Tracking Product Profitability

A Case Study on Challenges and Opportunities in Performance Management

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Key words: Product Profitability, Decision-Making, Tracking Profitability, Information-Sharing, Responsibility Centres, Data Value Chain, Performance Management, Product Management, Business Intelligence, Motivation, Feedback.
Preface

This paper is a master thesis written at Lund University, Faculty of Engineering, by Josefine Olsson and Mikela Persson Hollsten during spring 2014. The thesis was written within the programme of Industrial Engineering and Management on behalf of both Lund University and the company Atlas Copco.

Working with this thesis has been very fun and challenging and both authors learned a lot. We would like to thank our supervisors of this project, Olav Kvist and Anna Gustafsson at Atlas Copco and Peter Bergling at Lund University. Your support, insights on the topic, and motivational encouragements have been of great value for us and have made this thesis possible.

We would also like to thank all the people involved during the interviews, who took time from their busy schedules to help us with this study.

This thesis is our final step before graduating and we now look forward to future challenges. We hope that you will enjoy the reading of this thesis.

Lund, May 2014.

________________________________________
Josefine Olsson                                 Mikela Persson Hollsten
Abstract

Title: Tracking Product Profitability – A Case Study on Challenges and Opportunities in Performance Management

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Background: The case company Atlas Copco has a decentralized organisation where the product responsibility has been delegated to the Product Line Manager located at the production facility. To manage the product portfolio and make strategic and tactical business decisions related to the products, information about product performance and profitability is a key input.

Today, the Product Line Manager has inadequate knowledge and insight in the product profitability of the products in their portfolio. The product profitability is estimated from data with somewhat insufficient quality and reliability, with the help of tacit knowledge and experience. As a consequence, the Product Line Manager is occasionally forced to make decisions without complete supporting profitability data.
Research questions: 1. What are the existing business processes for tracking profitability at the case company?
2. Why is tracking product profitability difficult?
3. What are the risks of not tracking product profitability?
4. How can the business process for tracking product profitability at the case company be improved?

Methodology: This thesis is a qualitative case study with a deductive research approach. Empirical data has been collected through in-depth interviews with a theoretical framework as a base. The empirical data was matched against the theoretical framework in an analysis model, aiming to answer the research questions.

Conclusions: Tracking of product profitability is difficult for several reasons. The key-findings of this study are that tracking of product profitability is difficult because:
- complex product offering creates big data,
- complex organisational structure complicates information sharing,
- management accounting lacks guidelines and support,
- individual business units tend to focus on self-interested goals rather than on company goals,
- implemented IT-systems are not aligned with business needs.
Not tracking product profitability involves many risks for a company. Without product profitability measures:
- product portfolio optimization is not possible,
- the quality of tactical business decisions decreases,
- motivation can be negatively affected.

With a theoretical framework as a base, the following factors form the best practice when tracking product profitability. The business process and system should be:
- systematic and efficient,
- providing information with an adequate level of detail,
- including the entire value-chain,
- easy-to-use,
- reliable.

Based on these best practises, following recommendations are suggested to the case company:
- keep up the work with reducing product complexity,
- create a new BI-solution with corresponding business process,
- implement a new job position as “Product Controller”,
- improve communication between responsibility centres.

**Key words:** Product Profitability, Decision-Making, Tracking Profitability, Information-Sharing, Responsibility Centres, Data Value Chain, Performance Management, Product Management, Business Intelligence, Motivation, Feedback.
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## List of Acronyms

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<th>Description</th>
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<tbody>
<tr>
<td>ADC</td>
<td>Assistant Divisional Controller</td>
</tr>
<tr>
<td>BI</td>
<td>Business Intelligence</td>
</tr>
<tr>
<td>CC</td>
<td>Customer Company</td>
</tr>
<tr>
<td>CNP</td>
<td>Customer Net Price</td>
</tr>
<tr>
<td>COGS</td>
<td>Costs of Goods Sols</td>
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<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>GAC</td>
<td>Group Accounting Code</td>
</tr>
<tr>
<td>HQ</td>
<td>Head Quarter</td>
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<tr>
<td>PC</td>
<td>Product Company</td>
</tr>
<tr>
<td>PCC</td>
<td>Product Company Controller</td>
</tr>
<tr>
<td>PGC</td>
<td>Product Group Code</td>
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<tr>
<td>PLM</td>
<td>Product Line Manager</td>
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<tr>
<td>PM</td>
<td>Product Manager</td>
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<tr>
<td>SDE</td>
<td>Surface Drilling Equipment</td>
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<tr>
<td>TP</td>
<td>Transfer Price</td>
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<tr>
<td>URE</td>
<td>Underground Rock Excavation</td>
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1 Introduction

This is a master thesis written at the Faculty of Engineering, Lund University within the programme Industrial Engineering and Management during spring 2014. The thesis is written both on behalf of Lund University and the company Atlas Copco.

1.1 Atlas Copco

Atlas Copco is a global and market leading industrial company that offers its customers compressors, expanders and air treatment systems, construction and mining equipment, power tools and assembly systems. The company was founded in 1873, it has its headquarter in Stockholm, Sweden and conducts business in more than 180 countries. The revenues under 2013 were 84 million SEK and the number of employees was more than 40 000. Atlas Copco is listed on Stockholm’s stock market. (Atlas Copco, 2014)

Atlas Copco is divided into four business areas, which in turn are divided into a total of 22 divisions. The business areas are Compressor Technique, Industrial Technique, Mining and Rock Excavation Technique, and Construction Technique (see figure 1). (Atlas Copco, 2014)
Each division has one or more product companies (PCs) that is responsible for product development and production. The divisions also have several customer companies (CCs) that are responsible for customer contacts, sales and service, and are dedicated to one division or shared between various. (Atlas Copco, 2014)

*Figure 2. Example of a relation between PCs and CCs.*
Figure 3 describes a simplified relationship between a PC, CC, and the head quarter (HQ) at Atlas Copco. The HQ is responsible for the overall firm performance, the PC is responsible for producing the products and the CC is responsible for selling the products.

