Control” can be found on the homepage of The Swedish National Financial Management Authority (Ekonomistyrningsverket - ESV): “With different methods and models manage, control, and develop the business”. Business Control consist both of philosophies on how to control a business and practical tools to help control a business. It is rarely enough to use one tool or philosophy to improve the control of the organization.3

3 ESV
Business Control can be grouped into four categories of means of control:\textsuperscript{4}

\begin{itemize}
  \item \textit{Organizational structure}
  \item \textit{Reward Systems}
  \item \textit{Informal control methods}
  \item \textit{Formal control methods}
\end{itemize}

Responsibilities and authorities are assigned by the shape of the \textit{organizational structure}. Applying clear guiding principles for the different positions can facilitate follow-up and controlling business. \textit{Reward systems} such as bonus and provision systems can be used to motivate the co-workers. Examples of \textit{Informal control methods} are culture, learning and co-workers. The \textit{formal control methods} budgeting, product calculation and internal accounting are all examples of traditional accounting. Traditional accounting can be defined as controlling business by means of financial measures, and this way of controlling a business has been criticized a lot during the last decades.

The critics mean that the financial measures are historical facts not giving any information of how the business is doing right now and it is implied that this could conduce to an incorrect picture of the effectiveness and profitability of a business. Thus, moving over from the traditional accounting into a more contemporary way of controlling business is recommended by theorists as well as practitioners. The \textit{outcome measures}, i.e. financial measures that show the results from past efforts, need to be complemented by \textit{performance drivers} - the measures that drive the future performance.\textsuperscript{5} This leads us to a fourth example of a formal control method – performance measurement, i.e. controlling business by reviewing and following up on business performance.

\subsection*{2.2 Performance Measurement}
What is referred to when speaking about business performance within the trade and industry is how well things have been performed in relation to certain targets. The purpose of following up on business performance can be several; for example to monitor trends, to use the results as a basis for decision making, evaluate improvement projects, prioritize improvement projects or as warnings of potential problems. One of the most important purposes is to use performance measurement to motivate the co-workers. If the measurement is designed to give feedback to the co-workers this will stimulate improvement.\textsuperscript{6}

When studying the area of performance measurement you run into a lot of different concepts and terms within and around the area. An explanation of some of these terms and concepts can come in handy before moving further into the area.

\footnotesize
\begin{itemize}
  \item \textsuperscript{4} Samuelsson (2001)
  \item \textsuperscript{5} Kaplan & Norton (1996)
  \item \textsuperscript{6} Andersen & Faugerland (2006)
\end{itemize}
Performance Measure – can be defined as a metric used to quantify the efficiency and/or effectiveness of an action. A performance measure can be called many different things, such as metric, measure, indicator, performance indicator, Key Indicator, KPI (Key Performance Indicator), etc. The prefix “Key” implies that the performance measure stands out from the multitude of metrics, and is of significant importance to the business. A KPI is a performance measure that is used to draw attention to and drive something that is considered to be essential within a business. KPIs are often used to facilitate and concretize complex matters that are essential for a business ability to function.

Performance Measurement – can be defined as the process of quantifying the efficiency and effectiveness of an action.

Performance Measurement System (PMS) can be defined as a set of metrics used to quantify both the efficiency and effectiveness of actions. Most companies have some sort of PMS even if it is not referred to as a PMS. A PMS can be formal or informal. A formal system has intentionally been developed and implemented while the informal system has been developed more unintentionally.

Another important term when it comes to measuring performance is productivity. Productivity is seen as one of the most vital activities that affects the competitiveness of a company. Roughly productivity can be defined as Output divided by Input. There are different ways to calculate productivity and the measures are often categorized into:

- Partial productivity
- Total-factor productivity
- Total Productivity

A partial productivity measure uses ratios of output to one source of input, such as labor, capital, material or energy. The advantage of partial productivity measures is that they are easy to calculate and understand. One of the negative aspects is that partial productivity is difficult to measure on an aggregated level. A common partial productivity measure is labor productivity, e.g. output per working hour or output per employee.

Total-factor productivity uses the ratio of net output to the associated labor and capital input. The advantage of using total-factor productivity is that it is possible to aggregate and to be used for comparing different units or companies. One of the disadvantages is that it is difficult to understand and can be difficult to measure. Since the measure does not take the material inputs into account it is not suitable to use when material constitute a large portion of the production cost. Total factor productivity is sometimes referred to as value added productivity or multi-factor productivity.

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7 Tangen (2003a)
8 ESV
9 Tangen (2003a)
10 Ibid
11 Andersen & Faugerland (2006)
12 Tangen (2003a)
13 Total output minus intermediate goods and service purchased
Total Productivity is ratios of total output to the sum of all input factors. This productivity measure is similar to the total-factor productivity measure but it also includes intermediate goods such as purchased materials and energy. The advantage of the measure is that it is the most accurate measure. The disadvantages are that the measure is difficult to understand as well as difficult to measure.

2.2.1 What to measure and the process of selecting Performance Measures

In the article “Improving the performance of a performance measure” Stefan Tangen means that the question of “What to measure” should be answered when designing the structure of a PMS and that the next question to be answered is “How to measure”. This theory is also adapted within this thesis and the aim with this chapter is to try to identify the important criteria to consider when answering the question “What to measure”. The question “How to measure” will be handled within chapter 2.2.2.

2.2.1.1 Participants in the process of developing Performance Measures

Before starting the process of selecting measures one must decide who should participate in this process. Andersen and Fagerhaug recommend that a small project team consisting of representatives from all levels of the organization is established. The project team will be responsible for running the project, but several co-workers will be more or less involved in the process of selecting the measures. Andersen and Fagerhaug identify two different strategic approaches when developing a PMS:

- Top-down oriented
- Bottom-up oriented

What basically separates the two approaches is the co-worker level of involvement during the process of selecting and developing measures. In a top-down oriented approach the measures are first developed on the top-level and then step-by-step broken down to a more detailed level. Typically the performance measures are transferred formally from each manager to the subordinates. With a bottom-up approach each co-worker is responsible for participating in developing measures within the area or process where the co-worker operates. Each of these approaches has both advantages and disadvantages. The big advantage with the top-down oriented approach is that all measures will be aligned with the management thinking and business strategy. The disadvantage is that it can become difficult to get the co-workers to accept and use the PMS since they have not been involved in the development work. The advantage of the bottom-up approach is that when the co-workers are participating in the development process it will be easier to get everybody within the organization to accept the system. The disadvantage is that the performance measures that are developed can be diverging and not coordinated towards the same objectives.

14 Tanen (2005)
15 Andersen & Fagerhaug (2006)
Andersen and Fagerhaug recommend that a combination of the two approaches is used by letting the approaches meet half-way. The strategy should be used to state the generation of the performance measures. Each department or group will then be free to develop the measures in accordance with the strategy. The method can result in conflicting measures and it is important to review the measures to secure the consistency and agreement with strategy during the development work.

2.2.1.2 Where to start?
All the literature and research within the field of Performance Measurement implies that the question of what to measure is not easy to answer. In the article “Why Measurement Initiatives Fail”, Neely and Bourne argue that the key to designing a good PMS is not to start by asking the question “What should we measure?”. Instead the first step should be to design a success map that includes a cause and effect diagram. If a strategic objective is defined as “improve the operating efficiency”, the way that the business should achieve this objective needs to be defined - for example by improved delivery performance. The delivery performance on its part can be effected by reduced lead times and improved stock control. When the success map has been described it becomes possible to identify the right performance measures.16

![Sample Success Map](image)

**Figure 2 Sample Success Map**

2.2.1.2.1 Critical Success Factors
When selecting performance measures it is important to keep a comprehensive view and a methodic approach. If the measures are developed occasionally without an overall comprehensive view there is a risk that the amount of measures constantly increases and this also increases the risk for sub-optimizations.17 Tangen suggests starting by clearly defining the company vision. The vision is then used to identify the strategic objectives that the company wishes to achieve. By breaking down the strategic objectives into different Critical Success Factors (CSFs) it is then possible to identify a set of global performance measures.

16 Neely & Bourne (2000)
17 Tangen (2003b)
The global measures should show how the company performs compared to the strategic alignment. After the global measures are developed the same procedure is carried out to identify local performance measures. In order to ensure that the measures not counteract with each other it is also necessary to examine risks for sub-optimizations and ensure that each PM is in line with the strategic objectives.\textsuperscript{18}

![Figure 3 Process of developing Performance Measures suggested by Tangen](image)

2.2.1.2.2 A process oriented approach

Andersen and Faugerland recommend a process oriented approach when selecting and designing performance measures. Organizing the business into business processes instead of traditional departments has been advocated during the last decades. When a business is organized in terms of departments each department will try to maximize their own influence and authority, and also optimize the performance within the department. Hence, each department sub-optimizes their areas of responsibility, which will lead up to conflicting targets and actions between the different departments. If looking upon business in terms of processes where each process has a customer, the focus on the process will secure better focus on the end customers.\textsuperscript{19}

According to Andersen and Faugerland the procedure of selecting performance measures should start by mapping and understanding the business structure and processes. The step includes clarifying the business strategy, identifying the stakeholders (for example customers, suppliers, employees, shareholders, etc) and identifying, mapping and documenting the business processes. By documenting the business processes a lot of valuable knowledge is gained to be used when selecting measures. A systematic exposition of the processes also leads to a lot of new ideas about how to improve the processes. The next step is to prioritize the business performance. This means that the different demands and expectations of each stakeholder are identified and prioritized.

One method to do this can be by using the tables shown in Figure 4:

1. The stakeholders are graded after how important they are to the business
2. The expectations and demands of each stakeholder is then identified and translated into specific demands on the business
3. The demands of the stakeholders are categorized into being “basic”, “explicit” or “positively unexpected”. The demands can also be graded by importance in the same way as the stakeholders.\textsuperscript{20}

\textsuperscript{18} Ibid
\textsuperscript{19} Andersen & Faugerland (2006)
\textsuperscript{20} Ibid
HOW TO SELECT AND IMPLEMENT PERFORMANCE MEASURES – THEORETICAL FRAMEWORK

1. Stakeholder study

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Imp.</th>
<th>Reason for grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Customers</td>
<td>5</td>
<td>&lt; 10 % of sales</td>
</tr>
<tr>
<td>External Customer</td>
<td>10</td>
<td>&gt;70 % of sales</td>
</tr>
<tr>
<td>category A</td>
<td>7</td>
<td>&lt;20 % of sales</td>
</tr>
<tr>
<td>External Customer</td>
<td>7</td>
<td>&lt;20 % of sales</td>
</tr>
<tr>
<td>category B</td>
<td>8</td>
<td>Limited resource</td>
</tr>
<tr>
<td>Employees</td>
<td>8</td>
<td>Limited resource</td>
</tr>
<tr>
<td>Suppliers</td>
<td>3</td>
<td>Not critical</td>
</tr>
<tr>
<td>Etc…</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Stakeholder: Employees

<table>
<thead>
<tr>
<th>Demands/Expectations</th>
<th>Demand on Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive wage level</td>
<td>Offer satisfactory wages</td>
</tr>
<tr>
<td>Attractive working conditions</td>
<td>Offer a good and safe working environment</td>
</tr>
<tr>
<td>Possibility to work from home</td>
<td>Offer possibility to work from home</td>
</tr>
<tr>
<td>Solid and attractive work</td>
<td>Financial soundness</td>
</tr>
<tr>
<td>Etc…</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4 Prioritize the business performance

However; identifying an important stakeholder and its demands is not the same thing as saying that big efforts will be made to satisfy these demands. The quotient between benefit and cost should be as large as possible when satisfying different stakeholders. The results from the steps of mapping and understanding the business structure and processes and prioritizing the business performance will form the basis when selecting the performance measures. When measuring the performance of the processes the processes can be developed so that they reflect the business vision and strategies and satisfy the stakeholder demands.21

2.2.1.2.3 The Performance Prism

Several predefined frameworks aiming to help organizations to select a set of measures have been developed during the last decades. One of the more recently developed is the Performance Prism. The approach of the performance prism is similar to the approach suggested by Andersen & Faugerland as it includes both identifying stakeholder demands and business processes. The first step within the Performance Prism is to identify the most important stakeholders to the business and what their needs are. The strategies are then defined in a way that the stakeholder needs can be fulfilled.

The design process of the performance prism:22

1. Stakeholder satisfaction: Who are our most important stakeholders and what are their needs?
2. Strategies: Which strategies do we need to define in order to fulfill the needs of our stakeholders?
3. Processes: What critical processes do we need, if we are to execute these strategies? For each of these processes it is then possible to identify measures that allow management to address questions associated with each process.

21 Ibid
22 Neely et al (2001)
4. Capabilities: What capabilities do we need in order to operate and strengthen these processes? Capabilities are the combination of people, practices, technology and infrastructure that together enable the operation of the processes. When the capabilities needed are identified it is possible to define measures that tell if the required capabilities are in place and whether these are protected and maintained.

5. Stakeholder contribution: What contributions do we require from our stakeholders in order to maintain and develop these capacities? For example that we need our suppliers to contribute with timely deliveries.

![The five facets of the performance prism](image)

*Figure 5 The five facets of the performance prism*

The framework has not yet been adopted by so many organizations and therefore there are not so many “proven successful” or “proven unsuccessful” stories. Some of the criticism raised is that the framework does not offer so much help on how to realize the performance measures and guiding on how to select and implement the measures. Nor does the framework take the existing PMS that a company may have in place into consideration.

### 2.2.1.3 Different Dimensions of Performance Measures

In order to get an overview of the measures and to ensure that a balanced set of measures are used within the PMS it can be useful to categorize the measures into different dimensions or perspectives. A simplified categorization is to divide the measures in to financial measures and non-financial measures, or cost-related and non-cost-related. A more informative categorization can be to group the measures into Quality, Cost, Flexibility, Delivery Dependability, Speed, Cost and Innovativeness.

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23 Tangen (2004)
24 Ibid
There are different views upon which dimensions to use among the predefined frameworks. Described below are two of the most famous frameworks.

### 2.2.1.3.1 The Balanced Scorecard

The most commonly adapted and used framework is the Balanced Scorecard. The Balanced Scorecard was first introduced in an article written by two American writers, Kaplan and Norton, in Harvard Business Review in 1992. The new framework was developed as a consequence of the harsh criticism of the traditional accounting methods, only focusing on financial measures. Within the Balanced Scorecard framework the financial measures are complemented by other performance perspectives. The four perspectives suggested by Kaplan and Norton are the Financial perspective, the Customer perspective, the Internal Business Process perspective, and the Learning and Growth perspective. However; these perspectives are not to be taken as definite. Kaplan and Norton mean that the perspectives can be replaced or supplemented by other perspectives, such as an environmental perspective, supplier perspective, etc.
Simons point out that the Balanced Scorecard is not a replacement for an organization's other performance measurement and control systems - it is a complement that should direct the attention of managers and employees to factors where high performance levels are expected to lead to competitive breakthroughs.\textsuperscript{25}

The framework has been adapted by many organizations, and there are success stories as well as unsuccessful implementations. The unsuccessful implementations are implied to be the result of a selection of inappropriate or excessive measures, inefficient implementation by the management, delay in feedback or over-emphasis of financial measures. Furthermore there is no concrete evidence that the Balanced Scorecard really leads to improved performance. It has also been pointed out that the Balanced Scorecard being designed to implement the strategy fails to ask whether the chosen strategy is the right strategy for the business.\textsuperscript{26}

### 2.2.1.3.2 The Performance Pyramid

Another framework that also has been adapted by many organizations is the Performance Pyramid. The performance pyramid was first launched in 1991 in a book called “Measure Up! Yardsticks for continuous improvement”, written by Richard Lynch and Kelvin Cross. The pyramid is a hierarchical set of measures where the company is divided into four different levels. The top of the pyramid represents the corporate vision, which should be designed to set a strategic course. At the next level the strategic objectives are defined in both market and financial terms. The third level is the bridge between the daily operational measures and the top level measures. This level includes the core processes of the business, and the measures are divided into the categories customer satisfaction, flexibility and productivity.\textsuperscript{27}

\textsuperscript{25} Simons (2000)
\textsuperscript{26} Paranjape et al (2006)
\textsuperscript{27} Klippenberger (1996)
On operational level the performance measures are divided into Quality, Delivery, Cycle Time and Waste. The objectives are transferred down along the organization and the performance measures are transferred up along the organization. The performance pyramid has been criticized for being manufacturing oriented and somewhat single-minded about the things that matter for a business\textsuperscript{28}, as well as for not providing any mechanism to identify the key performance indicators.\textsuperscript{29}

### 2.2.1.4 Linkage between Performance Measures and Strategy

A common approach within the different theories and frameworks that have been presented in this chapter is the idea that there should be a clear linkage between the performance measures and the strategy. There are number of different definitions of the term strategy to be found in literature. According to Samuelsson, strategy, in a strict sense, tells how to reach the defined goals. But in practice, formulating goals and strategies are so closely connected that strategy work almost always concern both goals and strategies. In large corporations there are often several different levels of strategy, but the literature of strategy mostly refer to two levels: corporate strategy and business strategy.\textsuperscript{30}

The corporate strategy is the top level of strategy and it defines the way that a company attempts to maximize the value of the resources it controls. Decisions within corporate strategy focus on where the corporate resources will be invested, such as which business and segments of the market to compete in. The business strategy focuses on how to compete in these markets, such as how to create value for the customers and how to differentiate products and services from those of the competitors. Simons mean that the starting point for formulating the business strategy is the business mission. The mission refers to the reason why a business exists and should include both inspiration and a sense

\textsuperscript{28} Ibid
\textsuperscript{29} Tangen (2004)
\textsuperscript{30} Samuelsson, L (2004)
of direction for the future. The next step, after creating the mission, is to decide how to compete. An example of how to compete could be by offering a high level of service and a strong local presence with knowledgeable staff, which should make the customers willing to pay a price that is higher than some of the competitors. Strategic goals are then determined in order to ensure that the strategy is achieved. A strategic goal could for example be to increase the market share. Time frames and quantitative indicators must be added in order to make the goals actionable– for example to increase the market share by 4 % within 18 months.\textsuperscript{31}

![Diagram](image)

*Figure 9 Formulating strategy*

### 2.2.1.5 Different levels of Performance Measures

From the theory presented it can be concluded that different levels within an organization need different performance measures. The different levels can be categorized into the strategic, tactical and operational level. It is important that there is a linkage between the measures within the different levels. Otherwise there is an obvious risk that everybody within the organization not is working towards the same objectives. The performance measures should be correlated between the three levels. A performance measure on the strategic level can be broken down into specific measures in the tactical level, and from the tactical level into the operational level.\textsuperscript{32}

![Diagram](image)

*Figure 10 Different levels of Performance*

**Strategic level:** Most decisions within the top level of the organization are strategic to nature. The time scale for these measures is several years.

**Tactical level:** The tactical level holds measures that have a time frame by month or up to a year. The tactical level of performance measures is the linkage between the strategic and operational level.

\textsuperscript{31} Simons, R (2000)

\textsuperscript{32} Tangen (2004), Jackson (2000)
Operation level: Measures on the operational level cover a daily to monthly basis.

When developing the PMS it must also be considered to what level of detail the measures should be developed. It is possible to develop performance measures all the way down to individuals. These types of performance measures are often used as a basis for bonus. However there are several examples that measuring performance on individual level does more damage than good. It often requires a lot of resources to measure performance on individuals and in general it makes people feel uncomfortable.33

2.2.1.6 Limit the number of Performance Measures

More measurement demands more analysis time and it is a waste of time and resources to collect data if they are ignored. It is therefore important to pay attention to limiting the data requirements to both the necessary detail and frequency and to consider whether the data is needed for a specific useful purpose, and whether the cost of producing it is not higher than its expected benefit. A large number of performance measures also increases the risk of information overload – it becomes difficult to know which performance measures to prioritize and focus on.34

2.2.1.7 Make an inventory of the present PMS

Before starting the work to develop new measures it can be useful to study the present PMS system. The purpose of studying the present PMS is to find out whether any parts of it can be re-utilized. The study should include a summary of the existing performance measures as well as how the data is collected and presented.35

2.2.2 How to measure and implement Performance Measures

Most of the past research within the area of performance measurement has focused on the question “What to Measure”, and most of the existing frameworks are not helping the practitioners to answer the question of “How to measure”.36 There are a number of important criteria to consider in terms of deciding how to measure.