![Figure 3. Simplified representation of a relationship between business units.](image)

The organisation is structured and controlled through a decentralized form of responsibilities and authority. Each PC and CC is a legal company and each division is an operative unit with a board that has responsibilities to make decisions about strategic and tactical issues regarding its own product portfolio. The divisions are responsible to achieve a sustainable and profitable development of its own business through implementing and following up their strategies and goals. (Atlas Copco, 2013)

1.1.1 Surface Drilling Equipment
Surface Drilling Equipment (SDE) is one of five divisions in the business area Mining and Rock Excavation Technique. SDE develops, manufactures and markets worldwide rock drilling equipment for various applications in civil engineering, quarries and open pit mines. SDE’s product portfolio is large, consisting of several product types and variants of rigs, and a numerous options that can be added to the deal if the customer requires it. Atlas Copco’s product companies sell and deliver products to several customer companies that are
responsible for the different market areas and end customers, which are many and vary a lot among the different product portfolios. SDE sells around 500 machines every year, and each is sold with its unique deal, regarding to final product variant, price, and included options and service. (Kvist, 2014)

SDE has several product companies located around the world, and one of these is located in Örebro, Sweden. At Atlas Copco, it is the Product Line Manager (PLM) that is responsible for the division’s product portfolio. At SDE, the PLM is located at the product company in Örebro. (Kvist, 2014)

1.2 Problem discussion
Responsibilities of the PLM at Atlas Copco include strategic decision-making regarding the product assortment, managing risk, providing forecasts and increasing the overall product profitability. To be able to make this kind of decisions the PLM must understand the factors that drive revenues and costs related to each product.

Having a decentralized organisation structure with autonomous product companies and customer companies limits the transparency throughout the organisation. The product company and the customer company only have transparency regarding their own internal business, and the insight into other each other's business is limited.

Today, the PLM at SDE has inadequate knowledge and insight in the product profitability of the products in the portfolio. The product profitability is estimated from data with somewhat insufficient quality and reliability, with the help of tacit knowledge and experience in the division. Ad hoc data collection is conducted in particular cases to access information that enables detailed profitability calculations on specific products, but this task is inefficient and quickly becomes out-dated. As a consequence, the PLM is occasionally forced to make decisions without complete supporting documentation.
1.3 Purpose
One purpose of this study is to map the existing processes of tracking profitability at SDE, and, with this as a basis, explore the difficulties and opportunities that companies may face in the process of tracking product profitability. A further purpose is to investigate how the business can be affected by insufficient insight in the product profitability. The report is intended to serve as a support document to stimulate future changes in the business process of tracking product profitability. This is done by demonstrating the importance of a well-managed system and providing guidelines of how to implement a better business process according to identified best practises.

1.4 Research questions
To facilitate the making of this study and to focus on the process of achieving the purpose, the following research questions have been established.

1. What are the existing business processes for tracking profitability at the case company?
2. Why is tracking product profitability difficult?
3. What are the risks of not tracking product profitability?
4. How can the business process for tracking product profitability at the case company be improved?

1.5 Delimitations
This paper is a case study with delimitations to the Atlas Copco’s division Surface Drilling Equipment.

When discussing profitability, it may be argued that the internal transfer price is an important factor to consider as it contributes to the revenues of the product company. A study aiming at this issue has, however, previously been done in the Surface Drilling Equipment division, and therefore will this paper not be treating that topic. The transfer price will be considered as a fixed variable, hence not a factor of importance in the process of tracking profitability.
This study will not look into how the cost allocation is performed and assumes that the indirect costs are assigned to the products in an appropriate way.

1.6 Limitations
This study is a master thesis comprising 30 credits, corresponding to 20 weeks of work. This limits the size and scope to reasonable dimensions, even though further research is encouraged.

External benchmarking of how other companies handles tracking product profitability was initially a highly desired element to increase the credibility of the result. Unfortunately, this issue appeared to be a delicate subject, making it difficult to access the information from other companies, and external benchmarking is therefore not included in this study. It was also an initial aim to collect empirical data through an in-depth interview at one of SDE's customer companies. This planned interview could unfortunately not be executed because of a busy schedule of the interviewee and the limited time frame of this thesis.

1.7 Outline of the paper
The structure of this thesis will be described below to give the reader a quick overview of the content in each chapter.

Chapter 1, Introduction, gives the reader a background of the case company Atlas Copco and aims to give the reader the setting of this thesis in a problem discussion. This chapter also presents the overall purpose of the study as well as the four research questions.

Chapter 2, Methodology, aims to give the reader an understanding of the research approach and the methods used to execute the study. It discusses the chosen methods for conducting of the theoretical framework, collecting the empirical data, and how the analysis model has been used. This chapter also includes a discussion of the quality of the thesis, where terms of usability, reliability and validity are discussed.
Chapter 3, *Theory*, defines the theoretical framework that the thesis will use as a starting point. This chapter is later on matched against the research questions and is used as a base when answering the questions.