2.2.2.1 Secure Consistency and Agreement

When a set of measures have been selected it is important to make sure that these measures not conflict with each other. Each performance measure should be in accordance with the strategic objectives. Furthermore it is important to assure that the measures not will lead to any sub optimization, for example that optimizing any of the short term targets will be at the expense of long term objectives.37

It is of course also important that the PMS provides the users with accurate information. If the PMS is distorted and include many errors this will cause confusion and have negative influence on the productivity of the company. However what should be considered is the ability of the performance measure to measure what is intended.
Performance measures that are intended to be used for monitoring trends do not need the same level of preciseness as measures used within accounting for example. To dedicate resources to develop a PMS that is impeccably precise might delay or even prevent the introduction of a functioning PMS.  

**2.2.2.2 Design of Performance Measures**

Performance Measures can be calculated in many different ways. After deciding upon a number of performance measures, one must also decide how to calculate each measure. In its simplest form the measure can be defined as an absolute value, for example ‘Number of deliveries’. Absolute values are not always easy to relate to, and a better way to express the measure can be in a percentage ratio. When deciding upon how to calculate the performance measures there are several things to consider. Preferably the equation should be:  

- Easy to understand  
- Easy to calculate  
- Designed in consultation with those who are being measured  
- Stimulating improvement  
- As accurate as possible

To also include the target in the formula can facilitate the analysis of the measure results, i.e. to express the value of the measure in percentage of its target. Stefan Tangen has designed a formula for this purpose:  

\[
PM_{max} = \frac{x}{t} \\
PM_{min} = \frac{t}{x}
\]

- $PM_{max}$ = the value of the performance measure (%)  
- $t$ = Targeted value of the variable (unit)  
- $x$ = Measured value of variable (unit)

If it is desirable to increase the value the $PM_{max}$ formula should be used, and if measurement concerns something that is desirable to decrease the $PM_{min}$ formula should be used. The advantage with designing the formula in this way is that the user of the measure will immediately know when the target is reached (100%), not reached (<100%), or exceeded (>100%).

**2.2.2.3 Performance Targets**

As stated above one way of designing performance measures is by including the performance target in the equation. This leads to another important criterion when deciding how to measure - how to set the performance targets. A measure can only become actionable when a target is linked to it. The target must be reasonably challenging – not too easy or too difficult. A target that is too easy to achieve will not

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38 Andersen & Faugerland (2006)  
make people feel motivated, and a target that is unreasonably difficult will make individuals give up.\textsuperscript{40} Another problem is that the targets could be perceived as a ceiling for the employee - after the targets is reached or almost reach the personnel slows down and cease to strive for improvements. Therefore it is important to constantly review and communicate the targets.\textsuperscript{41}

Another difficulty in the goal setting process also lies in the fact that the targets are used for different purposes. The targets can be used for communicating strategy and motivation, for planning and co-ordination, early warning of potential problems or evaluation of the accomplishments. When the targets are to be used for all of these purposes, the level of the target must be adjusted to serve each different purpose.\textsuperscript{42}

Many companies make distinctions between the terms goals, targets and objectives. A goal may relate to general aspirations, such as to improve production efficiency. Targets and Objectives are often more specific as for example to reduce the cost of waste and scrap by 10\% per quarter over the next year. However there is little consistency in how the companies use these terms.\textsuperscript{43}

2.2.2.4 Performance Measure Type

As earlier stated it is important to identify a purpose for each selected performance measure. Performance measures are used for various purposes and it is also important that the users are aware of the importance of each measure. The users must know if the measure has strong impact on the organization or is it of a useful or informative character. In order to communicate the importance of a measure it can be classified into different measure types. Stefan Tangen suggests the usage of the following types\textsuperscript{44}:

<table>
<thead>
<tr>
<th>Measure Types</th>
<th>Information Benefit</th>
<th>Information Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A – Indispensable</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Type B – Useful</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Type C – Informative</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Type Zero</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Type Minus</td>
<td>Sub-optimizing</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1 Measure Types

Type A – Indispensable; this is the highest type of performance measure. It has strong impact on the organization.

Type B – Useful; Meaningful but not vital. Limited impact on organization

Type C – Informative; Low impact, purposes can only be related to informative reasons

\textsuperscript{40} Simons (2000)
\textsuperscript{41} Andersen & Faugerland (2006)
\textsuperscript{42} Simons (2000)
\textsuperscript{43} Ibid
\textsuperscript{44} Tangen (2004)
Type A, B and C can all be parts of a successful PMS, while type zero and minus clearly do not qualify.

Parmenter mean that many companies are working with the wrong measures and that many of the measures are incorrectly termed Key Performance Indicators (KPIs). Parmenter divides the performance measures into three different types:

- Key Result Indicators - KRIs
- Performance Indicators - PIs
- Key Performance Indicator – KPIs

A KRI tells you what you have done in a perspective, a PI tells you what to do, and a KPI tells you what to do to increase performance dramatically. Parmenter mean that KRIs are measures that often are mistaken for KPIs, such as Customer Satisfaction, Net Profit Before Tax, Profitability for customers, Employee satisfaction, ROCE, etc. The common characteristic for KRIs is that they are the result of many actions – they give a clear picture of whether you are traveling in the right direction, but they do not tell you what to do to improve the results. Parmenter suggests to use a governance report that ideally consist of up to 10 KRIs for the board and a BSC comprising up to 20 performance measures (a mix of KPIs and PIs). Between KRIs and KPIs there are numerous PIs, and the PIs should bee seen as complements to the KPIs. KPIs represent a set of performance measures focusing on those aspects of organizational performance that are the most critical for current and future success of the organization.

2.2.2.5 Specification of Performance Measures

Certain requirements must be fulfilled for each performance measure in order to ensure that the users understand the measure results and know how to measure. To avoid confusion the measures must come with necessary specification. The specifications should for example include information about what the measure will be used for (purpose), how it will be measured, and instructions for analysis. Based on the concepts originally presented by Neely et al (1997) in “Designing Performance Measures a structured approach” and by Medori and Steeple (2000) in “A framework for auditing and enhancing performance measurement systems”, Stefan Tangen has designed a table with 15 parameters specifying a performance measure:

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45 Parmenter (2007)
46 See appendix 9.7 for further explanation of the ROCE measure
47 Parmenter (2007)
48 Tangen (2004)
Measure Specification Form

<table>
<thead>
<tr>
<th>Parameter to specify</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General information:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Title</td>
<td>Labor Productivity</td>
</tr>
<tr>
<td>2. Formula</td>
<td>Number of produced units/number of worked hours</td>
</tr>
<tr>
<td>3. Purpose</td>
<td>To maximize labor productivity</td>
</tr>
<tr>
<td>4. Connections to other measures</td>
<td>None</td>
</tr>
<tr>
<td>5. Date of last review/Next review</td>
<td>January 2004/January 2005</td>
</tr>
<tr>
<td>6. Other notes and comments</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement Instructions</strong></td>
<td></td>
</tr>
<tr>
<td>7. Who measures</td>
<td>Foreman at line B</td>
</tr>
<tr>
<td>8. Source of Data</td>
<td>MRP system and work schedule</td>
</tr>
<tr>
<td>9. Frequency of measurement</td>
<td>Each week</td>
</tr>
<tr>
<td>10. How is the measure displayed</td>
<td>On billboards at each line</td>
</tr>
<tr>
<td><strong>Analysis Instructions</strong></td>
<td></td>
</tr>
<tr>
<td>11. Who acts on the data</td>
<td>Improvement team (line B)</td>
</tr>
<tr>
<td>12. Type of measure*</td>
<td>Type A</td>
</tr>
<tr>
<td>14. What do they do?</td>
<td>Initiate discussion with manager if decreasing</td>
</tr>
<tr>
<td>15. Known limitations</td>
<td>Do not consider capital. Can be affected by supplier performance.</td>
</tr>
</tbody>
</table>

Table 2 Measure Specification Form

2.2.2.6 Communicating Performance Measures

It is recommended that the PMS is kept as open as possible. If the information only is available to the management this will create distrust and send signals to the staff that the PM results will be used in some, for the co-workers, disadvantageous way. A PMS that is open can contribute to that the staff experience the PMS as something positive, and encourage reporting and improvement work.49

However, the PMS is likely to include information that could be damaging for the organization if it fell into the wrong hands. There are ways to communicate delicate information to the co-workers without giving away the core data. One way is to use icon reports not showing the actual figures. The icon reports can also include the critical success factors to constantly remind staff about the strategies.50

2.2.2.7 Revisit the Performance Measures

A business and the business conditions are constantly changing. If the strategic objectives are changing in order to keep the business competitive the performance measures must be aligned with the new objectives. And as mentioned above: a large number of performance measures also increases the risk of information overload and this is a good reason to remove “old” performance measures that no longer are of interest.

49 Andersen & Faugerland (2002)
50 Parmenter (2007)
2.2.2.8 Implementation of Performance Measures

Neely and Bourne implies that measurement initiatives often fail because of difficulties during the implementation phase, and they divide the reasons for failure under three main headings: political, infrastructure and focus. Under the political heading lies the fact that people feel threatened by measures. They worry about how to deliver the measure rather than delivering real performance. A classic example is the call center where the average time to answer the incoming calls is measured. In order to ensure that the call is answered within the time limit the operators avoid picking up the phone after the time limit has passed by, or simply pick up the phone and put it back again without speaking to the person calling.

It is essential that the PMS is introduced in a way that reduces or eliminates the risk of using the PMS in this way. One way could be to let the measurement data be reviewed by those who are being measured before the information is given to the management. This will give those who are measured the opportunity to analyze the information and decide upon actions before they receive questions from management.

Under the heading infrastructure lays the fact that there is a lack of infrastructure in many organizations. Even if a good set of measures originally was defined, the measures cannot be used since the infrastructure has not been put in place. The problem is that the data needed to calculate the performance measures are spread in numerous unlinked and unrelated databases, and often in inconsistent formats. This will lead up to that the organization gets frustrated over the fact that it takes so long to compile the required data. The time, efforts and resources required to implement the PMS leads to the third heading – focus. The process of building and implementing the infrastructure takes so long that the people involved get tired and lose focus.

Some important things to consider during the implementation phase according to Tangen are:

• Support from management – most important criteria as in any project
• Inform and educate the co-workers on why the measures should be used and how the measures will be used
• Let the co-workers be part of the project at an early stage
• Devote time and resources in order not to make the implementation a burden and ensure that the co-workers are committed
• Clarify how the performance measures will help to reach targets
• Design the performance measures in such way that the co-workers feel that they can influence the performance measure results

2.2.3 Summary

The most important criteria to consider when selecting and implementing performance measures will be summarized within chapter 5 - Analysis of empirical findings.

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51 Neely & Bourne (2000)
52 Tangen (2003b)
3 Method
Within this chapter the method that was used to perform the study is presented. Reflections upon the method used and the implications of the study are presented within chapter 7.

3.1 Overview of Method
The study has a deductive approach, which means that theories have been studied in the area chosen, and these theories have then been compared to empirical findings. The empirical data have been collected through interviews within different organizational levels in the case company. The thesis also includes recommendations to the case company on a way of working to develop the existing performance measurement system used by the case company, so that connections between different levels of performance measures will be ensured.

![Figure 11 Overview of Method]

3.2 Literature Review
A study of earlier research and writing within the subject has been performed in order to increase my understanding for the area chosen and also to form a theoretical framework for the interviews. Initially the literature review was carried out on a broad scale in order to develop a general view and idea about available literature and the research performed. Search engines like Google\(^53\) has been helpful for guiding my way further into literature and research articles within the area. Much has been written in the area chosen - I received more than 1.8 million hits when googling on the phrase “Performance Measurement”. The theoretical frame was then narrowed into literature that I found relevant in order to fulfill the purpose with the thesis. Research articles have primarily been collected by searches in the database Emerald.\(^54\)

\(^{53}\) http://www.google.se/
\(^{54}\) http://www.emeraldinsight.com/
I have tried to focus a lot of the studies on up-to-date literature and a large part of the theoretical framework is based on research articles written by Stefan Tangen, who is a Senior Researcher in the Department of Production Engineering, The Royal Institute of Technology in Stockholm. While much of the research performed within the area of performance measurement lie within answering the question of “what to measure”, Stefan Tangen also brings focus to the question of “how to measure”. As the purpose of this thesis not only is to define important criteria when selecting performance measures, but also to define important criteria to consider when it comes to how to measure and implement measures into the organization, his work forms an essential contribution to the theoretical framework.

In some cases it has been difficult to decide which criteria that concern the question of “what” and the question of “how” during the study. The questions are closely connected to each other and it has been difficult to make a clear distinction between them. The literature studied as well as my own perception has determined which question I have chosen to associate different subjects and criteria with. Generally within the thesis the question of “what” concern different frameworks and working procedures that can be used to determine what to measure, while the question of “how” concern matters about what to consider when implementing performance measures, such as how to design measure formulas and targets, how to communicate measures, etc. This has been the guiding principle when summarizing the literature study.

3.3 Case Study

The purpose of the case study was to compare the theories studied to empirical findings. The case studies have primarily been performed at Sandvik Process Systems (SPS), a product area within Sandvik Materials Technology which is one of three business areas within the Sandvik Group. The case company is included in a global organization with several levels of hierarchy. Based on the literature studied it can be concluded that different levels within an organization need different performance measures. This fact made the company well suited for the study. SPS consists of three different product centers that on their part include a number of product units, situated in different countries. The Sandvik Group includes several hierarchical levels such as:

- corporate level
- business area level
- product area level
- product center level
- product unit level

The main focus of the case study lies within the product area (PA) level, the product center (PC) level and the product unit (PU) level as these are the levels included within the case company (SPS). The performance measurement system used by SPS is also affected by requests and demands from upper levels within the organization. Therefore a brief study of the business area (BA) level was also performed in order to provide a better overview of the current situation. Furthermore a small comparative study of the other two business areas included within the Sandvik group was conducted. The purpose of the
comparative studies was to learn about differences and/or similarities that exist between the PMS used within the different organizations.

The study was carried out in form of interviews with persons within the different organizational levels. Using interviews to perform the study was suitable as different perspectives on what is important when it comes to selecting and implementing performance measures were to be examined. The informants were chosen with the intention to develop a broad understanding for how performance measures are selected and implemented into the organization. The aim was to cover different organizational levels, such as the BA, PA, PC and PU level, as well as to study differences between performance measurement within the strategic, tactical and operational level. Generally it can be said that the BA and PA level mostly concern issues that are strategic to their nature, while the PC level mostly covers the strategic and the tactical level. The PU level mostly concern tactical and operational matters.

The first informants chosen were recommended by my advisor at SPS based on the decision to start the case study from the upper levels within the organization and work my way down to the operational level. The reason for this decision was that I wanted to keep the case study as structured as possible. Keeping the case study structured facilitated the process of developing an understanding for the current situation as well as the process of documenting the empirical findings. Another structured approach could have been to conduct the study from the bottom-up, but I wanted to gain knowledge about the formal routines as well as the requests from upper levels at an early stage of the study. The top-down approach increased my understanding for the current situation in the subsequent interviews. The informants that followed were selected either upon suggestions made by the introductory informants or by my personal inquiries for specific roles within the organization.

An interview guide was developed and handed out to the informants before the time of each interview. The purpose with the interview guide was to form a basis for the interviews and also to provide the informants with an insight into the nature of the subjects that were to be dealt with during the interview. The questions were kept as open as possible in order not to guide the informant into the answers and also to get more dept to the interview. The interview guide was divided into five sections:

- **Information about Informant**: The informants described their undertakings and overall working targets
- **How Performance Measures are selected**: The informants provided information about which performance measures that are monitored today and also how these performance measures were selected
- **Implementation of Performance Measures**: The informants provided information about how the measures are implemented into the organization

55 See appendix 9.1
**METHODOLOGY**

<table>
<thead>
<tr>
<th>Analysis of Performance Measures</th>
<th>The informants provided information about how the results from the performance measures are analyzed and used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinions about the Performance Measurement System used today</td>
<td>The informants described their opinions about the present situation concerning performance measures used and the methods of working with implementation and analysis</td>
</tr>
</tbody>
</table>

Each interview was summarized and sent out to the informants in order to give each informant the opportunity to review the information and give feedback. Some of the empirical information has also been collected by using secondary sources as the Sandvik Intranet and Extranet, and also from different internal documents such as presentation material, journals, and minutes from meetings, etc.
4 Empirical Findings

Within this chapter the empirical findings are presented. The findings are mainly collected through interviews, but also secondary sources such as the Sandvik Internet homepage and Sandvik Intranet have been used. The findings from each organizational level are described in separate sub-chapters. Each sub-chapter begins with a presentation of the organizational structure and governance, followed by a description of which performance measures that are used today and how these measures have been selected and implemented. In order to give the reader a quick overview each sub-chapter is finalized with a summary of the findings.

4.1 The Case Company

In 1862 the company “Högbo Stål & Jernwerks AB” was founded by Göran Fredrik Göransson. He was the first to successfully produce steel on an industrial scale by using the Bessemer method. The idea of the method was to blow air through the melted pig irons in order to reduce the carbon content. The company went bankrupt in 1866, but was re-established under the name “Sandvikens Jernverk AB” in 1868. The name of the company was changed to “Sandvik AB” in 1972. At an early stage the business was focusing on high quality and refinement, investments in R&D and close contact with customers and this focus has remained through the years.

Today Sandvik is a high-technology engineering group with operations in 130 countries, 42,000 employees and annual sales of approximately SEK 72 billion. The group conducts operations within three core areas - Sandvik Tooling, Sandvik Mining and Construction and Sandvik Materials Technology. Each business area has full responsibility for research and development (R&D), production and sales of their respective products. Seco Tools, an independent, publicly listed company, is also a member of the group.

The company under investigation was Sandvik Process Systems (SPS), a product area within Sandvik Materials Technology. Since SPS also is affected by requests and demands from upper levels within the organization a brief study of the business area level was performed in order to provide a better overview of the current situation.

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56 http://www.sandvik.com/
57 Sandvik Annual Report 2006
4.2 The Business Area level

The business area Sandvik Materials Technology (SMT) has about 8,600 employees and annual sales of approximately 19.300 MSEK. The business area is a high-technology, cooperation partner within the field of materials technology and the products and materials are developed in close cooperation with customers.

4.2.1 Organization and Governance

The SMT business area is directed by a Management team. The team consists of the SMT President and managers from the six common functions within SMT (Finance, Research & Development, Strategic Business Development, Technology and Purchasing, Human Resources and Communication). The team is responsible for the coordination and continuous development of the SMT business and for the overall SMT strategy. SMT comprises six Product Areas: Tube, Strip, Wire, Kanthal and Process Systems and Sandvik MedTech.

![Figure 13 SMT Product Areas](image)

The managers of each Product Area report to the SMT President. The Product Areas are directed and coordinated by internal boards where the SMT president acts as chairman. The Product Areas have full responsibility for their product lines, within the framework of the business area, relating to:

- consolidated result
- capital employed
- steering and prioritization of product development
- production
- sales and marketing
- internal and external environment issues, including safety

The aim is to utilize the synergies within the Business Area without reducing the responsibility and authority of each Product Area.

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58 Ibid
4.2.1.1 SMT Business System

SMT has created a customized business model called “The SMT Business System”. This is a joint platform for the SMT way of working and doing business. The concept is built on the philosophy to work in the “best way” and become world-class in a number of key areas. At the time of the case study the SMT Business System contained five different key areas:

- Manufacturing
- Marketing and Sales
- Purchasing
- New Product Development
- People Development

The procedure is similar within all key areas. First a clear target picture of the future state of a world-class SMT is defined. The target picture is obtained by investigating how other successful companies do things, and also by looking at successful Sandvik units. Then a number of pilots are run at operational level, to test the working approach in practice. If something does not work as intended, this is adjusted. When the working approach is proven successful, the best way of working in each area is defined. After this the organization is provided with a tool kit for change and start the roll out into the whole organization. The roll outs are called transformations – the organization is transformed into the new ways of working. A number of coaches, called navigators, specialized in the different key areas, provide help and expertise during the transformations.

4.2.2 Performance Measures monitored today

The internal board focuses to a great extent on the financial performance measures that are included in the Financial Key Figure Report that is consolidated on a monthly and quarterly basis. The content of the Financial Key Figure Report is common within the Sandvik group.
<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Invoicing</td>
<td>Sales to Sandvik Group companies included.</td>
</tr>
<tr>
<td>External Order intake</td>
<td>Order Intake external customers. Order Intake from Sandvik Group companies</td>
</tr>
<tr>
<td></td>
<td>is not included.</td>
</tr>
<tr>
<td>External Invoicing</td>
<td>Invoicing external customers. Sales to Sandvik Group companies are not</td>
</tr>
<tr>
<td></td>
<td>included.</td>
</tr>
<tr>
<td>Growth</td>
<td>Organic growth(^59) in % of external invoicing</td>
</tr>
<tr>
<td>GP(^60)</td>
<td>Gross Profit (Revenue-Cost)</td>
</tr>
<tr>
<td>GP%</td>
<td>Gross Profit % of external invoicing</td>
</tr>
<tr>
<td>A&amp;S costs</td>
<td>Administration and Sales costs</td>
</tr>
<tr>
<td>A&amp;S costs%</td>
<td>Administration and Sales costs % of external invoicing</td>
</tr>
<tr>
<td>OR(^61)</td>
<td>Operating result (Total GP - Total A&amp;S costs)</td>
</tr>
<tr>
<td>OR%</td>
<td>Operating result % of external invoicing</td>
</tr>
<tr>
<td>EBIT</td>
<td>Earnings before Interest and Tax</td>
</tr>
<tr>
<td>EBIT%</td>
<td>EBIT % of external invoicing</td>
</tr>
<tr>
<td>Personnel, staff</td>
<td>Number of staff</td>
</tr>
<tr>
<td>Personnel, workers</td>
<td>Number of workers</td>
</tr>
<tr>
<td>Total Personnel</td>
<td>Total number of personnel</td>
</tr>
<tr>
<td>Stock, Standard</td>
<td>Stock at standard cost</td>
</tr>
<tr>
<td>Stock, GOC</td>
<td>Stock at Group Official cost</td>
</tr>
<tr>
<td>Stock GOC %</td>
<td>Stock GOC % of external invoicing</td>
</tr>
<tr>
<td>External NWC</td>
<td>External Net Working Capital</td>
</tr>
<tr>
<td>External NWC %</td>
<td>External Net Working Capital % of external invoicing</td>
</tr>
<tr>
<td>A/R</td>
<td>Accounts Receivable</td>
</tr>
<tr>
<td>A/R%</td>
<td>Accounts Receivable % of external invoicing</td>
</tr>
<tr>
<td>A/P</td>
<td>Accounts Payables</td>
</tr>
<tr>
<td>A/P%</td>
<td>Accounts Payables % of external invoicing</td>
</tr>
<tr>
<td>Other Receivables</td>
<td>Other Receivables</td>
</tr>
<tr>
<td>Other Receivables %</td>
<td>Other Receivables % of external invoicing</td>
</tr>
<tr>
<td>Other Liabilities</td>
<td>Other Liabilities</td>
</tr>
<tr>
<td>Other Liabilities %</td>
<td>Other Liabilities % of external invoicing</td>
</tr>
<tr>
<td>Capital Employed</td>
<td>Net Working Capital + Fixed Asset Net Book Value</td>
</tr>
<tr>
<td>SVA(^62)</td>
<td>Sandvik Value Added</td>
</tr>
<tr>
<td>Cash flow</td>
<td>Cash flow</td>
</tr>
<tr>
<td>Turnover factor</td>
<td>Turnover factor</td>
</tr>
<tr>
<td>ROCE%</td>
<td>Return on Capital Employed</td>
</tr>
</tbody>
</table>

Table 3 Financial Key Figure Report

\(^{59}\) Organic growth is the invoicing growth without taking the effects from currencies and acquisitions into account.

\(^{60}\) When reviewing the result and the gross profit of as specific country or market it is the performance measures Group Operating Result (GOR) and Group Gross Profit (GGP) are monitored instead of OR and GP. These performance measures also take respect to the sales to the market from another internal company.

\(^{61}\) See above

\(^{62}\) SVA stands for Sandvik Value Added. SVA above ‘0’ is the value created within Sandvik. SVA is calculated as: SVA = EBIT – (WACC × CE), Where; EBIT = Earnings before interest and tax, WACC = Weighted average cost of Capital, CE = Capital Employed
EMPirical Findings

The internal board is complemented by Product Area Reviews (PA Reviews). The purpose with the PA Reviews is to review performance and to follow-up on ongoing projects on the PAs. Problem areas and deviations that may arise are discussed and corrective actions are decided upon. The PA Reviews are carried out on monthly basis, and each PA Review is preceded by Product Unit (PU) Reviews, where the PA Management reviews the performance and on-going projects with their PUs. Each PA Review includes a number of financial performance measures that also are represented in the Financial Key Figure Report. The review also contains what is referred to as operational KPIs. Some of the operational measures are common for all SMT units and some are PA unique.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order stock</td>
<td>Opening balance of Order Intake + Order Intake for the month - Total Invoicing during the month</td>
</tr>
<tr>
<td>Delivery precision</td>
<td>No. Of orders shipped on or before due date / Total no. Of order due for delivery in the referred period</td>
</tr>
<tr>
<td>Product mix - % A products</td>
<td>Value of 'A' product orders / Total value of all orders</td>
</tr>
<tr>
<td>Product mix - % C products</td>
<td>Value of 'C' product orders / Total value of all orders</td>
</tr>
<tr>
<td>Customer complaints</td>
<td>Number of registered customer complaints</td>
</tr>
<tr>
<td>Manufactured volume</td>
<td>Metric ton or km, production which is marked and packed i.e. ready for shipment</td>
</tr>
<tr>
<td>Number of employees</td>
<td>Opening balance of Order stock + Order intake for the month - Total invoicing during the month</td>
</tr>
<tr>
<td>Manuf. volume/employee</td>
<td>Manufactured Volume/Total No. of employees</td>
</tr>
<tr>
<td>Productivity</td>
<td>Added value / man hours(workers only)</td>
</tr>
<tr>
<td>Lead time (Days)</td>
<td>Number of days required from first operation in production until finished product</td>
</tr>
<tr>
<td>Yield</td>
<td>Weight of Finished output quantity / Weight of input quantity</td>
</tr>
<tr>
<td>Conversion cost</td>
<td>(Variable costs + fixed costs) / Manufactured Volume</td>
</tr>
<tr>
<td>- Variable cost</td>
<td>Total variable costs / Manufactured Volume</td>
</tr>
<tr>
<td>- Fixed cost</td>
<td>Total fixed costs / Manufactured Volume</td>
</tr>
<tr>
<td>OEE63 in bottleneck</td>
<td>Overall Equipment Efficiency in selected key machine/bottleneck</td>
</tr>
<tr>
<td>Lost hours/100K hours</td>
<td>Lost hours due to accident / 100,000 working hours</td>
</tr>
</tbody>
</table>

Table 4 SMT Common Measures in PA Review

4.2.3 How Performance Measures are selected

The performance measures within the Financial Key Figure report are seldom exchanged or renewed, and when they are, this is upon an initiative on the Sandvik group level. However, which performance measures that are monitored more closely vary over time, in line with new focus areas that arise due to business changes and/or changes of business conditions. The focus areas are often communicated from the Sandvik group level.

63 See appendix 9.8 for a description of the OEE measure
SMT started to use the PA Reviews in 2005, and the informants at SMT do not know how most of the performance measures were selected at this point. The measure Accident Frequency was arisen from the Sandvik core value “Fair Play”, which is a part of the common Sandvik business platform “The Power of Sandvik”.64

4.2.4 How Performance Measures are implemented

4.2.4.1 Categorization and Specification of Performance Measures
The performance measures monitored on the SMT level are not distinguished in terms of how much impact the measure has on the organization. Sometimes the performance measures are referred to as “key figures” and sometimes as “KPIs”, “indicators”, “key indicators” or “performance indicators”. The financial measures are defined and explained in the SAFIR (Sandvik Financial Reporting) guidelines that are available on the intranet. The guidelines contain a description on how to calculate each measure. The SAFIR guidelines also include a specification of the measures included in the Fair Play Report. A similar description for the operational measures included in the PA and PU Reviews does not exist today.

4.2.4.2 Targets and Time frames
On short term basis the financial performance measures are compared to the result from the previous year, the forecast and the budget. Strategic objectives are set on a 4-year basis on a Sandvik Group level. The strategic objectives are not broken down to PA level in a structured way today, but there is a project going on at SMT that will result in a model to be used for breaking down the overall objectives into PA unique objectives. Short term operational targets are mostly set by each PA in co-operation with SMT. Operational targets for Accident Frequency and Delivery Precision are common for all SMT units, but the rest of the targets are PA unique.

4.2.4.3 Data Collection and Reporting
The financial performance measures and the Fair Play measures are reported by all units into the Corporate Performance Management (CPM) system – a common reporting and consolidation system for all Sandvik units. The performance measures within the Financial Key Figure Report are summarized per PA on a monthly, quarterly and yearly basis. The Fair Play information is reported quarterly by the units and the information is consolidated and reported to the Sandvik Board of Directors every quarter. At the end of the year, the results are also reported in the Sustainability Report which is an integrated part of the Sandvik Annual Report. The PA Review reports are Excel based and the data is collected and reported on by each PA.

64 The Power of Sandvik is a platform within the Sandvik Group that contains rules, policies, instructions and guidelines for how the Sandvik employees shall act. The platform also contains visions and objectives that the Sandvik employees shall strive towards. The Power of Sandvik is valid for all units within the Sandvik group and every management is responsible to implement the common rules, policies, etc in their own management systems.
4.2.4.4 How the Performance Measure Results are used

Each PA submits comments and analyzes of their result to SMT. SMT Business Controlling then makes a summary of these comments and analyzes for the whole BA. The BA results, analyses and comments are forwarded to the Sandvik AB management to be used by the board for business analyses. The performance measures within the PA Review are discussed and analyzed in monthly meetings between the SMT management and the PA managements. If any deviations are observed corrective actions are decided upon. SMT communicates some of the financial performance measures in form of charts on the intranet. SMT has also introduced a “Delivery Precision League” – a list published on the intranet where all the PUs and their delivery precision are displayed in a descending list with the best scores on the top. To improve the delivery precision is one of the most important focus areas for SMT during 2007. Another method used to communicate this are the digital signs showing the delivery precision on a weekly basis that have been put up on all manufacturing units. Health and Safety is another important area and to show this the digital signs also display “the number of days since last accident occasion”.

4.2.5 Future Changes

A new tool for analyzing PU and PA performance, called SMT Control Tower, is to be launched in October 2007. The Control Tower will contain a set of common performance measures that all PUs will be obligated to report on. The performance measures included have been developed by the SMT Business Controlling department in discussions with representatives from the product area Tube. The measures that already existed in the PA Reviews were used as a basis, but these measures have now been revised and the amount has also been reduced.

<table>
<thead>
<tr>
<th>SMT Common Operational Measures in Control Tower</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measure</strong></td>
</tr>
<tr>
<td>Days of sales outstanding (DSO)</td>
</tr>
<tr>
<td>Days of purchasing outstanding (DPO)</td>
</tr>
<tr>
<td>Delivery precision</td>
</tr>
<tr>
<td>Customer complaints</td>
</tr>
<tr>
<td>Order intake mix - % A product</td>
</tr>
<tr>
<td>Order intake mix - % C product</td>
</tr>
<tr>
<td>Order stock</td>
</tr>
<tr>
<td>Productivity</td>
</tr>
<tr>
<td>Lead Time</td>
</tr>
<tr>
<td>OEE in bottleneck</td>
</tr>
<tr>
<td>Accident Frequency</td>
</tr>
<tr>
<td>Lost days due to accidents</td>
</tr>
<tr>
<td>No of man-hours - workers and staff</td>
</tr>
</tbody>
</table>
When selecting the performance measures there has not been any particular focus on covering certain dimensions of performance, but there are plans to include all areas of the SMT Business system with 2-3 measures per area in the Control Tower. The Control Tower consists of a web application to be used by the units for reporting on operational measures and a tool for consolidating and analyzing the results. The analyses tool is a QlikView application that will collect and compile information from the web reporting of operational figures as well as financial figures from the CPM reporting.

A database that will hold a description of the performance measures included in the Control Tower is under construction. Within the database the performance measures will have a detailed description with enclosed examples. The database will be open for all employees.

### 4.2.6 Informants Business Area Level

Two informants were interviewed within the business area level. Both informants belong to the SMT financial organization; the Chief Financial Officer (CFO) and manager of the Business Controlling department.

![Informants Business Area SMT](image)

#### 4.2.6.1 Comments from Informants

#### 4.2.6.1.1 How Performance Measures are selected

According Jan, the SMT CFO, the overall business strategy is very important when selecting the performance measures, but SMT does not work in any formal way to ensure a connection between the overall strategy and the performance measures monitored. However, if this connection was to be examined Jan believes that there in 9 out of 10 cases would turn out to be a clear connection between critical success factors and the key performance indicators. The performance measures are not revised on any predetermined review time or upon a specified trigger, but the informants at SMT do not experience that the performance measures monitored are static, since there always is a critical approach to the performance measures monitored. The measures monitored vary over time as the business changes. The performance measures that are monitored more closely are automatically limited and changed by being connected to current focus areas. Jan means

---

65 QlikView is a tool used for dynamic analysis and presentation of data that can be extracted from one or several data sources.
that a lot of measures are available within the different systems and databases, but the question is which measures to focus on. He also believes that it is important to limit the number of performance measures in order to achieve targets.

**4.2.6.1.2 Categorization and Specification of Performance Measures**

The performance measures monitored on the SMT level are considered to be equally important to contribute to an overall comprehensive view, and the informants at SMT see no need to distinguish the measures in terms of how much impact the measure has on the organization. Even though the SMT common operational figures will be more standardized with the launch of the Control Tower there is awareness that the measures will be calculated in various ways among the units. Claes who is the manager of the SMT Business Controlling department, believes that it would be difficult to get a consistent way of calculating the operational figures, and from the SMT level point of view this is not necessary since the operational measures not are intended to be used for any benchmarking among the PUs. The purpose is rather to bring focus to the measures and to create a corporate culture where for example delivery precision is important. Therefore Claes does not think that there will be any risk that incorrect conclusions and decisions will be made if a PU for example shows a very poor productivity compared to other PUs.

**4.2.6.1.3 How the Performance Measure Results are used**

Jan thinks that the performance measures should be used as an active mean of control within discussions and communication with co-workers, and that the performance measures should be brought up on billboard meetings, department meetings, etc. Using performance measures is a good way to highlight important areas, and it is important that the performance measures are designed in such a way that the co-workers experience that they can relate to and contribute to the results of the performance measures. Jan believes that how efficient the different units within SMT are to communicate performance measures with the co-workers differs a lot among the units.
4.2.6.1.4 Data Collection and Reporting

According to the Claes, one of the problems with the existing follow-up is that it is on a very rough level. It is not possible to break down for example the revenue into how much of the revenue is the actual price and how much is the effect of currency- and alloy effects. SMT use different estimation models to calculate for example how much of the revenue that is the actual price, but the models are based on a lot of assumptions and Claes believes that these models are not reliable enough. SMT can not collect information on this detailed level today since the SMT units do not have a common way to mark their source data with the information needed. Claes believes that in order to overcome the problem SMT will need to develop guidelines for how source data should be marked and then support and make demands on the units to develop their systems and routines in accordance with these guidelines.

4.2.7 Summary of Findings

- The purpose of the performance measures are several; communicating important focus areas to the organization, as warnings of potential problems, as a discussion basis at review meetings, as a basis for decision making
- SMT uses formal re-occurring meetings to review and follow up on PC Performance
- SMT do not use any specific framework for selecting performance measures
- Link between performance measures and strategy is not ensured in any formal way
- Performance measures are not revised on a predetermined time or trigger
- Performance measures are not distinguished in terms of importance by for example name or by a measure type
- SMT has problems with infrastructure; the data to be used for compiling the performance measures is in inconsistent formats stored in several different databases.
4.3 The Product Area Level
Sandvik Process Systems (SPS) designs and manufactures steel belts, press plates and steel belt-based industrial processing systems. The business is divided into three product centers (PCs), which on their part include a number of Product Units (PUs).

**PC Belts**
PC Belts produces solid and perforated belts in a wide range of steel grades and dimensions. Typical applications include coolers, wood-based panel presses and bake ovens.

**PC Industrial Processing**
PC Industrial Processing (PC IP) produces complete installations for conveying and processing and the heart of the systems is a steel belt. The business is concentrated to chemical processing, food processing and film/sheet casting.

**PC Laminates**
PC Laminates produces press plates used for the production of technical and decorative laminates and melamine coating of wood-based panels. The markets include the furniture and flooring industries and electronics companies.

4.3.1 Organization and Governance
Sandvik Process Systems consists of the three PCs mentioned above and three sales regions; Europe, Americas and Asia. The sales area organizations are responsible for providing each PC with the sales resources required, as agreed with the PCs.

*Figure 15  Product Centers, PA Process Systems*
EMPIRICAL FINDINGS

The PC organizational level lie between the PA and the PUs and within SMT, the PC concept is unique for SPS. The aim with the PC concept is to work closely with the PUs and the sales offices around the world including, where applicable, appointed SMT agents. PA SPS is directed by a Management team consisting of the SPS President, the managers from the three common functions within SPS, and the managers from the three PCs. The team has monthly meetings, and is also complemented by yearly EM (Extended Management) team meetings. Besides from the members of the Management team, the EM team also includes managers from the sales regions. The PCs and the sales regions are directed by internal boards, where the president of SPS acts as chairman. The Management team handles operational and tactical issues, and the internal board handles issues that are more strategic in nature, such as decisions about new acquisitions, larger investments, resource issues, etc.

4.3.2 Performance Measures monitored today

Only financial performance measures are monitored on a consolidated PA SPS level. These performance measures are included in the Financial Key Figure Report, which as mentioned in the SMT chapter, is common within Sandvik (see chapter 4.2.2). The PA SPS management performs PC Reviews with each PC manager. The PC Reviews form the basis of the following PA Review. Each PC Review includes a number of financial performance measures that also are represented in the Financial Key Figure Report. These performance measures are common for all PCs and are also consolidated on a PC level within the Review Report.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Order intake</td>
<td>Order Intake external customers. Order Intake from Sandvik Group companies is not included.</td>
</tr>
<tr>
<td>Order Backlog (External)</td>
<td>Delivery this year Orders not yet invoiced</td>
</tr>
<tr>
<td>Secured invoicing (external)</td>
<td>Forecast of Full Year Invoicing based on the Order Backlog</td>
</tr>
<tr>
<td>External Invoicing</td>
<td>Invoicing external customers. Sales to Sandvik Group companies are not included.</td>
</tr>
<tr>
<td>External Invoicing - Price</td>
<td>% of external invoicing related to price effects</td>
</tr>
<tr>
<td>External Invoicing - Volume</td>
<td>% of external invoicing related to Volume (growth)</td>
</tr>
<tr>
<td>External Invoicing - Currency</td>
<td>% of external invoicing related to Currency effects</td>
</tr>
<tr>
<td>GP</td>
<td>Gross Profit (Revenue-Cost)</td>
</tr>
<tr>
<td>GP%</td>
<td>Gross Profit % of external invoicing</td>
</tr>
<tr>
<td>A&amp;S costs</td>
<td>Administration and Sales costs</td>
</tr>
<tr>
<td>A&amp;S%</td>
<td>Administration and Sales costs % of external invoicing</td>
</tr>
<tr>
<td>EBIT</td>
<td>Earnings before Interest and Tax</td>
</tr>
<tr>
<td>EBIT%</td>
<td>EBIT % of external invoicing</td>
</tr>
<tr>
<td>External NWC</td>
<td>External Net Working Capital</td>
</tr>
<tr>
<td>External NWC %</td>
<td>External Net Working Capital % of external invoicing</td>
</tr>
<tr>
<td>Capital Employed</td>
<td>Net Working Capital + Fixed Asset Net Book Value</td>
</tr>
<tr>
<td>Turnover factor</td>
<td>Turnover factor</td>
</tr>
<tr>
<td>ROCE%</td>
<td>Return on Capital Employed</td>
</tr>
</tbody>
</table>

Table 6 Financial Performance Measures within PC Review

66 See appendix 9.5 for an example of a PC Review report
The non-financial performance measures are called "Own KPIs by PU" in the report, and are mostly referred to as “Operational KPIs”. PA SPS has not yet adopted all of the SMT common operational measures.