Chapter 4, *Empirics*, describes the collected empirical data from in-depth interviews with relevant stakeholders. This chapter also includes mapping of current business process for tracking of profitability at the case company, being the answer to research question 1.

Chapter 5, *Analysis*, contains discussion and analysis linked to research question 2 and 3, based on the analysis model. In the analysis model, theory and empirical data are matched against each other. The results from this chapter, form answers to research question 2, 3 and 4.

Chapter 6, *Conclusions*, summarizes the key take-aways from the analysis chapter and answers research questions 2, 3 and 4. The answer to research question 4 is divided into general best practice for tracking of product profitability and specific recommendations for the case company.

Chapter 7, *Further Research*, discusses potential topics to explore in future studies.

Chapter 8, *References*, contains all sources that are referred to in the thesis. This chapter provides the reader with the opportunity to examine the sources for reliability, and brings the opportunity for further reading on related topics.
2 Methodology
This thesis is an assessment of tracking product profitability. The study was executed as a case study at the division SDE at Atlas Copco, where the empirical data was collected.

2.1 Research Approach
To achieve the purpose of this thesis and to answer the research questions, the following research approach was applied.

The research process of this thesis started off with a short pre-study at the case company, which was used to create an understanding of the subject and issue. After the pre-study, the next step in the process was scoping, where the purpose of the study was broken down further, and four research questions were identified to be explored and answered. The purpose of the pre-study was also to give ideas for theoretical research. In the theory study a theoretical framework was conducted and this framework was used as a base in the collection of empirical data. After collecting the empirical data, an analysis model was set up and was used as an outset to analyse the data and explore the research questions.

The thesis has a deductive approach, which means that the conclusions are derived from theories. The theoretical framework is used as a base for the
conclusions, which are later confirmed by empirics. (Björklund and Paulsson, 1994)

Since the thesis is a case study, the conclusions of the study are no proofs or statistically assured results (Höst, 2006). The ambition of the thesis is to expose the issue and examine it on a deep level to find possible explanations to the observed appearance.

Research question 1 is descriptive and the answer to this question serves as a basis for the rest of the study. Research question 2 and 3 are exploratory in their nature, and research question 4 has a more problem-solving approach. (Höst, 2006)

The study has a qualitative approach, since the collected data are words and descriptions instead of numbers. The nature of qualitative data is that it can be observed, but not measured. (Höst, 2006) A qualitative approach was chosen because of the nature of the purpose of the study. Having a qualitative approach means that no generalisations can be made, but that is not the aim of this thesis.

2.2 Theory study
The theory study included literature studies of subjects related to the assessment to make a solid theoretical base. Literature research was complemented with studies of scientific articles to give input on new perspectives.

The theory study resulted in a theoretical framework, which was used to develop the analysis model of the study. The theoretical framework identified seven key areas that were central for the assessment. In the analysis model, the first four areas were mapped to research question 2, while the remaining three areas were mapped to the research question 3. The analysis linked to finding a better
solution and answer the research question 4 was made based on the results from research question 1, 2 and 3.

2.2.1 Theoretical framework
The key research areas that were identified during the theory study were the following seven areas:

- financial and management accounting,
- information-sharing between responsibility centres,
- complex business context,
- IT and Business Intelligence,
- strategic decision-making and product portfolio management,
- tactical decision-making and operations management, and
- motivational aspects of performance management and feedback.

These seven areas were used as a base for reaching the main purpose of the study and to answer the four research questions.

2.3 Data collection
This thesis is of qualitative nature and most part of the empirical data was therefore done through in-depth interviews. The empirical data collection of this study was made with the theoretical framework as a foundation.

2.3.1 Interviews
The primary data was collected through interviews with stakeholders that were structured and semi-structured. The interviewees included a good variation of people with different employment positions to get as many different perspectives of the subject as possible.

Interviews were made with the PLM at the division SDE at Atlas Copco. The study also included interviews with two Product Managers (PMs) of the SDE division. These interviews gave an understanding of the management situation and the business needs of the company. To get the financial accounting perspective, interviews with both the Assistant Divisional Controller (ADC) and
Product Company Controller (PCC) at SDE’s product company in Örebro were executed. To achieve a deeper understanding, the study also included internal benchmarking by interviewing the PLM at the division URE at Atlas Copco.

2.3.2 Other empirics
The study included observations of the business processes at the case company. Secondary data has also been collected through internal documents of the case-company and financial reports. This data includes for example annual reports and organisational charts.

2.3.3 Process-mapping
The empirical data collection included mapping of business processes at the case company related to tracking of product profitability. The mapping of these processes served one of the research questions of the study, but was also used as an input to answering the rest of the research questions.

2.4 Analysis model and conclusions
The analysis model was developed to help answer the research question 2 and 3. The analysis was based both on the theoretical framework and on the empirical data collection.

In the first phase of the analysis, the business processes mapped in the empirical data collection phase where analysed. This answered research question 1; *what are the existing business processes for tracking profitability at the case company?* Three problem areas in the business processes were identified and these areas constituted a fundamental input to the next phases of the analysis. In the second phase, the problem areas identified from the business process analysis were matched against the theoretical areas related to research question 2; *why is tracking product profitability difficult?* In the third phase of the analysis, the empirical data collected and linked to research question 3 were matched against the theoretical areas for the same question; *what are the risks of not tracking product profitability?* The last phase of the analysis used the key take-aways from the previous analysis and discussed potential improvements on existing business
processes linked to tracking of product profitability. This part of the analysis had the aim to answer research question 4; how can the business process for tracking product profitability at the case company be improved?