The SMT common measures that have been adopted by PA SPS are:
- Delivery Precision
- Accident Frequency
- Number of complaints
- Productivity (only monitored on PC Belts and PC IP)
- OEE\(^{67}\) (only monitored at PU Sandviken)

Other PC unique measures within the review are:

<table>
<thead>
<tr>
<th>PC Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced meters in production line 1</td>
<td>Manufactured meters/month</td>
</tr>
<tr>
<td>Produced square meters in production line 2</td>
<td>Manufactured square meters/month</td>
</tr>
<tr>
<td>Warranty Cost (KSEK)</td>
<td>PoC – percentage of completion is followed up for the largest projects</td>
</tr>
</tbody>
</table>

Other PC unique measures within the review are:

Table 7 PC unique measures in PC Review

In addition to the performance measures included in the financial key figure report and the PC Reviews, there are also a number of performance measures showing the usage of the global CRM (Customer Relations Management) system used by SPS.

<table>
<thead>
<tr>
<th>CRM related Performance Measures</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects per market(^{68})</td>
<td>Objects per Market entered in CRM system</td>
</tr>
<tr>
<td>Total Objects</td>
<td>Total number of objects entered in CRM system</td>
</tr>
<tr>
<td>Customer visits per market</td>
<td>Customer visits per Market entered in CRM system</td>
</tr>
<tr>
<td>Service Activities</td>
<td>Number of Service activities entered in CRM system where the service category is reported</td>
</tr>
<tr>
<td>Lost Order Report</td>
<td>Number of Lost orders entered in CRM system where a lost order reason is reported</td>
</tr>
<tr>
<td>Business Opportunities</td>
<td>Number of business opportunities entered in CRM system</td>
</tr>
<tr>
<td>Active users Total</td>
<td>Number of total active users</td>
</tr>
<tr>
<td>Active users Primary users</td>
<td>Number of active primary users</td>
</tr>
</tbody>
</table>

Table 8 Performance Measures related to the usage of the CRM system

\(^{67}\) See appendix 9.8 for an explanation of the OEE measure

\(^{68}\) Objects are the machines where the steel belts are used
4.3.3 How Performance Measures are selected

The performance measures in the Financial Key Figure Report are very standardized and have a long tradition within Sandvik. The measures in the report are seldom exchanged or renewed, and when they are, this is upon initiative on the Sandvik group level. An example of this is the new Sandvik steering model that has been developed by Sandvik Finance that will be taken into use year 2008. Within the new steering model the performance measure GOR (Group Operating Result) will be replaced by GBR (Group Business Result). The difference between the performance measures is that GBR does not take calculated costs into consideration. The reason for changing to GBR is that GOR is an internal Sandvik measure, and the performance measure GBR is commonly used which will facilitate analyzes for external investors, etc.

The performance measures that are monitored are often a result of a current focus area derived from the Sandvik group level. As an example, there was a lot of focus within Sandvik on capital efficiency for a couple of years, and a TIC – Time is Capital project was started up on an initiative at the Sandvik group level. TIC training courses were carried out, and there was a lot of focus on improvement activities within this area, as well as on performance measures connected to capital efficiency, such as DPO (Days of purchasing Outstanding), DSO (Days of Sales Outstanding) and Days in Inventory, etc. The focus on performance measures like these then pass over to performance measures connected to new focus areas.

When the operational performance measures to be included in the reviews were selected, the PC managers were given some direction by the PA; for example that the SMT common measures Delivery Precision, Accident Frequency, Number of complaints and Productivity were to be included. How to calculate productivity and delivery precision has been up to each PC to decide. The PCs have on their part left this decision to their PUs.

4.3.4 How Performance Measures are implemented

4.3.4.1 Categorization and Specification of Performance Measures

SPS do not use any formal and common way to specify the performance measures considering type of measure, purpose of measure, measure definition, etc. The financial performance measures are described in the Sandvik Financial Report guidelines, and these guidelines are available for all co-workers on the intranet. The guidelines contain a description on how to calculate each measure. A similar definition does not exist for the operational performance measures today. The PA SPS controller is planning to create a specification that will include the unit of measure, a description and a definition of each measure. The specification will be included in the web application where the reporting units will supply their figures when the SMT Control Tower has been taken into use. The performance measures are not categorized in terms of how much impact the measure has on the organization. Just as within SMT the measures are sometimes referred to as “key figures” and sometimes as “KPIs”, “indicators”, “key indicators” or “performance indicators”.

45
4.3.4.2 Targets and Time frames

On the short term basis (1 year basis), targets for financial performance measures are set in connection with the budget preparation. Each PC sets targets for their business in co-operation with PUs and SUs. The targets are developed by looking at sales and cost forecasts where the effects of currencies, price development, etc are taken into consideration. The budget targets are quarterly compared and adjusted to forecasts during the budget year. The PC budgets are approved by the internal board before released. Budget is nowadays called Target. The budget was previously set once per year, and the budget targets set at this point, were the targets that the business performance was compared to for the rest of the year. In the new way of working, a yearly target is set and when entering quarter one, the target is compared to the new forecast. This will yield a new target, for example Target+5%, and this is what the business performance is compared to until entering quarter two, when a new adjustment is made.

Sandvik AB set long term financial targets (4 year basis), mostly referred to as strategic plans, for the entire Sandvik group, and these objectives are then broken down per BA. In co-operation with each PA, the BA objectives are then broken down to a PA level, and in the same way the PA objectives are broken down to PC objectives in co-operation with each PC. In other words, this is a rather interactive procedure where realistic objectives for each business are set in discussions with each management group. The process of setting targets for the so called operational measures included in the PC Review is not entirely clear; some of the informants mean that this is done in connection to the budget procedure, and some mean that it is an ongoing process frequently discussed within the reviews.

4.3.4.3 Data Collection and Reporting

All SPS units report on financial performance measures in the CPM (Corporate Performance Management) system. The information is consolidated monthly and quarterly into the Financial Key Figure Reports by the PA SPS controller. The Financial Key Figure Reports are stored in a database which the SPS Management team and the PC controllers have access to. The region managers have access to see the figures for their own region within this database. PA SPS also compiles the reports to be used in the PC Reviews. The financial measures in the PC Review report are collected directly from the CPM system, and the operational figures are gathered by each PC and forwarded to the PA SPS controller. PA SPS are not obligated to provide SMT with any consolidated financial performance measures. Since this information is reported by all units into the CPM system the SMT Financial department can extract the information and compile it directly into Financial Key Figure Reports on a PA and BA level. PA SPS complements the Key Figure Reports with comments and analyzes on the PA SPS results on a monthly and quarterly basis. The performance measures analyzed and commented are Order intake, Invoicing, Result, External NWC, SVA, ROCE and Cash flow.
4.3.4.4 How the Performance Measure Results are used

PA SPS use GAP plans to help determine how to reach the long-term objectives. Each PC develops a strategic plan that includes key activities within different areas to help achieving the long term objectives. The PC strategic plans are summarized into a PA SPS business plan that includes a GAP plan for each long-term objective. The effect each activity will have on the performance measure result is illustrated in a graph, showing how to go from the performance measure result year X, to performance measure objective year X + 4.

![Example GAP Plan](image)

The performance measures within the PC Review are discussed and analyzed within the review. If any deviations are observed corrective actions are decided upon. Since the beginning of 2007, SPS has also started to use quarterly reviews of the usage of the global CRM system. A number of CRM usage related measures are reviewed and activities concerning the performance and usage are also discussed and decided upon. The aim is that all users should enter all customer activities, businesses, business opportunities, objects, etc in the system. Many of the CRM system related performance measures are presented in form of graphs on the SPS global intranet home page.
A “Quarterly follow up” is also presented on the global intranet. The follow up shows the performance of each PU compared to some of the most important financial and operational targets. The actual figures are not displayed within the presentation. Instead of the actual figures, a traffic light showing red, yellow or green light, depending on how the PU is doing compared to the targets for each area, is used. The presentation also shows how the PUs are progressing in their work of introducing the SMT Business System. Other SPS performance measures that are presented and updated regularly on the SPS global intranet are Order Intake and Invoicing.

4.3.5 Informants Product Area level

Four informants were interviewed within the product area level; the Managing Director, the Financial Manager, the Financial Controller and the Manager of Communication & Marketing support.

4.3.5.1 Comments from Informants

4.3.5.1.1 Performance Measures monitored today

According to Mats, the Managing Director, the most important operational performance measures are Productivity and Delivery Precision, but Mats also says that delivery precision is not exactly critical for the SPS business. Mats takes the belt business as an example, and says that the belt customers are rather patient when it comes to how well the promised delivery dates are fulfilled. The reason for this is that the belts often are one of many pieces in a big project, running over a long period of time and including many different parts. The measure is more important if the order concerns a replacement belt, where the customer might have a production stop planned. However, Mats believes that potential orders can be lost if you can not live up to a prompt delivery, and therefore it is important to get control over the measure.

In general Mats thinks that it is difficult to come up with anything that is missing when it comes to the performance measures monitored today. He believes the risk that the amount of available measures are more than people have the ability to absorb and make use of, is bigger than the risk that something is missing when it comes to performance measures within the existing follow-up. However, he mentions that the measuring of customer satisfaction could be improved - a complementary addition to the measure “Number of Complaints” would be useful. Furthermore, Mats would like to be able to follow up on how the order stock is distributed over time, and he also mentions that a set
of measures that can be used for benchmarking between the PC Belts production units in Totowa and Sandviken would be interesting. These are the only PUs where similar products are manufactured and where a comparison would be meaningful.

4.3.5.1.2 How Performance Measures are selected
In general, the Financial Manager Göran believes that it is important to try to keep the amount of performance measures down. Otherwise he believes that there is a risk that the performance measures create more confusion than clearness. The risk is that people will not know what is important and what is less important, and this can also result in sub optimizations. Mats think the most important thing to keep in mind when selecting performance measures is that the co-workers feel that they can influence the measure results. According to Mats, each manager is responsible for overseeing that the business can be measured, and it is important that the performance measures are linked to the overall business objectives. However, no formal working procedure is used to ensure this connection.

4.3.5.1.3 How the Performance Measure results are used
Mats say that he is satisfied with the follow-up procedures, and he thinks that the PC Review concept has turned out very well. A PC Review is somewhat informal compared to the internal board meetings, and this helps to bring out discussions in a good way. When the PC Reviews first were taken into use, there was some resistance from the units, but when getting started everybody experienced that the concept was working very well. In general the Manager of Communication & Marketing support, Cecilia, thinks that too many performance measures are presented on the intranet and that this can cause confusion among the co-workers if the measure purposes and targets are not clearly communicated.

4.3.5.1.4 Categorization and Specification of Performance Measures
Mats do not see a need to distinguish the measures by different measure types, since he does not believe that working with formal definitions will lead up to anything. More important is that each manager brings out and communicates important measures to the staff. According to Mats, the purposes of the performance measures are frequently discussed at the PC Review meetings, and since performance measures are communicated a lot by the intranet and within different department meetings, Mats believe that most staff has a relatively good insight into the performance measures and the performance measure purposes.

4.3.5.1.5 Data Collection and Reporting
In the beginning Göran was afraid that the introduction of the Control Tower would lead up to a lot of double reporting for the units, but it looks as if a lot of the SMT common performance measures in the Control Tower can be selected from existing systems, such as the CPM system. Göran thinks that it is important not to demand more information from the units than necessary, in order not to overload the units. Göran think that there are a lot of advantages being a part of a large organization like SMT, but he also experience that when problems arise somewhere in the organization the SMT approach is too generalistic to its nature. He means that the focus could be more problem oriented and
focused on the areas with the biggest problems. In this way resources and corrective actions should be focused to the areas with the biggest pay-offs.

The financial controller, Ann-Sofie, believes that the units probably agree to that the operational figures they are being obligated to report are important, but maybe are questioning why this information should be reported to the PA and BA level. Ann-Sofie will be responsible for communicating the new Web reporting and analyses tool (SMT Control Tower) to the units, but she has not received any information from SMT about the measures and the measure purposes. The only communication link has been through the technical consultant that is developing the QlikView solution.

4.3.6 Summary of Findings

- The purposes of the performance measures are several; communicating important focus areas to the organization, as warnings of potential problems, as a discussion basis at review meetings, as a basis for decision making
- PA SPS do not use any specific framework for selecting measures
- Links between performance measures and strategy are not ensured in any formal way
- PA SPS uses formal re-occurring meetings to review and follow up on PC Performance
- PA SPS strive to limit the amount of measures
- Performance Measures are not revised on a predetermined time or trigger
- Performance Measures are not distinguished in terms of importance by for example name or by a measure type
- Measures that some of the informants would like to add to the existing follow-up:
  - Customer Satisfaction
  - Distribution (over time) of order stock
  - Some measure(s) to be used for benchmarking the PC Belts PUs in Sandviken and Totowa

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69 QlikView is a software used for dynamic analysis and presentation of data that can be extracted from one or several data sources
4.4 The Product Center level and the Production Unit level

Product Center (PC) Belts produces solid and perforated belts in a wide range of steel grades and dimensions. Typical applications include coolers, wood-based panel presses and bake ovens. Internally the main product categories are divided into 701 belts, 702 belts and service. Roughly the 701 belts are the belts produced in production line 1, and the 702 belts are produced in production line 2. The GPM (Global Product Manager) is responsible for the overall strategies and plans for his/her product globally.

4.4.1 Organization and Governance

PC Belts has its global headquarters in Sandviken, Sweden. The PC is responsible for overseeing and guiding all SPS Belt business around the world including sales, production and service. The aim with the PC concept is to work closely with three main PUs (Sandviken, Totowa and Japan), and with Sales Units (SUs) around the world. The PC Belts management team consists of the PC manager, the Production Manager for PU Sandviken, the Marketing and Sales Manager and the Belt Technology Manager. The PC Manager is also a member of the SPS Management Team. The PC Belts organization and the PU Sandviken organization are closely connected - the PU is referred to as PC Belts, and there is no separate organization chart for PU Sandviken. The two organizational levels are described in one chart where some staff has global PC undertakings and some are operating locally.

Figure 18 Product Center Belts

PC Belts and PU Sandviken have mapped some of their internal processes such as the global order process. However, the units are organized into traditional functions. Some of the mapped processes have appointed owners but there is no organization around these processes.

4.4.2 Performance Measures monitored today

Performance is monitored within several different areas, and the process of selecting the performance measures varies. In order to get some structure into this presentation, the
measures are presented in seven different categories within this chapter: Financial, Sales, Service, Quality, Environment, Health & Safety and Production.

The fact that the two organizational levels are so closely connected has made it difficult during the case study to distinguish which measurement activities belong to the PC level and which belong to a PU level. The determining factors for whether I have chosen to present the measures under the PC level or the PU level are:

- Measure results are consolidated to a PC level
- Measure results are compared between PUs or SUs
- Measures are used within PC Review

If any of these factors are fulfilled the measure will be presented under the PC level. If the measures also are followed up on the PU level this will also be described. The SU level is not included within the case study and performance measurement concerning the SUs will only be briefly described. To facilitate the presentation the measurement activities linked the PC and PU level, the performance measurement activities concerning both levels are described within this chapter.

### Measure Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Consolidated</th>
<th>Compared</th>
<th>PC Review</th>
<th>Organizational level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>x</td>
<td>x</td>
<td>PC and PU</td>
<td>PC and PU</td>
</tr>
<tr>
<td>Sales</td>
<td>x</td>
<td></td>
<td>PC and SU*</td>
<td>PC and SU*</td>
</tr>
<tr>
<td>Service</td>
<td>x</td>
<td>x</td>
<td>PC and SU*</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td></td>
<td></td>
<td>PU</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td>PU</td>
<td></td>
</tr>
<tr>
<td>Health and</td>
<td></td>
<td></td>
<td>PU</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td>PC and PU</td>
<td></td>
</tr>
</tbody>
</table>

*Table 9 Performance Measure Categories PC Belts

*) SUs are not included within the case study

#### 4.4.2.1 Performance Measures monitored on a PC level

##### 4.4.2.1.1 Financial

The financial performance measures included in the Financial Key Figure Report (see chapter 4.2.2) are consolidated on PC level by the PA SPS controller.
4.4.2.1.2 Sales

Some of the sales related performance measures are unique and some are common for all markets. OI and Sales are followed up per market, but also consolidated per product group (special belts, standard belts and service). PC Belts also plan to take the Customer Satisfaction Survey (CSS) that has been developed by SMT into use and a handful of the available performance measures within the survey will probably be used by PC Belts. Which measures to use is not yet decided at the time of the interviews.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Intake</td>
<td>External Order Intake/market</td>
</tr>
<tr>
<td>Invoicing</td>
<td>External Invoicing/market</td>
</tr>
<tr>
<td>CAP</td>
<td>No of Customer Action Plan/No of A-customers</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Measures to be included not yet decided</td>
</tr>
</tbody>
</table>

Table 10 Sales related measures PC Belts

4.4.2.1.3 Service

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilization Manning</td>
<td>Total invoiced hours (external and internal)/Available work hours</td>
</tr>
<tr>
<td>Utilization Invoiced Hours</td>
<td>Invoiced hours external sales/Available work hours</td>
</tr>
<tr>
<td>No of jobs</td>
<td>Total number of jobs (installations, repairs, inspections, etc)</td>
</tr>
<tr>
<td>New belt installations</td>
<td>Total number of new belt installations</td>
</tr>
<tr>
<td>New belt installations new line</td>
<td>Number of new belt installations on new lines</td>
</tr>
<tr>
<td>New belt installations old line</td>
<td>Number of new belt installations on old lines</td>
</tr>
</tbody>
</table>

Table 11 Service related measures PC Belts

4.4.2.1.4 Production

<table>
<thead>
<tr>
<th>Measure</th>
<th>PU Sandviken</th>
<th>PU USA</th>
<th>PU Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity (Totowa and Japan)</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Productivity (Meters P1/month)</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Productivity (Square Meters P2/month)</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Delivery precision (%)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>OEE(^{70}) Bottlenecks</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 12 Production Related measures PC Belts

Each PU uses different formulas to calculate the productivity; PU Totowa calculates the produced square meters divided by the number of blue collar work hours, PU Sandviken calculate productivity as the number of invoiced square meters divided by the total number of work hours (all employees) and PU Japan calculate productivity as the percentage of time that their polishing machine has been used. Delivery Precision is

\(^{70}\) See appendix 9.8 for an explanation of the OEE measure
calculated in the same way for both Sandviken and Totowa, but Japan calculates it as capacity utilization. OEE is only used in Sandviken. In other words; none of the production related measures within the PC Review are calculated in the same way for all three PUs.

4.4.2.2 Performance Measures Monitored on a PU level

4.4.2.2.1 Financial

Financial performance measures included in the Financial Key Figure Report (see chapter 4.2.2).

4.4.2.2.2 Quality

“Customer Complaints” and “Delivery Precision” are performance measures defined as quality related. The performance measure Delivery Precision is also described as performance measure related to production.

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complaints</td>
<td>Number of approved complaints</td>
</tr>
<tr>
<td>Delivery Precision</td>
<td>The delivery precision is measured on own stock, that is if manufacturing orders are finished in line with the planned ready dates.</td>
</tr>
</tbody>
</table>

Table 13 Quality related measures PU Sandviken

4.4.2.2.3 Environment

<table>
<thead>
<tr>
<th>Environment Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity consumption</td>
<td>Relative electricity consumption; (MWh/COGS)</td>
</tr>
<tr>
<td>Water</td>
<td>Relative usage; m3/COGS</td>
</tr>
<tr>
<td>Media usage</td>
<td>For example compressed air m3/COGS</td>
</tr>
<tr>
<td>Hydraulic oil</td>
<td>Conformity between used/removed amount (liters)</td>
</tr>
</tbody>
</table>

Table 14 Environment related measures PU Sandviken

4.4.2.2.4 Health and Safety

<table>
<thead>
<tr>
<th>Health and Safety Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTI frequency rate</td>
<td>(Lost time injuries x 1000000 / (number of employees x 2000). Lost time injuries (LTI) is work-related injury that would result in one or more days Lost. Incidents when traveling to and from the work place are not to be included.</td>
</tr>
<tr>
<td>Number of days since last accident</td>
<td>Number of days since last accident</td>
</tr>
<tr>
<td>Sick leave ratio</td>
<td>Number of days lost due to illness / total working-days in period. Any form of illness, occupational illness and illness arising from natural causes, resulting in one or more days away from work. (Working-days per person for one year = 250)</td>
</tr>
<tr>
<td>Reporting on Near accident</td>
<td>Number of reported near accidents per accident lost time injury</td>
</tr>
<tr>
<td>Performance dialogues</td>
<td>Performance dialogue performed for % of employees per year</td>
</tr>
<tr>
<td>Average risk mark score</td>
<td>Risk mark score is presented by FM Global for each unit audited, and total SMT result will be presented by staff function Quality &amp; Environment.</td>
</tr>
<tr>
<td>OHSAS certificate</td>
<td>Number of production – and service units having an occupational health and safety management system certified to OHSAS 18001</td>
</tr>
</tbody>
</table>

Table 15 Health and Safety related measures PU Sandviken
EMPIRICAL FINDINGS

4.4.2.2.5 Production

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced special belts</td>
<td>Grinded m²</td>
</tr>
<tr>
<td>Produced standard belts</td>
<td>Produced meters</td>
</tr>
<tr>
<td>Delivery Precision</td>
<td>The delivery precision is measured on own stock, that is if manufacturing orders are finished in line with the planned ready dates.</td>
</tr>
<tr>
<td>Productivity</td>
<td>Invoiced Square meters of belts /man-hours</td>
</tr>
<tr>
<td>OEE⁷¹</td>
<td>Overall Equipment Efficiency</td>
</tr>
<tr>
<td>CI project related measures</td>
<td>The CI Team create performance measures to follow up on improvement activities</td>
</tr>
</tbody>
</table>

Table 16 Production related Performance Measures PU Sandviken

4.4.2.2.5.1 Produced quantity
This performance measure shows how many meters and square meters that are available for selling. These performance measures can to some extent predict the future invoicing.

4.4.2.2.5.2 Delivery Precision
As previously mentioned all units within SMT are obligated to report on their delivery precision. PU Sandviken has decided to calculate their delivery precision by measuring the internal deliveries to stock, i.e. to measure whether manufacturing orders are finished in line with the planned ready dates. The delivery precision includes both orders for stock replenishment and customer orders.

Delivery Precision = no of orders delivered on time/ total no of orders delivered

Order delivered on time: actual date of delivery ≤ promised date of delivery

PU Sandviken use the date when the last operation is finished and the goods is put into stock as the actual date of delivery and the planned ready date of the manufacturing order as the promised date of the delivery.

4.4.2.2.5.3 Productivity
The productivity measure is included in the PC Reviews, and it is reported on by all PC Belts PUs. However, each PU uses different formulas to calculate the productivity; PU Totowa calculates the produced square meters divided by the number of blue collar work hours, PU Sandviken calculate productivity as the number of invoiced square meters divided by the total number of work hours (all employees) and PU Japan calculate productivity as the percentage of time that their polishing machine has been used

4.4.2.2.5.4 OEE - Overall Equipment Efficiency
The calculation of OEE⁷² is based on the three OEE factors: Availability, Performance, and Quality. PU Sandviken uses the OEE measure in bottlenecks and the follow-up is based on a known ideal time for each machine. Previously this ideal time was calculated

⁷¹ See Appendix 9.8 for an explanation of the OEE measure

⁷²
from the best known time so far, but this was recently changed to what the machine actually should be able to perform.

### 4.4.3 How Performance Measures are Selected

The process of selecting measures varies among the different areas. PC Belts is currently introducing the Sales program (called World Class Sales) from the SMT Business System. The program is to be introduced on all PC Belts markets and many of the markets have already been transformed into the new way of working. During each transformation a set of measures are implemented. These measures were selected during the first phase of the project, and they are derived from the predefined measures that come with the Sales program. Some of the performance measures that have been developed will be common for all SU Reviews and some will be unique for a specific country.

The performance measure “Customer Action Plans” is not monitored on all markets, only the markets where this is identified as a problem within the sales transformations. The Manufacturing program from SMT Business System was introduced in PU Sandviken in 2005 and most of the production related performance measures used today were developed and implemented during the transformation.

PC Belts develop a strategic plan, called Business Plan, in accordance with the strategic objectives. The business plan includes key activities within different areas to help achieving the long term objectives. The global product managers develop a GPP - Global Product Plan for each of the product groups; special belts, standard belts and service (for service the plan is called Global Process Plan). The GPP is discussed in the PC Belts management group and aligned to the overall PC Belts business plan. The GPP contain prioritized segments, pricing strategies and models, success factors, etc.

The SMT units are certified according to the ISO 14001 standard and the environmental performance measures and objectives are set on the SMT level. PU Belts have adapted these performance measures and objectives where possible. The measures monitored within the Health and Safety area have also been set on the SMT level. The aim is to use a standardized way of working within the area of health and safety and all SMT Product Units and some of the SMT distribution centers are to be certified to OHSAS 18001 before the end of 2007.

### 4.4.4 How Performance Measures are implemented

#### 4.4.4.1 Categorization and Specification of Performance Measures

As mentioned earlier within this report the financial performance measures are described in the SAFIR guidelines that are available on the intranet. The performance measures related to Quality and Environment are all documented within the Quality database that all employees in Sandviken have access to. The specification contains a description of the PM, the actual target and a performance measure owner. These specifications have been made upon the initiative by the Quality and Environment manager. The other performance measures do not have a similar description. Just as within the other
organizational levels within this study, the performance measures are not categorized in terms of how much impact the measure has on the organization. The measures are sometimes referred to as “key figures”, “KPIs”, “indicators”, “key indicators” or “performance indicators”.

4.4.4.1.2 Targets and Time frames
The process of setting targets varies among and within the different areas:

- Short and long term financial targets are set in the procedures described in chapter 4.2.4.
- Some targets are set by SMT; such as targets connected to Health & Safety, Environmental target, Accident Frequency and Delivery Precision.
- The targets for the sales related performance measures are set in the SU Review discussions are unique for each SU (order intake and invoicing targets are set in the budget procedure).
- The procedure of setting targets defined for the PU Sandviken production related measures varies. Targets for the SMT common measure Delivery Precision is set on the SMT level. The targets for produced meters and square meters are defined as the result previous year.
- Targets for Environment and Health and Safety related measures are set by SMT.
- No targets are specified for the service related measures.

4.4.4.1.3 Data collection and reporting
Data is collected and reported on in several different systems. As previously mentioned all units perform reporting on financial performance measures in to the CPM system. The financial department also summarizes a lot of financial information from the local ERP system used in Sandviken. The local follow up on invoicing and order intake for instance is compiled from the ERP system into a QlikView\textsuperscript{73} application and refreshed on a daily basis. The sales related performance measure customer activity plans are handled within the SPS global CRM system. All customer activity plans are to be entered in the CRM system by the salesmen, and this information can be compiled in predefined reports upon requests from the users. Service reporting is done in a web application developed by PC Belts. The application consists of a SQL database where the reported information about the belt service activities is gathered. The reporting units enter the information through a web form on the intranet on a monthly basis. The information is aggregated into a QlikView application showing Invoicing, Gross Profit, Utilization, etc. The global product manager for service has access to the consolidated information, and some of the sales managers have access to see information linked to their own market.

\textsuperscript{73} QlikView is a software used for dynamic analysis and presentation of data that can be extracted from one or several data sources
All claims are entered in a common database where all internal information related to the claim is stored. Some of the production related performance measures are calculated by using information from the ERP system, some are reported on in an Excel based application by the production personnel, and some are manually followed up in Excel by one of the production supervisors. Delivery Precision is also reported into two different web applications; one for the presentation on the digital signs, and one for the Delivery Precision League on the intranet. The performance measures related to improvement projects are mostly reported directly on production bill boards by the CI (Continuous Improvement) team.

4.4.4.1.4 How the Performance Measure results are used

The production related performance measures are used by the production management in Sandviken to analyze the effectiveness of the production and to identify problems and improvement opportunities. Productivity and Delivery Precision are also followed on a regular basis within the PC Belts management group and occasionally also in the internal board meetings. These performance measures are also frequently discussed in the production bill board meetings. All of the production related measures in PU Sandviken are also included in the PC Review report. The PC reviews are not preceded by PU Reviews in a sense that the PC management reviews the performance of the PUs in specific review meetings. The basic data concerning measure results are sent to the PC management on a monthly basis, to be used within the PC Reviews. The aim is that the performance measure result monitored should be connected through bill board meetings -> weekly production management meetings -> (PU Review meetings ->) PC Review Meetings -> PA Review Meetings

The sales related performance measures selected in the World Class Sales Project are used within the Sales Unit (SU) Reviews. The SU Reviews were taken into use in connection with the introduction of WCS and these are monthly meetings between GPMs and SU Managers where the performance of each SU is reviewed and discussed. The meetings follow a formal agenda and include both a review and problem solving part. The SU drives the meeting and reports on performance measure results and actions. Each GPM summarize the SU Reviews and bring the essential parts to the following GPM Review where the PC manager follows up on results (order intake and invoicing) and actions connected to each product (special belts, standard belts and service) with each GPM. The PC manager brings essential information from the GPM Reviews forward to the PC Review meetings.
Many of the performance measures are communicated to the employees by the intranet, on boards and in department meetings. The PC manager also carries out quarterly “breakfast meetings” with all co-workers in Sandviken. Different kinds of performance measures are often communicated in these meetings, as well as in the weekly information letters that are sent out to the employees in Sandviken, and the monthly PC Belts information letters that are sent out to all SPS employees. The quality related performance measure *Number of Complaints* is communicated to all employees in Sandviken when a new claim has been entered within the Claim Handling Database. An email with a link to the documented claim is sent out to all employees. The document also has a counter where the users can see how many claims that have been approved so far during the year.

### 4.4.5 Informants Product Center and Product Unit Level

Seven informants within the PC and PU level were interviewed; the PC manager, the Marketing and Sales manager (also Global Product manager for 702 belts), the PU production manager, the PC controller, the manager for Quality Assurance and environment, a CI technician and one of the employees within the packing department.

### Table 17 Informants PC Belts/PU Sandviken
4.4.5.1 Comments from Informants

4.4.5.1.1 Performance Measures monitored today

The PC Manager, Anders, means that the most important measure on a PC consolidated level is EBIT. According to Anders this is really the only measure that is interesting within the PC Reviews, the other measures that are included within the review is merely a matter of form. Other important performance measures are invoicing and order intake. Anders also follows up on other financial performance measures included in the Financial Key Figure Report, but not on a regular basis. On the PU level it is more interesting to follow up on invoicing according to Rob, the PC Controller. He means that Sandvik exists to generate cash for the shareholders and what drives generating cash is revenue. Rob also says that since the business is stable and the costs are predicable, the EBIT will follow if the invoicing is known.

In general Anders thinks that all important dimension of measuring is covered when it comes to PU Sandviken, and for the most part also for PU Totowa. What he to some extent misses are a few performance measures for measuring production yield and maintenance of the production plant in Sandviken. The Production Manger, Daniel, has not experienced that there has been any focus on measuring yield, but says that if this would be brought up as an important area, it could of course be measured. Maintenance of machines is today performed by a team that is shared between the PU in Sandviken and another SMT unit. Efficient maintenance is considered to be an important area in order to be able to improve quality and production capacity, and therefore it has been decided that PU Sandviken will establish a maintenance team of their own. The team will primarily focus on preventive maintenance which is expected to lead to less unplanned maintenance work.

Anders is hesitant to the performance measures used by PU Japan. He thinks that it should be possible to use the same measures within all three PUs, but the PU in Japan controls the business based on the number of hours that the machines run, rather than on the number of meters or square meters produced. Anders estimates that the business in Japan consist of about 99% polished belts, and the machine used for polishing the belts can only run in a certain speed. Therefore it is important to get as many hours out of the machine as possible. The management in Japan mean that they would lose effectiveness in their control if they where to use the same performance measures as PU Sandviken.

Productivity and produced quantity: Daniel sees the productivity measure as a measure to be followed on a quarterly or perhaps a 6-month basis, to monitor how efficient the business is. He means that the productivity measure can be used as a discussion basis when there is for example a need to increase or decrease the workforce. If the productivity decreases this could indicate that the workforce is too large, or that the order volumes are decreasing. Anders do not feel that the productivity measure is really useful, he thinks that monitoring the produced quantities is more interesting since it can tell a lot about the coming revenue. Daniel would like a more clear connection between the sales forecasts and the produced meters and square meters. He believes that the link between
the sales forecast that is calculated in money, and the number of meters or square meters that are forecasted, could be made clearer.

Tony, who is working in the packing department, on the other hand does not think that the “produced meters” measure is useful at all in its present form, and means that the measure do not say anything about how efficient the production personnel have been. Some belts require more work than others, and after a really busy week the number of produced meters can still be few. The weekly targets are based on last years total number of produced meters, and this number has then been divided by 48 weeks, which gives the weekly target. In order to make the measure useful Tony thinks that the weekly target should be based on the orders that are planned to be produced each week. Concerning follow-up on performance when it comes to packing, Tony thinks that it would be more interesting to for example follow up on the number of order lines planned to be shipped during the week, rather than the number of meters.

Delivery Precision: Anders believes that the measure Delivery Precision is important, but not critical for the PC Belts business. PC Belts is one of a few actors on their market, and the customers are quite patient when it comes to how well the promised delivery dates are fulfilled. The Marketing and Sales Manager, Johan, on the other hand, say that “Right quality on right time” is one of the most important critical success factors for PC Belts. Rob also believes that the measure is very important. He gives an example that a plant can have a shut down plan for a specific day and if they have not received the belt this date this can cost them a lot of money. Rob means that if you can not keep your promises when it comes to deliveries, it can cost you business down the road.

Tony thinks the measure is important, but also wonders if it would not be more interesting to include the promise made to the customer rather than the date when the belts are planned to be ready in manufacturing. The planned ready date is compared to when the belt is ready in production according to the information that Tony got, and at this point the belt is not yet packed. Moreover Tony also thinks that the results presented often not are corresponding with how the packing personnel interpret the delivery precision. From the packing personnel’s point of view the deliveries are often 100% on time, but the delivery precision shown on bill boards, etc is often much poorer. Tony do not know why this is the case, but he guesses that the reason is that the shop travelers only show the last promised date of delivery and not the original promised date. In general Tony thinks that it would be useful to develop a number of operational measures that the personnel can relate to. He also point out that during a process of selecting a number of operational measures it is very important to include the co-workers that will be affected by the measures.

OEE: The new way of calculating OEE has resulted in a considerable decrease of the measure result. On the PA SPS management level there were some concerns about the measure result being so low now, but Daniel means that the new way of calculating the measure gives a more correct picture of the capacity of the machines. Daniel does not think that the measure is suitable for follow-up on a regular basis on a management level. The OEE measure is complex and includes a lot of parameters, and when broken down it
is a good tool to identify improvement areas. Furthermore Daniel mean that the OEE measure also can be very useful in investment discussions since it can give a very clear picture of returns on investments.

Sales and Service: Johan is quite content with the follow up used today, but he thinks that the focus on short term measures such as invoicing is too big. Johan also mentions that one of the factors that he believes is critical for the future business is highly skilled salesmen and personnel. In order to improve the salesmen level of education PC belts has developed a Business Engineer education program which includes both a technical and a commercial part. PC belts started out by creating a profile on what a “good” salesman should be like. A good salesman for PC Belts is a technician with a commercial sense that can transform discussions with customers into steel belt solutions. The profile formed the basis for the Business Engineer education package that was created. The aim is that as many of the salesmen as possible should carry out the education, but no specific targets or timeframes for this activity exist today. The Environment and Quality manager keeps track of educations that have been carried out.

Another critical success factor that Johan mentions is quick service, i.e. how quick a service technician can be on place. This is not measured today. Johan believes that measuring how quickly a service technician can be on place when it comes to unplanned service would be more important than measuring the attendance on planned installations. In case of unplanned service the customer can lose a lot of money for each day the production is down.

Lars, who is working as a CI Technician, mentions during the interview that he would like to see more focus on health and safety related measures, such as sickness leave.

4.4.5.1.2 How the Performance Measure results are used

Johan thinks that there are big advantages with the reoccurring reviews that now have been taken into use. The reviews create a continuous communication between the SUs, GPMs and the management. A formal agenda contributes to make the meetings concrete and the minutes that are kept make sure that nothing is forgotten or peters out. However, Johan believes that some portion of flexibility is necessary, and that it in some cases is enough to perform quarterly reviews.

Lars thinks that quick feedback is important. The performance measure showing produced meters and square meters for example is a week old when it is presented on the bill boards. He mean that to give the co-workers a chance to influence the performance measure results, it is necessary with a prompt feedback – the co-workers should know at the end of the day if they have done a good job and how the progress is compared to the targets. Lars summarizes this with the phrase: “It is better to try to influence the result during the game rather than after the game”. Furthermore Lars thinks that the organization is doing a good job in developing different kinds of performance measures, but could do a better job when it comes to communicating measure results and purposes. He also believes that in order to motivate and stimulate the co-workers it is important communicate the linkage between different measures; for example to show how a productivity increase can lead up to increased sales and profit.
Rob believes that different managers within the organization have understanding why performance measures should be followed and reported, but he thinks that when it comes to communicating the performance measure results and purposes throughout the organization among colleagues, SPS could probably do a better job.

4.4.6 Summary of Findings

- There is no clear distinction between the PC Belts and the PU Sandviken organization
- No specific framework is used when selecting measures and the procedure of selecting measures varies between the different areas
- Many of the non-financial measures used have been developed during SMT Business system transformations
- Already existing measures within other areas are not regarded in procedures of developing new measures
- Operational measures on group level are not used today, besides from the OEE measure used in bottlenecks
- Many measure results are communicated on the intranet, within department meetings, etc
- Purpose with the measures and how the measures are calculated are rarely communicated
- The process of setting targets for the operational measures included in the PC Review is not entirely clear
- None of the production related performance measures are calculated in the same way for all three PUs
- Measures that some of the informants would like to add to the existing follow-up:
  - Yield
  - Maintenance
  - Operational measures on group level
  - A clearer link between the sales forecast and the manufacturing forecast
4.5 Comparative Study 1
One of the comparative studies was performed within Sandvik Mining and Construction Supply. The Sandvik group acquired the Finnish company Tamrock in 1997 and in 1998 Tamrock and Sandvik Rock Tools was merged into the new business area Sandvik Mining and Construction (SMC). Today SMC is the world's leading supplier of drilling and excavation machinery, equipment, tools and services for mining and construction industries. SMC has approximately 12,200 employees and operations in 130 countries.

4.5.1 Organization and Governance
The business area is divided into 5 global customer segments: Construction, Exploration, Surface Mining, Underground Hard Rock Mining and Underground Soft Rock Mining.

The customer segments are supported by the common functions SMC Logistics and SMC Supply. SMC Supply acts as supplier of parts, tools and components to the Customer Segments. The organization is built around Production Units and Global Sourcing Category Teams. The role of the Global Sourcing Category Teams is to develop and implement one common sourcing solution from the basis of achieving the best value for SMC as a whole. The Production Units and Global Sourcing Category Teams are coordinated through a small central organization, with a number of staff functions and administrative processes.

The comparative study involved one informant. The informant is the manager of the SMC Supply Finance organization.
4.5.2 Performance Measures monitored today

SMC Supply is responsible for Supplier/Sourcing and Production in the supply chain. The performance measures monitored today are:

**Sourcing**

Examples of sourcing performance measures:
- Purchasing volume
- Cost Evolution
- Supplier Delivery Accuracy

The different performance measures are also measured on different dimensions such as country, category, supplier, product, etc.

**Production**

Production is measured concerning:
- Volume (Production value and added value)
- Productivity (Actual productivity and change in % compared to previous period)
- Variances (Cost, capacity utilization, efficiency)
- Quality (Costs for claims and scrap)
- Delivery (Delivery security, throughput time, etc)

The productivity measure is calculated as standard added value divided by the blue collar production hours. SMC Supply also measures delivery security in terms of volumes promised to be delivered compared to the actual delivered volumes.

Each of the above production dimensions is covered by between 2 and 5 measures, to a total of 17 measures.

**Capacity Planning**

SMC Supply uses Capacity planning to follow up on Production Unit performance and to predict supply bottle-necks. The capacity planning is followed up in two reports; a Group Planning report and a Manufacturing Planning Report. The Group Planning report contains a compilation of order intake and manufactured volume for all Production Units for each capacity group (a capacity group is a group of products that share the same machine capacities). The Manufacturing Planning Report contains a compilation of order intake and manufactured volume for individual Production Units for all relevant capacity groups.
4.5.3 How Performance Measures are selected
SMC started an extensive strategy project in 2005 which among other things resulted in a restructure of the organization, for example the formation of the SMC Supply organization. Key Success Factors were identified within the strategy project and Key Performance indicators in alignment with these were proposed. Many of the performance measures used by SMC Supply today originate from the performance measures proposed within the strategy project. The informant agrees to that the amount of measures should kept down and also experiences that management has a critical view upon the measures used and since the strategy work took place some performance measures has been removed and some added.