![Figure 5. The different phases in the analysis model.](image)

The results from the analysis was discussed and summarized as answers to the different research questions. The conclusions also include recommendations to the case company.

### 2.5 Quality
For a master thesis to be of good quality it must reach a high standard when it comes to the quality measures usability, reliability and validity.

#### 2.5.1 Usability
This study describes and explores an issue that is relevant for many big companies. Tracking product profitability is a key component of performance management in every firm. Because of that, the conclusions from this thesis have a high usability. The analysis model conducted in this thesis is a scientific
contribution, since it can be applied to pursue a similar study on other case companies.

The conclusions made in this study are not general proofs because of the nature of a case study, which is the chosen method (Höst, 2006). The ambition of the thesis has been to describe the situation at the case company and the conclusions should be seen as possible solutions that could be adapted to other studies.

2.5.2 Reliability
For a thesis to be of high quality, it is very important that the results of the thesis are reliable. To ensure the reliability of the thesis, the method has been planned and executed very thorough and with high accuracy.

The method is thoroughly described in this chapter to give the reader the chance to evaluate the study and to make sure that the results are authentic. Since the method is described, it would be possible for a third part to conduct the same study and find the same results. The data collection and analysis are reliable because of the thorough execution and the possibility for the reader to examine every step of the process, including the results. The literature search were extensive and the sources chosen after deep considerations. Most sources are scientifically examined by independent experts, which make them trustworthy. The interviewees were selected to give a wide range of perspective of the studied issue and they have all been given the opportunity to examine the collected data and the drawn conclusions to make sure the data is authentic.

2.5.3 Validity
Validity is a measure of quality that investigates if the study actually measure and research the correct things. To ensure high validity, the study has to focus on systematic observations. In this study, the tool triangulation has been used to increase the validity. Triangulation means that the same object is observed and studied with different methods and with different perspectives to minimize the risk to capture random observations and conclusions. (Höst, 2006) Additionally, independent opponents have examined the thesis to ensure the validity.
2.5.4 Criticism of the chosen method
Because of the nature of the chosen method, no general conclusions or proofs can be made. The ambition of the thesis was to create deep understanding of the researched issues and this, in combination with the time limit, resulted in a one-case study. In order to make general conclusions, more case companies must be researched.

As mentioned in the limitations, external benchmarking was originally an aimed to be done to increase the reliability of the research. Now, only internal benchmarking with another division at Atlas Copco has been applied with the aim to increase the reliability. Further research on other case companies is of course encouraged. The external benchmarking was supposed to be executed as an interview at a customer company at SDE. However, this interview was not able to take place and some assumptions related to the customer companies had to be made based on the interviews from the product company. These assumptions could affect the reliability of the study.

In this study, deep interviews were conducted with a number of key stakeholders at the case company. More interviews would have limited the influence of subjective opinions from the interviewees and broaden the perspective.

The study was conducted based on qualitative research, thereby the choice of using in-depth interviews. The purpose was to study complex issues with many dimensions, and because of this, a quantitative approach was not possible. In case of interest, the method could have been complemented with a quantitative study where the issues studied in this report could be ranked after degree of importance.
3 Theory Study

This chapter starts with defining profitability measures and product profitability because these subjects are the main focus in this case study. The following theory consists of seven topics and is structured to build a framework for answering research question 2, 3 and 4. Out of these seven topics, the first four are related to research question 2; why is tracking product profitability difficult? These topics are complex business context, financial and management accounting, information sharing, and IT and Business Intelligence. The last three topics relate to research question 3 and concern strategic product management, tactical product operations management, and feedback and motivation.

![Figure 6. Illustration of the relationship between the theoretical framework and the simplified description of the organisation. The numbers represent the theoretical outline, where number 1-4 relate to research question 2 and number 5-7 to research question 3.]

3.1 Profitability calculation

Profitability measurement is an important part of performance management at all firms. Profitability in this study refers to the numeric difference between
revenues and cost, often referred to as gross profit, (Skärvad, 2013), which is the most basic form of measures of product profitability (Varley, 2001) and one of the most important (Haldar, 2010). Product profitability is defined as the profitability of a specific product or model, i.e. the difference between the revenues and costs that are directly related to the products (Skärvad, 2013).

In theory, it is easy to measure profitability since the needed data can be collected from financial statements or public documents. In reality, the measurements become more complicated. In businesses divided into divisions and business areas, it may also be interesting to analyse profitability by products, or by each division, business area or other business segments (Skärvad, 2013).

3.2 Complex business context
A complex business context consists of many parts. This study focuses on the areas complex product offering and complex organisational structure.

3.2.1 Complex product offering
A lot of firms realise the value of customizing their products, particularly those that have many customers in many different markets, each one with unique requirements. A high number of products in the product portfolio and a high degree of customized products in the offering contribute to loyalty and engagement from the customers and to attracting more potential customers. By modifying the products to meet the preferences of the customers, a business gains competitive advantage and the customers are willing to pay more. (Spaulding and Perry, 2013) However, an essential issue of having a differentiated product strategy is to customise the products in a profitable way (Hvam, Mortensen and Riis, 2008).