4.5.4 How Performance Measures are implemented

4.5.4.1 Categorization and Specification of Performance Measures
Explanations/formulas of the performance measures are available on the SMC Supply intranet. Other specifications such as KPI purpose, owner and type of measure, etc are not used.

4.5.4.2 Targets
The performance measures are compared to budget, target and previous year. Some targets are decided upon by the management and are common for all units (for example Delivery Security). Most targets for operational performance measures are decided together with the local Product Unit Managers and these targets are unique for each PU.

4.5.4.3 Data Collection and Reporting
The sourcing performance measures are collected automatically from the units into a data warehouse solution. The production performance measures are reported by all units into an Excel based solution. Explanations/formulas of the performance measures that are to be reported as well as timetables for reporting are available on the SMC Supply intranet. The SMC Supply Financial manager does not experience that there is any resistance to reporting, although some units are better on performing the reporting than others. SMC Supply also strives to give the units quick feed-back on reporting. The informant also thinks that before requesting measure results, you need to consider the purpose of each measure. Ideally you should be prepared to make decisions based upon the measure results as often as you require the information.

4.5.4.4 How the Performance Measure results are used
The strategy project is well communicated to the staff and a Strategy Portal has been developed were strategy related information continuously is published. In order to keep the co-workers up to date on what is going on Strategy newsletters are published on the portal. Performance measures are sometimes communicated within the newsletter and on the strategy portal but not on a regular basis. The informant also means that communicating the performance measure results to all co-workers would be too risky, since the information could be harmful to the company if it fell into the wrong hands.
The performance measures are consolidated into SEK in a “Production Key Figure Report” and also in a PU Dashboard. The dashboard shows all production units and the performance measure results in a table format where the cells are highlighted in green and red color for quick analyzes of the results. Some of the measures are also gathered in a “PU Benchmark” report. The consolidated Key figure reports are used by the management to analyze business and to follow up on activities. Key Figure Reports for individual units are also used by management in investment discussions and also in the quarterly review meetings. Quarterly review meetings are held with all local product unit managers. The purpose with the review meetings is to review performance and follow up on local activities. The Production Key Figure Reports form a good basis for the meetings and ensures that the discussions are factual. The sourcing figures in the data warehouse are consolidated and analyzed in a QlikView solution.

4.5.5 Summary of Findings

- SMC Supply use formal reviews similar to the PU and PC review used by SMT to review the PU performance and follow up on corrective actions
- The performance measures used by SMC Supply are derived from a strategy work
- The review performance measures are reported into a common web interface
- The performance measures included in the review are very standardized
- SMC Supply calculates productivity as value added productivity
- SMC Supply strive to keep the amount of performance measures down
4.6 Comparative study 2
The second comparative study was performed within the Sandvik business area Tooling. The business area was formed in 1999 and it comprises a number of independent brands, with about 15,100 employees working out of nearly 70 countries. Sandvik Tooling provides tools and tooling systems for metal cutting, as well as wear parts and super abrasive components.

4.6.1 Organization and Governance
Sandvik Tooling is organized as a matrix with six product areas and 5 supporting processes; Supply, Product Management and R&D, Finance, IT and Human Resources. The supporting processes are all cost centers. A product area may consist of a single brand or a group of coordinated brands with a related market approach or offering. There are eight product areas within Sandvik Tooling, covering a total of 16 brands, some of them operating in clusters. The task of the brands is to meet the sales and profit targets, by developing the customer offerings in terms of products and services. The brands have their own resources for sales, marketing, brand-specific product development and production as well as certain support functions, such as HR and controlling. The brands compete independently on the market.

![Sandvik Tooling Organization](image)

The Supply process carries the major part of the costs within the Business Area and hence has the greatest potential synergy effects by sharing resources, creating economies of scale and standardizing best practice methods across the process. The purpose of the Supply process is to support the market position and profitability of the Sandvik Tooling Product Areas by supplying industry-leading products in terms of quality and delivery performance while simultaneously minimizing cost and use of capital.
EMPirical Findings

The comparative study involved one informant. The informant is the manager of Tooling Business Control.

4.6.2 Performance Measures monitored today

Performance is monitored on corporate Tooling level as well as per PA and the five common processes. The corporate level and the PAs are measured on characteristic financial measures such as order intake, invoicing, profitability, etc and also on market shares. The common supporting processes are measured on:

<table>
<thead>
<tr>
<th>Common process</th>
<th>Measure</th>
</tr>
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<tbody>
<tr>
<td>Supply chain</td>
<td>Variance production cost</td>
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<tr>
<td></td>
<td>Actual production cost</td>
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<tr>
<td></td>
<td>Stock Availability</td>
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<td></td>
<td>Productivity</td>
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<tr>
<td>Finance</td>
<td>Close Cycle Days Book Closing</td>
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<td></td>
<td>Audit defects</td>
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<td></td>
<td>Delivery Reports on time</td>
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<tr>
<td>HR</td>
<td>Staff</td>
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<td></td>
<td>Workers</td>
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<td>Employee Turnover</td>
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<td>Internal vs. external hire</td>
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<td></td>
<td>Diversity gender (staff)</td>
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<td>IT</td>
<td>Cost % of external invoicing</td>
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<td></td>
<td>IT Delivery</td>
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<td></td>
<td>IT Development costs</td>
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<tr>
<td>Product Management, R&amp;D</td>
<td>New sales ratio/PA</td>
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<td></td>
<td>R&amp;D Cost share</td>
</tr>
<tr>
<td></td>
<td>Portfolio value</td>
</tr>
</tbody>
</table>

4.6.3 How Performance Measures are selected

The finance function has recently introduced the Tooling scorecard that holds a number of different key performance indicators to review the performance of Tooling as a whole as well as the PAs and the five common processes. The performance measures included in the scorecard have been selected and developed by the Tooling Business Controlling function in discussions with the Tooling management and the supporting process owners. The informant sees the scorecard as a living document and expects that the content in the scorecard will continuously be discussed within the management team, so that new measures will be added when required as well as that irrelevant measures should be dropped.
4.6.4 How Performance Measures are implemented

4.6.4.1 Categorization and Specification of Performance Measures
Just as within the other organizations within the study, the performance measures are not categorized in terms of how much impact the measure has on the organization. Just as within the other organizations within the study, the performance measures can for example be referred to as “key figures”, “KPIs”, “indicators”, “key indicators” or “performance indicators”. The informant thinks that the term KPI is somewhat carelessly used.

4.6.4.2 Targets
On the short term basis (1 year basis), targets for financial performance measures are set in connection with the budget preparation. Sandvik Tooling sets targets for their business in co-operation with the PAs and the management for each common process. The targets are quarterly adjusted to forecasts during the budget year. The actual results are compared to previous year, forecast and target. Sandvik AB set long term financial targets (4 year basis), for the entire Sandvik group, and these targets are then broken down per BA. In co-operation with each PA, the Tooling long-term objectives are then broken down to a PA level.

4.6.4.3 Data Collection and Reporting
The Tooling Business Controlling function summarizes the tooling scorecard on monthly basis from several different data sources. The scorecard is aggregated to a corporate level and also on PA level. A lot of the information is extracted from the CPM system. The information that cannot be selected from existing data sources is handed over to Business Controlling by each PAs and each supporting process (within the supply chain each PU collects and forwards the necessary information).

4.6.4.4 How the Performance Measure results are used
The Business controlling function distributes the scorecard on a monthly basis to the Tooling management team and the Tooling Executive Board. The scorecard is used to monitor trends, a basis for decision making, as a discussion basis during management meetings and as warnings of potential problems.

4.6.5 Summary of Findings

- The Sandvik Tooling organization is organized around supporting processes and PAs
- Sandvik Tooling has developed a scorecard that cover performance measures within all supporting processes and PAs
- Financial as well as non-financial performance measures within the score card are standardized
5 Analysis of Empirical Findings

This chapter contains an analysis of the empirical findings, i.e. the theories studied are compared to the empirical findings. The first part of the chapter deals with the question of “what to measure” and the second part deals with the question of “how to measure”.

A lot of research has been conducted within the area of performance measurement during the past two decades and, as presented within the chapter covering theory, there are several different views on what is the “best practice” when it comes to develop selecting a set of measures. However theorists agree upon several important criteria. The list below contains those that I have found to be most relevant to include within the analysis when it comes to answering the question of what to measure.

1. Traditional financial measures – outcome measures - tell you what you have done in a perspective and these measures need to be complemented by measures that drive the business performance – performance drivers
2. A methodic approach and a comprehensive view should be used when selecting measures in order to avoid that the amount of measures constantly increases and to avoid sub-optimizations and conflicting measures.
3. The performance measures should in one way or the other be linked to strategy in order to ensure that everybody within the organization are working towards the same objectives
4. There must be a linkage between the different levels of performance measures in order to avoid conflicting measures and sub-optimizations
5. Limit the amount of measures

Within this chapter the empirical findings will be compared with the criteria in the list above. Since all criteria are so closely connected, the analysis of “what” will be treated as one coherent subject where these criteria are discussed.
5.1 What to measure and the process of selecting Performance Measures

New financial measures are rarely added within the case company, and when they are this is upon initiatives from the Sandvik group level. Typically new financial measures are derived from new focus areas and projects such as “Time is Capital” (see chapter 4.3.3). Other measures appear to be added occasionally, either from SMT business system programs, or being requested from the group level or BA level. The importance of measuring more aspects than the financial has been advocated a lot during the last decades. Theorists state that traditional financial measures – outcome measures - tell you what you have done in a perspective and these measures need to be complemented by measures that drive performance; the performance drivers.

The case company has added several non-financial measures during the past two years, but it is difficult to know whether these measures actually are performance drivers. Just because a measure not is financial it is not necessary a driver of performance. Hence, the importance of both financial and non-financial measures is validated through the study but it is also important to highlight the need of a time span in order to decide the validity of the measures that are chosen.

To find out which the performance drivers are theorists all seem to agree that a methodic approach and an overall view must be used. This might also be the case within the different SMT business system transformations when selecting measures, even if I have not found anything indicating this within my study. The suitability of using a common methodic approach within the entire business area could also be questioned. The SMT business area is large and complex and includes several companies. It is likely that the methodic approach needs to be different depending on the conditions within each organization that is undergoing a transformation.

Furthermore, it could be questioned whether an overall view has been used and whether the already existing measures - that might be derived from another program already introduced - are taken into consideration during the process of selecting new measures. This discussion also brings out the importance of thinking things through from the beginning and keeping the development of performance measures under control. A common control and management of a company’s PMS will prevent it from growing in an unstructured and uncontrolled way.

After examining how performance measures are selected within the case company my apprehension is that no overall comprehensive view or methodic approach is used within this procedure. What about the companies within the two comparative studies? The performance measures used within the first comparative study (SMC Supply) are derived from an extensive strategy work that took place a few years ago. The organization examined was constructed as a result of the strategy work and the performance measures that were suitable for following up on business were proposed at the same time. The company within the second comparative study (Sandvik Tooling) has recently developed a scorecard that contains the performance measures that are monitored. The scorecard
was developed by the Business Controlling function in discussions with the management team and the process owners. As the comparative studies only included one level within the hierarchy it is difficult to make any assumptions considering if the companies uses methodic approaches and overall views when selecting measures.

It is however clear that the company within the first comparative study (SMC Supply) has aligned their performance measures to strategy. This is in line with another important criterion that is argued by many theorists - performance measures need to be aligned with the company vision and strategic objectives. Otherwise there is a risk that the different measures used within the organization conflict with each other and cause sub-optimizations. Aligning performance measures to the company vision and strategic objectives is a way to ensure that everybody within the organization is striving towards the same objectives. Within the strategy work the company identified their critical success factors and these were then used when developing the performance measures.

This approach has resemblance to the approach suggested by Tangen\(^74\). He suggests starting by clearly defining the company vision when selecting measures. The vision is then used to identify the strategic objectives that the company wishes to achieve. By breaking down the strategic objectives into different Critical Success Factors (CSFs) it is then possible to identify the performance measures. In this way the linkage to strategy is ensured.

Whether the case company has used vision and strategic objectives when selecting measures can be discussed. Many informants mean that the measures always are selected with the strategy kept in mind. In many cases this is probably correct, but as no methodic approach or overall view appear to be used when selecting performance measures, I have not been able to find any evidence during the case study that this is really the fact. The GAP plan used by the case company is a tool to help determine how to reach the long-term objectives. The plan includes key activities within different areas that are identified by each PC on how to achieve the objectives. These key activities are however not transformed into any performance measures. The GAP plan is among other things based upon a GPP (Global Product Plan) used by the case company. The GPP contains prioritized segments, pricing strategies and models, critical success factors, etc.

Hence, on the product level there is thinking in terms of critical success factors within the case company. However, the critical success factors do not seem to be used when it comes to selecting performance measures. A skilled work force, in the form of business engineers, is identified as a CSF, but this CSF has not been used when developing performance measures. This is however a good example of a CSF that could be used to identify performance measures. “A skilled workforce” could for example be transformed into a performance measure that keeps track of the share or numbers of salesmen that fulfill the business engineer profile. Another performance measure that could be derived from this CSF is the share or number of salesmen that have taken part in the Business Engineer education program.

\(^74\) Tangen (2003b)
All the literature and research performed within the area implies that selecting performance measures is not an easy task. Even if being attempts to simplify a complicated reality the theories and predefined frameworks all appear very complex. A plausible assumption is that developing and implementing a PMS using any of the frameworks would become an extensive project running over a long period of time. How time- and resource demanding the development of a PMS system would become probably depends on several different factors. The size and complexity of the organization, how the business is controlled and managed as well as the structure and control of an already existing PMS are likely some of the most determining factors in this context.

The case company involves a large organization covering several levels of hierarchy and it appears as if the existing PMS have been developed in a rather unstructured way, without any overall view. During such circumstances perhaps a better approach could be to look upon the development as a constantly on-going activity in the spirit of continuous improvements, rather than a complex project running over a limited time. If looking on the development as a constantly on-going activity this could prevent the development from becoming too complex a project where an organization loses focus and cannot manage it all the way.

The question is what methodic approach to use when selecting measures. Many criteria are agreed upon among the theories and frameworks, but the methodic approach suggested to be used when selecting measures differs more or less. To start from the stakeholder needs and developing the strategies and business processes according to this might be the most correct approach. However the phases involved before actually starting to develop performance measures, appears to be very complex. Nevertheless; linking the performance measures to the processes is a good way to ensure that the correct things are measured and this will also help to improve the processes.

Andersen and Faugerland\textsuperscript{75} recommend that the first step when selecting a set of measures should be to document and understand the business processes. The company within the second comparative study (Sandvik Tooling) is structured into business processes and having well defined processes and clear targets for the processes will likely facilitate the work to select performance measures. Furthermore; shedding light upon the processes will likely encourage new ideas about how to improve them. Perhaps it can also be argued that having clearly defined business processes is fundamental prerequisite in order to develop a set of performance measures. On the other hand it can also be argued that you first need to know what you like to measure on an aggregated level so that the business and business processes can be organized in a way that will make it possible to put these measures in place.

\textsuperscript{75} Andersen & Fagerhaug (2006)
Clearly there is a strong connection and dependency between performance measurement and managing business processes. The best approach when selecting measures can also vary from one case to another as previously discussed within this chapter. A company already having well-defined and -implemented processes can use these when developing a PMS, while it might be suitable for a less process oriented company to develop measures and processes coherently.

Some of the informants within the case company believe that the amount of available performance measures in general might be too big, and that this might cause confusion, when it comes to deciding which measures to focus on. Practically all informants within the case company as well as within the comparative studies believe that the amount of measures must be kept down in order not to overload the organization with measures. Informants also think it is important not to demand more information from the units than necessary, in order not to overload the units with work collecting the information. According theory studied it is important to limit measures. One of the reasons is of course that it is a waste of time and resources to collect data that is ignored, but even more important is probably to avoid an overflow of information. An overflow of information could lead up to the fact that people will not be able to absorb the information and make use of it. The risk could be that people will either ignore the information or decide by themselves what is important and what’s not.

Most informants – in the case study as well as within the comparative studies – also believe that there is a critical view upon the measures that are used within the organization, and that measures that not are considered to contribute are removed from reporting and follow-up. What makes this task difficult is the fact that the case company is a part of a large organization where information often is requested from upper levels. To avoid a situation where the number of performance measures requested by upper levels within the organization constantly increases, and where measures never or seldom are removed, those who are asked to report on information should be entitled to request a clear purpose of each measure.

5.2 How to measure and implement performance measures

The list below contains the important criteria that were included in the theoretical chapter answering the question of how to measure and implement performance measures. Each criterion is compared to the empirical findings.

1. Measure Purpose
2. Designing Performance Measures
3. Targets
4. Specification and Categorization of Performance Measures
5. Communicating Performance Measures
1. Measure Purpose
Each measure must have a clear purpose – the user must know why the measures are used. The case company does not have purposes defined for their performance measures. Some of the informants mean that since the measure purposes often are discussed during review meetings, department meetings, etc and also often are communicated on the intranet there is awareness among co-workers why the different measures are used. Other informants, on the other hand are concerned that communicating a lot of measures on the intranet could cause confusion if the purposes not are communicated as well.

Clearly it is important to know why different performance measures are used. However, many measures, as for example delivery precision, are so self-evident that defining purposes appears unnecessary. But not all performance measures have purposes that are as obvious as the measure Delivery Precision. The case company present several CRM system related measures on the intranet, where one can suspect that the purpose not is obvious for all co-workers, such as for example “No of objects entered in CRM system”. If it is difficult to define a purpose with a measure it can be questioned if the measure really qualifies in the PMS.

2. Designing Performance Measures
Tangen argues that percentage ratios should be used rather than absolute values when it comes to designing performance measure formulas. He also suggests that including the targets in the measure formulas can facilitate the analysis of the measure results. The case company uses both absolute values and percentage ratios. None of the performance measures found within the case study includes the target. Including targets in the measure formulas would also lead to that the need of maintenance of the PMS would increase; the formulas would need to be modified each time the targets are modified.

Concerning the design of performance measures Tangen also implies that the measures should be:

- Easy to understand
- Easy to calculate
- Designed in consultation with those who are being measured
- Stimulating improvement
- As accurate as possible

The PMS used by the case company include both measures that are easy to understand and calculate and those that are more complex to their nature. If the measures are easy to understand and use, the measures will likely facilitate improvement activities, rather than using complex measures such as OEE for this matter. Hence, for what purpose the measure is used will make this recommendation more or less important. A more sophisticated and complex measure can for example be suitable for analyzing business, while it is more important that measures intended to be used for motivating improvements are easy to understand.
None of the performance measures found within the case study can be said to be designed in consultation with those who are being measured. The few operational measures that exist have rather been developed and implemented with a top-down oriented approach. Furthermore it can be questioned if any of the measures within the existing PMS really stimulate improvement. If the co-workers do not experience that the measure results can be influenced the measures will not motivate co-workers to improvement activities.

Tangen also mean that the performance measures should be as accurate as possible, and it is of course important that the PMS provides the users with correct information. The possibility to actually measure what has been decided might not always be possible to do with impeccable preciseness. As stated by Neely and Bourne\textsuperscript{76} the infrastructure within the company often causes problems in this context. Information might be inconsistent and stored in several different databases. In some cases it might be enough to “clean” existing data before it can be used and in other cases it might be necessary to modify or completely rebuild the infrastructure and working procedures to be able to capture correct information. In these cases the returns on such investments must of course be taken into consideration. Important to remember in this context is also - as implied by Andersen and Faugerland - the ability of the performance measure to measure what is intended. Performance measures that are intended to be used for monitoring trends do not need the same level of preciseness as measures used within accounting for example.\textsuperscript{77}

One of the observations from the performed case study is that the non-financial measures within the case company not are standardized in the same way as the financial performance measures are. Financial measures follow a long tradition and many of the financial measures are derived from accounting standards. Standardization of financial measures is also necessary in order for external stakeholders to make comparisons and decisions. Similar demands to standardize non-financial measures do not exist. Possible advantages that could be gained by a general standardization of non-financial measures can be questioned as different strategies are needed in order for different businesses to become successful.