A product portfolio often consists of various product families with related variants that represent a group of alternatives, out of which only one is chosen. An option is a characteristic that either is selected or chosen not to be included
in the deal of the customer. An option can be additional features as changes or additions to the product, accessories, or extra services as maintenance or transportation. (Kropsu-Vehkapera et al., 2011)

3.3.2 Complex organisational structure
As firms grow larger, the more complex they get in the organisation structure, working processes and product mix. Due to this complexity in large, often global firms, top management find it difficult to control operations efficiently. A natural implication of the growth of a firm is, in varying extent, to divide the organisation into divisions and departments with different functions, each with assigned responsibilities and decision rights. Divisions can be based upon different factors as regions, markets or products. In an organisation with divisions based on the types of products, each divisional manager is responsible for all the operations relating to their particular product or products. The divisional manager reports to a chief executive or top management team that normally is located at the corporate HQ. (Drury, 2009)

Responsibility centres
Another solution to manage the complexity that comes from growing firms is to divide the organisation into different responsibility centres. The type of focus that the unit has on the financial measurements determines what type of responsibility centre it is. If the focus lies on costs, or if it is the only possible to measure, it is called a cost centre. When both the revenues and costs can be measured, and the focus lies on increasing the revenues, it is called a profit centre. (Drury, 2009)

In every division exist multiple cost and profit centres, where one profit centre is dedicated to one or more cost centres, i.e. provides products from different portfolios that are associated to each cost centre (Drury, 2009). Cost and profit centres have communication and collaboration between each other as it may be illustrated in figure 7, making the structure even more complex when the picture of a divisional organisational structure is added to it. (Tamer, Toon and Hastak, 2012)
3.3 Financial and management accounting

3.3.1 Financial accounting
Large and public listed businesses have a legal duty to conduct auditing and accounting (Mancini, Vaassen and Dameri, 2013) and use the information to frequently compile financial reports in which the financial state of the company is presented (Skärvad, 2013). This legal duty of accounting refers to financial accounting and is organised towards external functions as well as top management, which have an interest of knowing the financial position and financial performance of the business (Ciuhureanu, 2012). External users of the accounting information are for example investors and regulators, which use the information from published financial statements to make investment decisions, regulatory rulings, etc. Top management use the information to formulate overall policies and long-range plans, but the financial data also provides a basis for lower level managers to make short-term planning and control decisions. (Johnson, Scholes and Whittington, 2009)
accounting reports within short time intervals, the company needs to simplify the accounting process. This often results in data consolidation to decrease the level of detail and to make it possible to collect the data quickly. (Skärvad, 2013)

3.3.2 Management accounting
There are a lot of different definitions of management accounting, which also is differently referred to (e.g. managerial accounting, strategic management accounting, etc.). After having compared different studies, two definitions of management accounting are selected to be presented here, as they cover the main elements of the concept. Proctor (2002) defines management accounting as “a broad management approach that makes use of external and non-financial information as well as internal financial information”. Ciuhureanu (2012) has a slightly different description and defines the concept, as “managerial accounting is the analytical representation of internal processes of the company which brings both quantitative and qualitative transformations of the patrimony, provides managers from different organisational levels with information on the effectiveness of the activity they manage and on the factors hindering the managed system”.

Management accounting is not a compulsory activity, but instead something carried out in the organisation due to the wish of managers to improve the effectiveness of operations (Drury, 2009). According to Ciuhureanu (2012), management accounting contributes to firm advantages within the areas:

- cost analysis and estimation,
- coordination within the organisation,
- forecasting,
- control,
- decision-making, and
- performance evaluation.

Moreover, it can act as a tool for managers to make decisions, as choosing the right product-mix with the right properties, or controlling the production factors. Lack of experience and/or knowledge about organising this type of
accounting process, and no sufficient supporting IT system, are reasons to why obstacles may occur in management accounting. (Ciuhureanu, 2012)

3.3.3 The difference between financial and management accounting
Laws, regulations and general principles regulate the process of financial accounting and reporting, making financial accounting differ even more from management accounting, which is utterly optional. Since the execution of management accounting is optional, the processes and the way of doing it is decided by each business or business unit itself without direct guidelines. As a result of using different systems and processes, difficulties arise in the process of compiling the information (Indjejikian and Matejka, 2012).

<table>
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<tr>
<th>Comparison criteria</th>
<th>Financial accounting</th>
<th>Management accounting</th>
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<tr>
<td>Implementation</td>
<td>Legal requirements</td>
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<tr>
<td>Users</td>
<td>External users and managers</td>
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</tr>
<tr>
<td>Purpose</td>
<td>Control, present financial statement</td>
<td>Provide information to decision-making</td>
</tr>
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<td>Documentation format</td>
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<td>Characteristics of content</td>
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</tr>
<tr>
<td>Key part of measurement</td>
<td>The business as a whole</td>
<td>Part of the organisation, division or department</td>
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Table 1. Comparison between financial and management accounting.
*Inspired from Ciuhureanu (2012, p97)
Conclusions made from this are that the information from financial and management accounting complement each other, and that the two processes must be organized as two different systems. Financial accounting gives enough
information to compile financial reports, but it doesn’t necessarily satisfy the information need of managers. Only conducting financial accounting will thus not automatically satisfy the needs that instead can be covered by the management accounting. Organisation of these systems is a vital part that affects which information becomes visible for managers, and thereof influences the decision-making process and the result of these decisions.

3.4 Information-sharing between responsibility centres
It is important to create open information flows and incentives for information-sharing in order to achieve a well-functioning organisation. Organisations with responsibility centres will logically realise more difficulties to create an open information flow due to cross-functional barriers (Matheson and Matheson, 1998).