Both companies within the two comparative studies have managed to develop and implement a set of standardized, non-financial measures. Standardizing non-financial measures within a business would make benchmarking possible and when using common definitions it also becomes possible to aggregate the information. Aggregated information can facilitate business analyzes on the corporate level. Furthermore when speaking about delivery precision, productivity, etc there would not be any questions of what is being referred to. Thus, even if the possibility to, and the advantage of, a general standardization of non-financial measures is doubtful, it can be possible and advantageous to standardize non-financial measures within a business. However, this is probably not always an easy task as non-financial measures in many cases include more dimensions than financial measures.

\textsuperscript{76} Neely & Bourne (2000)
\textsuperscript{77} Andersen & Faugerland (2006)
3. Targets
A measure can only become actionable when a target is linked to it. The target must be reasonably challenging – not too easy or too difficult. A target that is too easy to achieve will not make people feel motivated, and a target that is unreasonably difficult will make individuals give up. It is also important to constantly review and communicate the targets. Within the case company the process of setting targets for the financial measures is very standardized. Long term targets are set on a corporate level and broken down to lower levels and the short term financial targets are set in connection with the yearly budget preparation. The short term targets are continuously modified during the budget year.

The process of setting targets for non-financial performance measures on the other hand varies within the case company. For some of the performance measures no targets are defined (for example CRM system related measures and service related measures). The so called operational KPIs within the PA and PC reviews all have targets. The informants have given differing information to how these targets are set. Some mean that these targets are set in the budget preparation and others mean that these targets are continuously discussed and set during the review meetings. It can be concluded that the process of setting targets for the non-financial measures not is entirely clear within the case company. Targets are not always necessary; for example if the purpose of monitoring the measure results is to watch trends. Also, as it appears as if there is a lack of measures on the operational level within the case company, it can be questioned whether the theory that targets must be reasonably challenging – not too easy or too difficult, is really applicable. If people do not feel that the measure results are possible to influence, will it then make any difference if the targets are reasonably challenging or not?

4. Specification and Categorization of Performance Measures
There are different types of performance measures. Some measures might have strong impact on how the organization will perform relatively strategic objectives. Other might be more informational – not critical but informative. It is important that the organization is aware of the importance of the different measures in order to know what to focus on and what to prioritize. As earlier stated within this thesis it is also important to limit the amount of performance measures in order to avoid information overflow. The case study company do not distinguish the measures in any other way than calling some financial and some operational. The performance measures are often called KPIs but also key figures, key indicators, etc. Most informants do not experience that this is a problem. Some informants mean that all measures are equally important to provide an overall view and others mean that working with formal definitions in this sense would not lead up to anything.

However, many of the informants are concerned that the amount of measures might be too big and that this could cause confusion among the co-workers. Somewhat far-fetched; but how are the co-workers to know if the KPI “water consumption” is equally important to the KPI “delivery precision”? In many cases it is probably enough to use common

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78 Andersen & Faugerland (2006)
sense when making decisions and prioritizing activities. But there are likely also cases when common sense is not enough and where a distinction between measures would facilitate decision making. To categorize the performance measures into A, B and C, etc as suggested by Tangen, could be a good solution for a company that has a rather well-developed and well-established PMS. The risk is that this type of categorization would cause more confusion than clearness in a company, where the PMS is more informal to its character. In this case the distinction suggested by Parmenter, dividing the performance measures into KRI (Key Result Indicators), KPI (Key Performance Indicators) and PI (Performance Indicators) would be more useful. It can also be taken into consideration to add a fourth category: RIs – Result Indicators. Just as KPIs and PIs; not all result indicators are “keys”. But once again, too many categories would likely cause more confusion that clarity, and therefore it might be better to use the three types KPIs, PIs and RIs (Result Indicators).

Furthermore Parmenter mean that a lot of KRI incorrectly are called KPIs, such as ROCE and Customer Satisfaction. However, this theory has its weaknesses, since most performance measures in fact are results of many actions. ROCE and Customer Satisfaction are of course results of many actions, but so are also for example Delivery Precision, Customer Complaints and Productivity. Thus, the question is where to draw the line between result indicators and performance indicators. Calling all financial indicators “Result Indicators” would facilitate the process of deciding where to draw the line. If there is a clear distinction between the measures that are the most critical for current and future success of the organization and those that are more informational, it is possible to use many performance measures as desired. Limiting the amount of measures is important, but there often are cases when the “key performance indicators” need to be complemented by several “performance indicators” in order to make analyses possible. The risk for information overflow can also be reduced by letting the “performance indicators” be available to the users on an ad-hoc basis when desired.

To avoid confusion Tangen also mean that each measure must come with necessary specification. The specifications should for example information about what the measure will be used for (purpose), how it will be measured and analysis instructions. The table, designed by Tangen, to be used when specifying performance measures contains 15 different parameters. One more parameter could be considered: “Owner of measure”. Appointing owners to each measure could facilitate the process of revisiting measures. Just as categorizing the performance measures into A, B and C, etc as suggested by Tangen, the 15 parameter specification form could be a good tool for a company that has a rather well-developed and well-established PMS. For a company, which PMS is under development and not yet well-established, it is likely that this specification form would become too extensive. In this case it would probably be better to use a reduced version of the form to start with.

79 Tangen (2004)
5. Communicating Performance Measures

The business area, that the case company belongs to, communicates a lot of performance measures to the employees by using the intranet. Examples of this is the delivery precision league, the digital signs put up on all manufacturing units, the quarterly follow up presented on the intranet, the KPIs presented on the intranet, performance review meetings, etc. Performance measures are also communicated to the production personnel during daily billboard meetings. It is recommended that the PMS is kept as open as possible. If the information only is available to the management this will create distrust and send signals to the staff that the performance measure results will be used in some, for the co-workers, disadvantageous way. A PMS that is open can contribute to that the staff experience the PMS as something positive, and encourage reporting and improvement work.80 The case company is making efforts to communicate performance measures. However, since the purposes of the measures rarely are communicated, the benefit of communicating measures might be lost. To illustrate how increased delivery precision and productivity can influence the financial results can be a good way to motivate co-workers. The contents within a financial quarterly report are not easy to relate to for all employees.

80 Andersen & Faugerland (2002)
6 Recommendations to Case Company

This chapter contains recommendations to the case company on how to improve the present PMS. The recommendations are based on the made analyses and conclusions made from the analyses.

6.1 Improvement Opportunities

- No overall view or methodic approach is used when selecting measures
- Already existing measures within other areas are not regarded in procedures of developing new measures
- Linkage to strategy is not ensured in any formal way
- None or very few measures exist on an operational level
- No categorization and specification of performance measures
- Purpose with the measures and how the measures are calculated are rarely communicated

None or very few measures appear to exist on an operational level. Hence, starting to use performance measurement as a tool for motivating the co-workers provides a strong improvement potential. But before developing a set of measures on the operational level it is important to examine which dimensions of performance that need to be covered on a strategic level. The amount of measures will constantly increase if the measures are developed occasionally without an overall view and methodic approach.

It is possible to improve the existing PMS by introducing a methodic approach in a step-by-step procedure. But in order to do that it must first be decided which steps the methodic approach should contain. The case company has realized the importance of working with processes, but there is a long way to go before reaching the destination of being a process oriented organization. Placing the work with developing a successful set of performance measures into a mothball until reaching the process oriented organization is therefore not to recommend. Since the case company has a fairly good understanding for which the business processes are it should be possible to link performance measures to these processes. This could encourage working with improving processes as well as performance measure results. Therefore a process oriented approach and letting the performance measures be derived from Critical Success Factors, in combination with linking the measures between the different hierarchical levels, will be adapted within the recommended approach. This can be illustrated in what I decided to call The Performance House.
6.1.1 The Performance House

The vision should be designed to set the strategic course and this is the foundation that the house rests on. The vision is then used to identify the strategic objectives that the company wishes to achieve. By breaking down the strategic objectives that are found on the first floor of the house into different CSFs it is then possible to identify a set of performance measures on the strategic level. Identifying the stakeholders and their needs in the way suggested by Andersen and Faugerland could facilitate the work of identifying the Critical Success Factors.

The measures on the strategic level are found on the second floor and these measures are global and should provide an overall view of the business performance within critical strategic areas. The global measures should then be used to break down into local measures. The local measures cover both the tactical level on the third floor and the operational level on the fourth floor. By linking the measures to the business processes an overview of the measures is provided, and this will also give an idea whether performance is measured in all of the important processes. This will also ensure that a balanced set of measures are used. The performance of the main process is measured on both the operational and the tactical level. On the operational level the measures are broken-down on a detailed level, for example showing the performance of a sub-process, while on the tactical level the measures are more aggregated.

![The Performance House Diagram]

*Figure 23 The Performance House*
The supporting processes will form the roof beams as well as the cross bars supporting the main processes and their sub processes. The critical success factors should also be used to identify which performance measures to use within the supporting processes and these will cover all three performance measure floors. In other words the performance measures linked to the supporting processes will be found both on the strategic, tactical and operational level.

1. Start from the foundation of the house - the vision and identify the strategic objectives that the company wishes to achieve.

2. The vision is then used to identify the strategic objectives that the company wishes to achieve.

3. By using the strategic objectives found on the first floor of the house the critical success factors can be defined by using a success map. If a strategic objective is defined as “ROCE X % by year Y”, the critical success factors will tell how the business will achieve this objective.

![Success Mapping](image)

*Figure 24 Success Mapping*
4. When the success map has been described it becomes possible to identify the right strategic performance measures found on the second floor of the house. Strategic performance measures can for example be customer satisfaction index, number of returning customers, share of returning customers, number of new products, number of “business engineers”.

5. The strategic measures should then be used to break down into the tactical and operational performance measures on the third and fourth floor of the house. A tactical performance measure can for example be Delivery Precision. How to improve delivery precision should then be defined. For example by improved stock control and by reducing lead times. A measure like delivery precision can also be linked to the operational level, but it is important to remember that the co-worker must experience that they can influence the operational measures in order for the measures to become actionable. Thus, it is important to involve the co-workers in developing measures within the area or process where the co-worker operates.

Figure 25 Success mapping continuous

The tactical and operational performance measures should be linked to the business processes. Linking the measures into processes will encourage working with improving the processes as well as performance measure results. Measures can also be linked to the supporting processes.
During the process of selecting and developing measures it is important to define a purpose with each measure. I also recommend that a slimmed version of the measure specification form suggested by Tangen is used. The specification form should include:

- **Title**
- **Formula**
- **Purpose**
- **Type of measure**
- **Owner**

**Title**
The title should be clear and indicate what the performance measure is. The title should reduce the risk that different measures are mixed up.
RECOMMENDATIONS

**Formula**
The formula should be as precise as possible. It is also important to remember that the formulas should be designed in consultation with those who are being measured. While designing formulas it should be kept in mind that formulas preferably should be easy to understand and to calculate.

**Type of measure**
In order to communicate which measures to focus on it is recommended to make distinctions between different measures. I recommend that the term KPI (Key Performance Indicator) only is used for those measures that have been identified as “Keys”. An organization can have as many performance measures as desired as long as distinctions are made between measures that simply are indicators and those that are “Key indicators”. I believe that limiting the amount of KPIs is important, but I also believe that there often are cases when the KPIs need to be complemented by several PIs in order to make analyses of the KPIs possible. Making distinctions between the two categories will decrease the risk of confusion and not knowing what to focus on. The risk for information overflow can also be reduced by letting the PIs be available to the users on an ad-hoc basis when desired.

**Owner**
I also recommend that a parameter “Owner” is added to the specification form. Appointing owners to each measure could facilitate the process of revisiting measures.

6.1.2 Managing the PMS
If improving the present PMS used by the case company as suggested it is also important to prevent it from growing in an uncontrolled way. Therefore the case company should introduce some form of control of the PMS. One way to do this could be to manage the PMS by forming a team consisting of the process owners and a representative from the top level of the company that acts as chairman. The team will be responsible for overseeing that the PMS develops as intended and also for deciding upon matters such as performance measure specifications, how to communicate the measures, etc.

6.1.3 Additional Performance Measures
During the interviews some of the informants mentioned different measures that they would like to add to the present follow-up. The possibility to add the “missing” measures that were mentioned will be examined within this chapter. However – as stated it is recommended that the case company let their performance measures be derived from critical success factors. Furthermore it is important to involve the co-workers in developing measures within the area or process where the co-worker operates.

6.1.3.1 Customer Satisfaction
A Customer Satisfaction Survey (CSS) developed by SMT will soon be taken into use. Which measures to be included was not yet decided at the time of the interviews, but after investigating with SMT I got a reply that there are plans to include a performance measure that shows how many markets that have conducted CSSs. Furthermore there are future plans to include a CSS index that will show the average score per market and PA.
Which performance measures that are needed to include from the case company point of view will become clearer after investigating critical success factors. One of the important success factors that were mentioned during the interviews was the level of service. Thus, a few performance measures showing the customer satisfaction relating to service, such as quality and time are likely to be useful to add within the survey.

6.1.3.2 Distribution (over time) of order stock

One of the informants mentioned that it would be useful to add a measure that shows the distribution of the order stock over time. For the PU Sandviken orders this is already available within an existing QlikView application showing Order Intake and Backlog. The backlog is shown in a chart with the distribution of the order stock per year. It is also possible to drill down to month and promised dates of delivery.

![Backlog SEK](image)

*Figure 28 Distribution of Order Stock*

As most SUs uses local solutions for their order handling and there are several different ERP systems among the PUs the infrastructure would make it difficult to get an overview of the complete PA SPS order stock.

6.1.3.3 Link between the sales forecast and the manufacturing forecast

A more clear connection between the sales forecasts and manufacturing forecast is desired by the production management. The sales forecast is calculated in money and divided into standard belts and special belts. Since the present sales forecast does not tell anything about the steel grades or dimensions it is difficult for the production management to transform the sales forecast into something useful.

The aim is that all users should enter all customer activities, businesses, business opportunities, objects, etc in the CRM system used by the case company. Objects are the machines where the steel belts are used and each object entered in the CRM system should also include information about the belts included in the object. Within the information about the objects it is possible to define a next belt forecast, i.e. when it is estimated that the belts will need to be replaced.
RECOMMENDATIONS

Within the object list it is also possible to insert information about the belt dimensions and steel grade.

If this information would be inserted into the system for each belt that is sold, it would become possible to create a sales forecast that includes both belt dimensions and steel grades. This information would also need to be complemented by the forecasts of new objects. By adding an object status called for example “Prospect” it should be possible to handle new object forecasts in the same way as for existing objects within the CRM system.
6.1.3.4 Yield
The production yield in PU Sandviken would be possible to calculate automatically per machine if desired by using the information available in the ERP system. Examples of performance measures showing yield:
- Weight of Finished output quantity / Weight of input quantity
- Square meters of Finished output quantity / Square meters of input quantity

6.1.3.5 Maintenance
Maintenance of machines is today performed by a team that is shared between the PU in Sandviken and another SMT unit. Efficient maintenance is considered to be an important area in order to be able to improve quality and production capacity, and therefore it has been decided that PU Sandviken will establish a maintenance team of their own. The team will primarily focus on preventive maintenance which is expected to lead to less unplanned maintenance work. When establishing a maintenance team of their own, the possibilities for the case company to define a set of measures related to maintenance will be improved. Some proposals of performance measures that could be used are listed below.
- Preventive maintenance/total work hours maintenance personnel
- Unplanned maintenance/total work hours maintenance personnel
- Share of preventive maintenance/unplanned maintenance
- Total cost for maintenance
- Machine Availability
- Total stop time/machine
- Number of machines with appointed “owners”

There are several possibilities to keep track of the time used for different kinds of maintenance work. It is for example possible to use the existing ERP system or keep track of times spent on different machines in a simple Excel solution. Another alternative that probably would be the simplest solution is to use the time reporting system called PROJUS that is available within the Sandvik group. PROJUS is an internet application where employees can report time spent on projects as well as assignments and internal time. Predefined time reports are also available within the system.

6.1.3.6 Operational measures on group level
As stated earlier within this chapter it is recommended that operational measures are developed in co-operation with the people who influence the measure results. But before developing a set of measures on the operational level it is important to examine which dimensions of performance that need to be covered on a strategic level. The amount of measures will constantly increase if the measures are developed occasionally without an overall view and methodic approach. The performed case study indicated that it would be interesting to examine how delivery precision could be broken down so that each part of the internal supply chain is measured.
6.1.3.7 Measures for benchmarking
To use common definitions of performance measures such as delivery precision, productivity, etc brings out more advantages than the possibility to benchmark units. If a common definition is used it also becomes possible to aggregate the information and this could facilitate business analyses on a PC and PA level. Furthermore when speaking about for example delivery precision and productivity there would not be any questions of what is referred to. For the case company it would be possible to define one general delivery precision for belt deliveries, one for service, one for spare parts, etc.

Another performance measure that could be suitable for benchmarking is productivity. For calculating productivity the PU in Japan uses hours instead of meters or square meters as in Sandviken and Totowa. The machine used for polishing the belts can only run in a certain speed and therefore it is important to get as many hours out of the machine as possible. The management in Japan mean that they would be losing effectiveness in their control if they where to use the same performance measures as PU Sandviken. However using the same way of calculating for example productivity does not necessarily mean that this would be the only type of productivity measure to be used. If it is desired to monitor for example the number of square meters/man hours this should be fairly easy to calculate automatically by extracting information from the ERP systems, since all of the three PUs within PC Belts uses advanced ERP systems for their daily operations. On an aggregated level it should be more equitable to use a value added productivity measure. For example SVA/total number of man hours.
CONCLUSIONS

7 Conclusions
The chapter presents the conclusions drawn from the analysis that was made in chapter 5. The chapter also contains criticism towards the chosen method and recommendations on future research.

7.1 What to measure and the process of selecting Performance Measures
Several different frameworks aiming to help organizations to answer the question of what to measure have been developed during the last decades. The frameworks differ more or less, but theorists appear to agree on several matters. My conclusions of the most important criteria to be taken into consideration when answering the question of what to measure is:

1. **Performance Drivers**
The outcome measures, i.e. financial measures that show the results from past efforts, need to be complemented by pro-active performance drivers - the measures that drive the future performance.

2. **Linkage to company vision and strategic objectives**
To ensure that everybody within the organization is working towards the same objectives it is important that all measures are derived from the company vision and strategic objectives.

3. **Involve the co-workers in the process**
It is important to involve the co-workers in the process of developing measures. If the measures are selected on upper levels and transferred formally from each manager to the subordinates it will become difficult to get the co-workers to accept and use the PMS. Everybody within the organization must accept the system if it should become successful. A vital success factor is also to communicate the intentions to the whole organization at an early stage. If the whole organization is aware of the intention and the purpose this will facilitate the process of developing and implementing a PMS.

4. **Overall comprehensive view and methodic approach**
In order to avoid that the amount of measures constantly increases and to avoid sub-optimizations and conflicting measures it is important to use an overall comprehensive view and methodic approach should be used in the process of selecting measures. The methodic approach suggested among the frameworks differs, and which approach that is most suitable to use will vary from one case to another. My personal belief is that linking the performance measures to the business processes is a good way to ensure that the correct things are measured and this will also help to improve the processes. Hence, having clearly defined business processes will facilitate the work to select relevant performance measures, but this should however not be considered as a fundamental prerequisite. The best approach when selecting measures can vary from one case to another. A company already having well-defined and -implemented processes can use these when developing a PMS, while it might be suitable for a less process oriented company to develop measures and processes coherently.
CONCLUSIONS

5. **Limit the amount of measures**
It is a waste of time and resources to collect data that are ignored and even more important is to avoid an overflow of information. An overflow of information will lead up to the fact that people will not be able to absorb all the information and make use of it. People will either ignore the information or decide by themselves what is important and what’s not.

6. **Retain the methodic approach**
Irrespective of the approach chosen when selecting measures it is always important to continue to develop the PMS in a structured and coherent manner. In order to do this is necessary to use some form of common control and management of the PMS. If letting go of this control the PMS will soon start growing in an unstructured and uncontrolled way.

7.2 **How to measure and implement Performance Measures**
After answering the question of what to measure there are also a number of important criteria to consider when it comes to how to measure and implement measures into the organization:

1. **Define measure purposes**
The users must know the purpose of a measure in order for a measure to become actionable.

2. **Assign reasonable targets to the measures**
Not too easy or too difficult. A target too easy will not motivate people and a target too difficult will make them give up. In this context it should however be noted that targets not always are necessary, as for example if the purpose of the measure is to monitor trends.

3. **Consider the field of application when designing a performance measure**
It is important that measures that are intended to be used for motivating improvements are easy to understand, while more sophisticated and complex measures sometimes could be suitable for analyzing business.