Decentralized organisations with responsibility centres imply conflicts due to its nature (Garber, 2011). When an organisation holds the profit centre responsible for the sales and the cost centre responsible for the cost, it is a natural consequence that these units build up different perspectives and focuses, and potentially a self-interested behaviour (Nicolaou, 2010). Cost centres have performance metrics according to cost, schedule and quality, and profit centres measures performance from sales volume and revenue. The employees working at the profit centres often have a sales-focused education and background and share the view that high revenue equals good performance. On the other hand, employees at a cost centre that work close to the production often have different educations and backgrounds, and are more naturally focused on keeping the costs down. On the contrary to profit centres, cost centres associate lower costs to better performance. (Tamer, Toon and Hastak, 2012)

The fact that the responsibility centres shape self-interested behaviour is positive in a business unit perspective. A problem arises if the units work against each other’s objectives, which may impact the corporate objectives. (Nicolaou,
2010) By focusing only on one part of the value-chain, there is a risk of not making smart decisions, but decisions that only benefit some parts of the business and simultaneously hurt other parts. The could imply a negative impact of the overall profitability. (Matheson and Matheson, 1998) This risk is however decreased when the actions of different business units are aligned with the corporate objectives (Martin and Eisenhardt, 2010). Secondly, the difference in background and perspective of the different units can also affect the way the information and knowledge is shared between them. The centres’ self-interested behaviour may cause the reliability of the information to be questioned, and there is a risk that the information is not fully conveyed. (Nicolaou, 2010)

Furthermore, it may also exist a lack of incentives to care about the other part’s performance metrics. Without incentives to care about the total value-chain of the company, this could create a barrier for information sharing between different units. (Matheson and Matheson, 1998)

Without incentives to share information between different business units, tracking of profitability related to specific products becomes difficult. It is necessary to have information about both revenues and costs to enable tracking product profitability, which means that data needs to be collected from both profit centres and cost centres. This type of data collection needs incentives at both centres to share information, and the employees need to understand the overall goals of the business. The employees must have the knowledge of the fact that the performance information that they possess is a key input in the process of measuring the overall performance. It is important that they share this information despite the fact that it is an action that is not directly linked to the performance metrics that they are individually evaluated against. (Matheson and Matheson, 1998)

Transparency is a term that concerns exposure of information that belongs to one party and that otherwise would be held private, and exchange of both
information and knowledge. It allows knowledge to be acquired within the different responsibility centres regarding their internal and external environment, which enables understanding of the importance of information sharing. (Nicolaou, 2010) Conclusions can thus be made that transparency is a very important factor to be considered in order to achieve high quality information sharing in organisations, especially when it comes to complex organisation structures with a lot of entities to collect data from.

3.5 IT and Business Intelligence

IT plays a critical role in information sharing within organisations because it can enable transparency, which subsequently improves the quality of the transferred information and increases the reliability (Nicolaou, 2010) The greater amount of entities to share data between, the greater becomes the amount of data to be collected, analysed and distributed. Hence, the importance of IT’s role escalates when it comes to securing the reliability and quality of the data in complex organisational structures that consist of several entities to collect data from. Transparency in the information flow creates a basis for more advanced accounting management and enables the organisation to get more information that better meet the business needs (Magnusson, 2005). Because of the critical role that IT plays in firms, the system design is very important to take into account, and it must be designed in a way that enhances the capability to coordinate the large amount of data. (Nicolaou, 2010)

3.5.1 Enterprise Resource Planning system

An Enterprise Resource Planning (ERP) system is standardized business management software. This IT system plays an important role of the firm’s management control system, and the accounting processes, since it should support all the business processes in the firm, from material planning to sales and helps keeping track of important data and information. (Magnusson, 2005) ERP systems are standardized systems that are made to fit many different firms, which is the reason to firms might find that the system does not fit their specific business needs. It should be seen as an asset that can help a firm to satisfy its
information need, and must therefore be aligned to the corporate objectives. (Aschton, 1995) However, if the information system does not support the current business needs, the system could instead be limit the business (Magnusson, 2005). From this follows that the firm must make a decision about if they should change the system or adjust their business processes and business needs in order to achieve a good fit. This procedure is called Business Process Engineering and links the organisational restructuring with the development of systems. (Ashton, Hopper and Scapens, 1995) Customizations and changes in an ERP system are however very costly and time demanding. Due to this, it is most often shown that companies chose to change their business processes to fit with the system. (Magnusson, 2005)

Alignment of ERP systems and business processes is not the only factor affecting the performance of the system, also knowledge about how to use the IT system, regarding which data that can be provided and implemented routines for how the information should be brought out in the organisation are other important factors that have to be implemented (Magnusson, 2005).

3.5.2 Business Intelligence
Business Intelligence (BI) is a concept that describes a firm’s way of using business data and information to increase their business value (Raisinghani, 2004). BI could be defined as a systematic and organized process by which a company can collect, analyse and distribute information from internal and external sources so the this information can be used to make good business decisions (Lönnqvist and Pirttimäki, 2006). The data used in the BI system is most often retrieved from the ERP system, in which raw data is collected. In order to achieve the full value of the BI system accordingly must be connected to the implemented ERP system. (Williams and Williams, 2010)

Organisations are often in possession of big data, but may face the challenge of collecting, analysing and distributing the data in an effective way so that they enable a good decision-making process (Williams and Williams, 2006). In a
world with high competition, BI becomes an important tool that helps the firms to access the needed information and consequently in their struggle to fight the competitors (Raisinghani, 2004).