4. **Communicate the performance measures**
Make efforts to keep the PMS as open as possible. This will contribute to that the staff experience the PMS as something positive and encourage reporting and improvement work, while a PMS where the information only is available to the management will create distrust among the co-workers. Furthermore, when communicating measures it is also necessary to be clear about the measure purposes and the measure targets. Again; the co-workers must know why the measure is used in order to make it actionable. Communicating measure results without communicating the measure purposes will cause confusion rather than motivate co-workers.

5. **Specify the measures**
Using measure specification forms will ensure that important criteria such as measure purposes and formulas are considered. The content and extent of the specification form must however be adjusted to suit the conditions within each company.
CONCLUSIONS

7.3 General Conclusions
In a jungle of different advices and guiding principles considering development and implementation of a PMS, this thesis contributes by compiling the most important criteria to consider in the process. The results from the case study also contributes to the research field by illustrating how a company that already possess several performance measurement systems could - and need to - continue to develop these systems. Furthermore, the thesis sheds light on the importance of starting out from a company’s own unique conditions when developing and implementing a PMS. The frameworks available are indeed attempts to simplify a complicated reality, but even so, they all seem rather complex, and cannot be said to provide organizations with any simple guidance towards improving or implementing a PMS. Hence, to develop and implement a PMS by the book will imply an extensive project for any company. How time- and resource demanding the project will become will differ from one company to another.

In this sense it is important that companies consider factors such as the size and complexity of the organization, how the business is controlled and managed as well as the structure and control of an already existing PMS. In a case where the company is rather large and has an existing PMS that has been developed in an unstructured manner, the approach should be to look upon the development as a constantly on-going activity in the spirit of continuous improvements, rather than a complex project running over a limited time. In this context it is important to think big - use an overall comprehensive view and methodic approach - but start in small scale. Companies must improve their PMS on a continuous basis – a business and the business conditions are constantly changing and the PMS must be changed accordingly.

7.4 Proposal of how to develop the existing PMS used by the case company
A secondary purpose of this study was to propose a way of working to develop the existing performance measurement system used by the case company, so that connections between different levels of performance measures would be ensured. The new way of working that was proposed in chapter 6 was illustrated in the shape of a Performance House. The criteria that were listed in the previous sections of this chapter formed the basis when creating the Performance House. The house was designed to introduce a methodic approach in a step-by-step procedure when selecting performance measures. In brief the concept of the house is start out from the company vision to identify the strategic objectives that the company wishes to achieve. By breaking down the strategic objectives into different Critical Success Factors it is then possible to identify a set of performance measures on the strategic level. By using these strategic performance measures to break down into tactical and operational performance measures, a linkage between the different levels of measurement as well as to the strategic objectives and the company vision can be ensured.
7.5 Implications of Study – General Applicability, Reliability and Validity

The study has a deductive approach, which means that theories have been studied in the area chosen, and these theories have then been compared to empirical findings. An inductive approach, on the other hand, means that the researcher aims to join into a principle or theory based upon observations that are made in empirical studies. A deductive approach can increase the objectivity in the research as the basis of the research lies within an already existing theory, but a disadvantage could be that the already existing theory might influence the researcher so that new discoveries not are made. It is also likely that I have been affected by the research studied when drawing my conclusions. Furthermore the study could be criticized due to the fact that a large part of the theoretical framework is built upon the research performed by the same researcher (Stefan Tangen). I believe however that my conclusion that each company must start out from its own conditions rather than to develop and implement a PMS by the book shows that I have strived to keep a critical view upon earlier research within the area.

As the case study has been carried out through interviews, including only one main study of a company and two minor comparative studies of companies within the same corporation, the general applicability of the study with regard to the empirical data is limited. The cases examined within the study are in other words too few to be used to draw any general conclusions that are applicable to any business in relation to the literature study. Each of the comparative studies only included one informant and most of the interview time during the comparative studies was spent on developing an understanding for the organizational structure and the formal procedures concerning performance measurement. Therefore the two comparative studies were not contributing with that much information about any possible problems or opinions about the present situation. However, since the method has been described in detail within this report, my hope is that the study will be useful in comparison with similar studies, and thereby make a contribution to general knowledge within the limit of the purpose of the study.

The term reliability indicates how trustworthy the measuring instrument used to conduct the study is. The reliability of this study has been attempted to be strengthened by summarizing each interview and communicating this to each informant. In this way the informants were given the opportunity to review and revise the information. The interview guide was also communicated to the informants before each interview. The purpose was to give the informants an insight into the nature of the questions that were to be dealt with so that the informants could prepare for the interviews. If the informants were prepared I considered the risk that the informants would give subjective, rash, or incomplete answers would decrease, and that the quality of the study thereby would increase.

81 Patel & Tebelius (1987)
82 Ibid
The interviews were kept rather open in order not to guide the informants into specific answers, and I also tried to keep an objective view and approach throughout the study. However, my own background and perception have probably affected my questions as well as my conclusions. The replies given by the informants can also have been affected by the relationship between the informant and the investigator at the time of the interview. In other words there is a possibility that the informants would have given other answers to the same questions during other circumstances.

The term *validity* indicates the relevancy of the measuring instrument used to conduct the study. In this context criticism could be raised against the study due to the fact that many of the informants belong to financial departments. As my intention was to conduct the study by a top-down approach the interviews involving informants working in finance mostly concern the first phase of the case study. The reason for this is that I made the assumption that these informants were the ones on the upper hierarchical levels of the case company that knew most about the working procedures considering performance measurement. When reaching the PC and PU level there is more variation when it comes to the different informant roles. Even so, the numbers of informants that cover the operational level of the case study are limited and therefore it would contribute to the study to investigate the needs, requirements and present situation on the operational level further. This will be further discussed within the following sub-chapter.

### 7.6 Recommendations on future research

It is important to be aware of the fact that different levels within an organization will need different performance measures. If there is a lack of measures on the operational level, the tactical and strategic measures cannot become actionable. “What gets measured gets done” is a common phrase, but measuring for example productivity, delivery precision or customer satisfaction will not automatically improve the performance. The co-workers must experience that they can influence the measure results. Thus, aggregated measures need to be broken down on an operational level, giving the co-workers as quick feedback as possible on their efforts.

During my study I have not found any operational measures within the formal reporting, but since the study of the operational level was limited it is of course possible that several informal measures exist. Some of the measures are called “operational KPIs” within the formal reporting, but these measures are more tactical than operational in character. Individuals must experience that they can influence the measure results in order for a measure to be assigned to the operational level. Delivery precision, for example, is referred to as an operational KPI within the formal reporting and the measure is followed up on a weekly basis. The packing personnel experience that the delivery precision often is 100% and are surprised to see a much lower score being presented on the digital signs the following week. The confirmed delivery date that is displayed on the shop travelers can have been changed several times before the belt reaches the packing department. If the order planners have not manually entered the originally promised date on the document, the co-workers have no possibility to know this date. Furthermore before the belt is ready to be packed it has traveled through a lot of workstations and a small delay in each part of the chain will make a big difference in the end.
Other examples are the measures “produced meters” and “produced square meters” that also are referred to as operational KPIs. One of the informants imply that these measures do not say anything about how well the production personnel have performed since the measure target is a weekly average of the yearly target and some belts require more work than others. The informant mean that from the production personnel point of view the measure would become more actionable if the weekly targets were connected to the orders planned for a certain week.

The performed study indicates that co-workers and managers tend to have different view upon the measures that are used and it appears to be a lack of operational measures within the case company. However, the study does not include enough informants from the operational level even to draw any general conclusions applicable on the case company. Investigating the situation and the needs on the operational level within the case company further would therefore contribute to the performed study. It would also be interesting to complement such study by examining a similar business where operational measures have been implemented in a structured way.

Further research is also necessary to validate the Performance House proposed to introduce a methodic approach to be used by the case company when selecting performance measures. The house was created from a theoretical perspective and actual tests to validate the structure of the house, as well as the working procedure proposed, have not been included in this study.
8 List of References

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Patel, R & Tebelius, U (1987), Grundbok i forskningsmetodik, Lund, Studentlitteratur
Samuelsson, L (2004), Controllerhandboken, Stockholm, Teknikföretagen

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Klippenberger, T. (1996), The Performance Pyramid, The Antidote; Vol 1, Issue 1
Tangen, S (2003a), An overview of the most frequently used performance measures, Work Study, Vol 52, No 7
Tangen, S (2003b), Utformning av framgångsrika prestationsmått, Bättre Produktivitet med Plan-nytt, No.4.
8.3 Internet
Sandvik Intranet (November 2007)
Ekonomistyrningsverket, http://www.esv.se/ (October 2007)
http://www.emeraldinsight.com (October 2007)

8.4 Informants
Anders Bodin, Manager, PC Belts 2007-09-21
Cecilia Olsson, Communication & Marketing Support, Sandvik Process Systems 2007-11-02
Claes Åkerblom, Business Controller, Sandvik Materials Technology, 2007-09-18
Daniel Axelsson, Production Manager, PU Sandviken 2007-10-12 and 2007-11-29
Göran Forsberg, Quality Assurance & Environment Manager, PU Sandviken 2007-10-10
Jan Öhman, Chief Financial Officer, Sandvik Materials Technology, 2007-09-27
Johan Sjögren, Marketing & Sales Manager and Global Product Manager Special Belts, PC Belts 2007-10-11
Lars Brodmar, CI Technician, PU Sandviken 2007-10-11
Marko Tulus, Financial Manager, SMC Supply, 2007-10-2
Mats Engblom, Managing Director, Sandvik Process Systems, 2007-09-25
Patrik Sjölund, Manager Tooling Business Control, 2007-10-17
Rob Stivale, Controller, PU Totowa 2007-09-26
Tony Svensk, Packing Department, PU Sandviken 2007-11-28
9 Appendices

9.1 Interview Guide
The purpose with the interview is to provide knowledge about how performance measures are selected and implemented into the organization. The interview is divided into five sections, which are described below.

Information about Interviewee
- Name
- Position
- Overall Working Target

How Performance Measures are selected
This part is aiming to provide knowledge about which performance measures are monitored today and also how performance measures selected.
Examples of questions:

- Which performance measures are used today and which are the 3 most important?
- Describe the method of working when selecting performance measures
- Which are the most important characteristics for a performance measures in your opinion?

Implementation of Performance Measures
The purpose is to provide knowledge about how the measures are implemented into the organization.
Examples of questions:

- Are there any particular factors that are considered when designing (formulating the equation) of a new performance measure?
- Describe the method of working when selecting targets and time frames for the performance measures
- How are new performance measures communicated to the persons responsible for reporting (education concerning purpose, how to calculate, etc)?
- How are the measures presented?

Analysis of Performance Measures
The purpose is to provide knowledge about how the results from the performance measures are analyzed and used.
Examples of questions:

- Describe the method of working when analyzing the results from the performance measures?
- How is the analysis used?
Opinions about Performance Measurement System used today

Interviewee opinion about the present situation concerning performance measures used and the methods of working with implementation and analysis.

Examples of questions:

- Do you think that all important dimensions of performance are covered with the measures that you use today?
- Do the persons responsible for reporting performance measures have understanding for why the different measures should be reported in your opinion?
- Do the trends that you can see from the performance measures used today correspond with actuality?
## 9.2 Overview of Performance Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Performance Measure/KPI</th>
<th>Description</th>
<th>BA</th>
<th>PA</th>
<th>PC</th>
<th>PU</th>
<th>WG</th>
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<td>GP</td>
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<td>x</td>
<td>x</td>
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<tr>
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<td>Capital Employed</td>
<td>Net Working Capital + Fixed Asset</td>
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<td>Return on Capital Employed % of external invoicing</td>
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<td>Objects per market</td>
<td>Total number of objects entered in CRM system</td>
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<td>Number of Service activities in CRM</td>
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---

[83] “Follow-up by” indicates on which organizational level the performance measures are monitored.
### APPENDICES

<table>
<thead>
<tr>
<th>No.</th>
<th>Measure (Measure)</th>
<th>Description</th>
<th>Notes</th>
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<td>45</td>
<td>CRM Lost Order Report</td>
<td>Number of Lost orders in CRM system</td>
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<td>46</td>
<td>CRM Business Opportunities</td>
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<td>CRM Active users Total Active users</td>
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<td>48</td>
<td>CRM Primary users</td>
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<td>49</td>
<td>Sales CAP Customer</td>
<td>Measures to be included not yet decided</td>
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<td>Sales Satisfaction</td>
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<td>Service Utilization Manning Utilization Invoiced Hours</td>
<td>Invoiced hours external sales/Available work hours</td>
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<tr>
<td>53</td>
<td>Service No of jobs New belt installations</td>
<td>Total number of jobs (installations, repairs, inspections, etc)</td>
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<tr>
<td>54</td>
<td>Service New belt installations new line</td>
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<td>55</td>
<td>Service New belt installations old line</td>
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<tr>
<td>58</td>
<td>Quality Complaints Electricity consumption</td>
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<td>59</td>
<td>Environment Water</td>
<td>Relative usage; m3/COGS</td>
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<td>Environment Media usage</td>
<td>For example compressed air m3/COGS</td>
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<td>61</td>
<td>Environment Hydraulic oil</td>
<td>Conformity between used/removed amount (liters)</td>
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<tr>
<td>62</td>
<td>Environment Health &amp; Safety LTI frequency rate</td>
<td>Lost time injuries frequency rate</td>
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<tr>
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<td>Health &amp; Safety Number of days since last accident</td>
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<td>Safety Sick leave ratio</td>
<td>Number of days lost due to illness / total working-days in period</td>
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<td>Health &amp; Safety Reporting on Near accident</td>
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<td>Health &amp; Safety Performance dialogues</td>
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<td>Health &amp; Safety Average risk mark score</td>
<td>Risk mark Score is a tool which rates the risk quality on a scale 0-100 (lowest to highest quality). A low Risk Mark Score indicates a significant risk of both likelihood and severity of loss.</td>
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<td>Health &amp; Safety OHSAS certificate</td>
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<td>Production Grinded belts</td>
<td>Grinded m²</td>
<td>x x x</td>
</tr>
<tr>
<td>71</td>
<td>Production Produced standard belts</td>
<td>Produced meters</td>
<td>x x x</td>
</tr>
<tr>
<td>72</td>
<td>Production Delivery Precision</td>
<td>% On time orders to customers</td>
<td>x x x</td>
</tr>
<tr>
<td>73</td>
<td>Production Productivity</td>
<td>Invoiced Square meters of belts /man-hours</td>
<td>x x x</td>
</tr>
<tr>
<td>74</td>
<td>Production OEE</td>
<td>Overall Equipment Efficiency</td>
<td>x x x x</td>
</tr>
</tbody>
</table>
### 9.3 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/P</td>
<td>Account Payables</td>
</tr>
<tr>
<td>A/R</td>
<td>Accounts Receivables</td>
</tr>
<tr>
<td>BA</td>
<td>Business Area</td>
</tr>
<tr>
<td>CAP</td>
<td>Customer Activity Plans</td>
</tr>
<tr>
<td>COGS</td>
<td>Cost of Goods Sold</td>
</tr>
<tr>
<td>CPM</td>
<td>Corporate Performance Management System – Common Excel based system for reporting on financial PM’s</td>
</tr>
<tr>
<td>CRM</td>
<td>Customer Relations (or Relationship) Management</td>
</tr>
<tr>
<td>EBIT</td>
<td>Earnings Before Interest and Taxes</td>
</tr>
<tr>
<td>GBR</td>
<td>Group Business Result</td>
</tr>
<tr>
<td>GP</td>
<td>Gross Profit</td>
</tr>
<tr>
<td>GGP</td>
<td>Group Gross Profit</td>
</tr>
<tr>
<td>GPP</td>
<td>Global Product Plan (Strategic product plan PC Belts)</td>
</tr>
<tr>
<td>GOR</td>
<td>Group Operating Result</td>
</tr>
<tr>
<td>IP</td>
<td>Industrial Processing (a PC within SPS)</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>LTI</td>
<td>Lost Time Injuries</td>
</tr>
<tr>
<td>NWC</td>
<td>Net Working Capital</td>
</tr>
<tr>
<td>OEE</td>
<td>Overall Equipment Efficiency</td>
</tr>
<tr>
<td>OR</td>
<td>Operating Result</td>
</tr>
<tr>
<td>PA</td>
<td>Product Area</td>
</tr>
<tr>
<td>PC</td>
<td>Product Center</td>
</tr>
<tr>
<td>PM</td>
<td>Performance Measure</td>
</tr>
<tr>
<td>PMS</td>
<td>Performance Measurement System</td>
</tr>
<tr>
<td>PU</td>
<td>Product Unit</td>
</tr>
<tr>
<td>ROCE</td>
<td>Return on Capital Employed</td>
</tr>
<tr>
<td>SAFIR</td>
<td>Sandvik Financial Reporting – a common set of financial measures</td>
</tr>
<tr>
<td>SMC</td>
<td>Sandvik Mining and Construction – one of the three Sandvik Business Areas</td>
</tr>
<tr>
<td>SMT</td>
<td>Sandvik Materials Technology – one of the three Sandvik Business Areas</td>
</tr>
<tr>
<td>SPS</td>
<td>Sandvik Process Systems – a Product Area within SMT</td>
</tr>
<tr>
<td>SVA</td>
<td>Sandvik Value Added</td>
</tr>
<tr>
<td>WG</td>
<td>Work Group</td>
</tr>
</tbody>
</table>
9.4 Agenda SU Review

<table>
<thead>
<tr>
<th>Monthly GPM/SU review</th>
<th>Timing</th>
<th>Max 60 min/month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>To review the performance of the SU and agree on corrective actions</td>
<td></td>
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</tbody>
</table>

**Agenda**

1. Review SU performance 15 min
   - Review of financial target/forecast
   - Review of activity list

2. Hot projects and lost orders 10 min
   - Pending offers/orders
   - Identify and log issues/reasons for further discussion

3. New opportunities 10 min
   - Identify and log issues for further discussion

4. Other issues 10 min

5. Summarize corrective actions 15 min
   - Agree on corrective actions and next steps
   - Assign unsolved issues to responsible person
   - Log new activities

**Attendees**

- GPM
- Sales Manager

**Standard input**

- Monthly target report
- SU activity list

**Meeting rules**

- SU drives the meeting
- Sales manager report results, gaps and actions
- Should be kept short covering both review and problem solving
- All participants should have read and studied the reports beforehand
- Participants should have prepared decision material and backups
- Sales manager will update and distribute the activity list
APPENDICES

9.5 PC Review Report

SPS MONTHLY REPORT - PC Review

71 Delta
2007 MAY

Order Backlog

External Ordertable

External Involved

Gross Profit

EBIT

EBIT IV/C

FINANCIAL INDICATORS BY PC

<table>
<thead>
<tr>
<th>PC</th>
<th>SQLS</th>
<th>%</th>
<th>ACT</th>
<th>GTO</th>
<th>%</th>
<th>ACT</th>
<th>GTO</th>
<th>%</th>
<th>ACT</th>
<th>GTO</th>
<th>%</th>
<th>ACT</th>
<th>GTO</th>
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Sales data per PC

PC Breakdown

PC USA

PC Japan

<table>
<thead>
<tr>
<th>PC</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
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Debts

<table>
<thead>
<tr>
<th>PC</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
<th>Actual</th>
<th>Target</th>
<th>%</th>
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Total Debts
**9.6 Definition of EBIT**

EBIT stands for Earnings before interest and tax and is calculated as:

\[
\text{Invoicing} - \frac{\text{Cost of goods sold}}{\text{Gross Profit}} - \text{Expenses} + \text{Other income} = \text{EBIT}
\]

*Figure 31 The EBIT Tree*

**9.7 Definition of ROCE**

ROCE stands for Return on Capital Employed, and is calculated as:

\[
\text{Invoicing} - \frac{\text{Cost of goods sold}}{\text{Gross Profit}} - \text{Expenses} + \text{Other income} = \text{EBIT} = \text{ROCE}
\]

*Figure 32 The ROCE Tree*

**9.8 Definition of OEE**

OEE stands for Overall Equipment Efficiency and is calculated as:

\[
\text{Availability} \times \text{Performance} \times \text{Yield}
\]

Where:

- Availability = Planned production time - Unscheduled Downtime/Planned production time
- Performance = Cycle time x number of products processed/ Production time
- Yield (Quality Rate) = (Number of processed products – Number of rejected products)/ (Number of processed products)