For a BI system to work well and add value to the business of a company, the system has to be well implemented in two dimensions. The first dimension is technical maturity and is a measure of the quality of the information that the BI system provides. The technical maturity of the BI system depends on the underlying technical architecture and data management. The second dimension is the utilization rate of the system. This dimension measures how well the BI system is used by the company and if all the benefits of the BI system actually is exploited and it is of course important that this rate is high for the system to be effective and useful. (Popovic, Turk and Jaklic, 2010)

The maturity of the BI system that is implemented in a firm can be described by the BI maturity matrix (see figure 8). Firms in the second or third quadrant have failed to match the business need with the BI development. Either they have a more sophisticated BI system than the firm has need for or capabilities to use, or a BI system that has a lower technical maturity than the business has a need for. The optimal journey would be for the company to move from the first quadrant to the fourth, where the system is recognised to have information of high quality and high utilization rate within the organisation. (Popovic, Turk, Jaklic, 2010)
3.6 Strategic decision-making and product portfolio management

Strategic management issues are matters that concern key success factors in an organisation’s overall strategy to achieve the common goals. They have a long term focus and concern all parts of the organisation, making it a complex matter to deal with. (Johnson, Scholes and Whittington, 2009)

3.6.1 Product profitability related to strategic decisions

Reliable and relevant information based on correct values from measures is a fundamental input for managers to be able to make good decisions (Matheson and Matheson, 1998). To make strategic decisions, managers need information of various kinds, but one essential input is information about product performance and product profitability (Johnson, Scholes and Whittington, 2009). The product profitability is an important component that contributes to the overall profitability of the firm, and hence an informant factor to know about to be able to make a strategic analysis of the drivers behind the overall firm profitability (Ashton, Hopper and Scapens, 1995).

Deciding about the mix of product offering is one part of strategic decision-making (Devinney and Stewart, 1988), which, like many other strategic decisions, is a complex matter by its nature because it concerns uncertain issues
regarding the future, and it involves a lot of risk (Johnson, Scholes and Whittington, 2009). Making decisions in well-informed conditions and after profound considerations are methods to minimize the risk. (Matheson and Matheson, 1998)

Holding an existent product portfolio, the manager in charge have to chose between five possible actions; keep existent products, keep a product but change the marketing strategy, implement product modifications, remove an existing product from the product line or introduce a new product. These strategic decisions about the product portfolio should be based both on current product performance and anticipated future product performance. (Eisenhardt and Zbaracki, 1992) Knowledge about the profitability related to each product in the product portfolio is therefore crucial to make well-informed decisions based on correct fact (Wind and Claycamp, 1976).

Managing the product portfolio includes tasks like sales and marketing effort. This can be done when managers have information about cost and profitability. It also concerns decision of reducing the numbers of products that are unprofitable, or which products that are less profitable than other. (Bruns, 2005)

**Pareto Analysis**

Pareto analysis is a helpful strategic management tool to get an overview of which products in the product portfolio that contributes to overall profitability. The information presented in a Pareto chart can rank the products by the profitability contribution per unit. During a Pareto analysis, 80/20-conditions (the fact that only a small amount of the products is contributing to a big share of the total profitability) can often be discovered. (Drury, 2009) The information from these analyses is very valuable when a manager wants to decrease the amount of products in a product portfolio. To optimize the portfolio performance, the “tail” (products with low contributing profitability) should be cut off. (Brynjolfsson, Jeffrey Hu and Smith, 2006)
**Product Life Cycle Analysis**

Another important input to managers that is making strategic product decisions is in which stage of the product life cycle the product is currently at. A product passes through various stages during its product life cycle; introduction stage, growth stage, maturity stage and decline stage. (Anderson and Zeithaml, 1984) Knowledge about the trend in product profitability; how the profitability of a product is changing, is crucial to be able to determine the stage of the product life cycle. Profit per unit varies as products move through the stages of their life cycle, falling following the growth phase. (Ashton, Hopper and Scapens, 1995) If a manager is aware of where in the product life cycle a product currently is, the manager can make good strategic decisions suited for every different stage. (Horngren et al., 2011) This give rise to different strategic actions, since each phase of the product life cycle poses different threats and opportunities. (Ashton, Hopper and Scapens, 1995)
**BCG Matrix**

Insight in product profitability can also help the PLM to get a better overview of their product portfolio when it comes to growth and market share. The BCG matrix is a helpful tool to do that. The BCG matrix divides the products into four quadrants based on growth and relative market share; cash-cows, stars, dogs and question marks, as seen in figure 11. (Johnson, Scholes and Whittington, 2009) Relative market share is a proxy for profitability and cash-generating ability. Relative market share is the ratio between a firm’s market share and the market leader’s. A high relative market share is considered to lead to higher profitability on the basis of the experience curve theory, which states that a market leader should have the lowest costs at a current price level. (Ashton, Hopper and Scapens, 1995)
When the different products have been plotted in the BCG matrix, analyses can be made both on market share in different geographic markets but also in different customer segments. (Johnson, Scholes and Whittington, 2009).

### 3.6.2 Risks of making strategic decisions without full insight in product profitability

Without full insight in the profitability of different products, it is very difficult to manage the product portfolio and determine which actions (Wind and Claycamp, 1976) that need to be implemented. When the development of the product profitability over time can’t be assessed, it is very difficult to see where in the product life cycle a product is. If the manager can’t identify when a product is losing its competitive strength on the market, the manager can neither make the strategic decisions necessary. (Horngren, et al., 2011)

Another risk with not correctly and systematically tracking product profitability is that wrong conclusions might be drawn from a Pareto analysis. If a PLM wants to decrease the number of products in their product portfolio in the ambition to lower business complexity, they might choose which product to remove based on incorrect information. The product that appeared as one of the 80 per cent of
products that was not very profitable, might in fact be one of the 20 per cent of the products that actually contributed the most to the overall profitability. Removing this product could of course results in a very negative impact on the portfolio performance. (Drury, 2009)

Without knowledge about the products growth and market share it is impossible to plot the portfolio in the BCG matrix. When this can’t be used as a performance management tool, the company will not be able to see which products that are cash cows and which products that might be hidden stars with great prospects for the future. (Johnson, Scholes and Whittington, 2009)

3.7 Tactical decision-making and operations management

In contrast to strategic management that shape the long-term direction of a firm, tactical management considers the implementation of the strategy and decisions are made more frequently to support the operational work. The focus is short-term and made decisions are more easily changeable than the strategic decisions. Even though tactical decisions don’t impact the business in the same degree, it is still very crucial to make these decisions based on solid information. (Johnson, Scholes and Whittington, 2009)

Tactical business decisions should guarantee continuing success of a business. Knowledge about profitability and how the business is performing is a key to make sure that the tactical decisions that are made are successful. (Johnson, Scholes and Whittington, 2009) Access to reliable and relevant information is also a fundamental input to managers regarding tactical decisions to ensure a high quality in the decision-making (Matheson and Matheson, 1998).

When managing a business on a tactical level, managers must be able to identify situations when the operations don’t work the way they should. Tracking performance enables visibility of these situations since it makes it possible to compare performance values and recognise situations that differs from normal.
Without visibility of the trends, managers are not able to take action and implement the changes needed to make the operations run optimally again. If the production cost is increasing, the manager must be given this information to be able to identify the reason behind the increase and implement a solution. (Matheson and Matheson, 1998)

Tracking performance is also important so that managers can identify the effects of actions they implement (Horngren et al., 2011). If a manager implement a new sales campaign, the manager must get information about if the sales increased, decreased or remained the same after the campaign.

3.8 Motivational aspects of performance management and feedback

A performance measurement system is implemented to shape a motivating working culture with incentives for continuous improvement. For the system to operate effectively, it must include:

- clear objectives,
- measured output, in a form which is directly comparable with the objectives, and
- the ability to take actions, if the objectives and outputs are not the same. (Ashton, Hopper and Scapens, 1995)

Motivation is the drive towards some selected goal that creates effort and action toward that goal. Without motivation, the employees in a firm will lose interest in improving their work and the firm will soon become inefficient. (Horngren et al., 2011)

There is a clear role for accounting measures in motivation and performance appraisal. If performance is not measured and recognized, the employees of a firm will lose their motivation to do a good work and the organisation will stop improving. People generally need to see the results on their achievements and efforts to continue to be motivated and in this process the performance
measurement system have an important role. (Ashton, Hopper and Scapens, 1995)

The performance measurement system should be used as a feedback tool to create a feeling of participation in involvement in the firm’s performance. Continuous feedback on the results of the decisions and actions motivates the employees and makes the work feel meaningful (Ashton, Hopper and Scapens, 1995). It is very important to take that into consideration when designing a performance measurement system because motivated employees tend to be more productive. It is however very important that the system focuses on controllability, which means that the managers must be evaluated on performance measures that measure factors in their control (Horngren et al., 2011).
4 Empirics

4.1 Consolidation of product data
SDE has a wide range of products within their product portfolio and the high degree of customer customisation makes every product unique. To handle this product complexity in performance management processes, the product data is reported in different groups and consolidations. In accounting purposes, the products are consolidated into a Group Accounting Code (GAC). All products can, in a simplified way to describe it, be divided into two groups, GAC 17 (these products are called Tophammer) and GAC 19 (Down-The-Hole). (Kvist, 2014) In other performance management processes the products and the linked performance data are consolidated in different ways, creating four levels of product consolidations used at Atlas Copco (Pettersson, 2014):

- GAC,
- PGC,
- rig model, and
- rig number (specific rig).

The Product Group Code (PGC), is a group that includes several rig models and is therefore more specific than the GAC. Still, the PGC do not reveal information considering exact rig model or specific rig customisations. (Pettersson, 2014)

4.2 IT systems used at SDE

**Movex**
All financial business transactions performed at the product company are documented in the ERP system Movex. This system is accessible for all employees at the plant and holds specific data linked to each rig number. Particular rigs that have been produced at the plant can thus be tracked through the whole production process, with the internal transfer price (TP), production costs and cost of goods sold (COGS). Single operations and events are
represented by codes, which make it possible to identify for example a production stop. Nevertheless, ability to interpret these codes requires high level of knowledge about both the system and the production processes. (Gustafsson, 2014)

<table>
<thead>
<tr>
<th>Key facts</th>
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<tbody>
<tr>
<td><strong>Level of detail</strong></td>
<td>Rig number</td>
</tr>
<tr>
<td><strong>Access to system</strong></td>
<td>Product company</td>
</tr>
<tr>
<td><strong>Profitability data registered</strong></td>
<td>• TP</td>
</tr>
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<td></td>
<td>• COGS</td>
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*Table 2. Key facts about Movex.*

**Local ERP-system at the customer companies**
The financial business transactions related to the customer companies, as the customer net price (CNP), are recorded in the local ERP systems, which is only locally accessible. Most customer companies use SAP but also other solutions exist. (Pettersson, 2014)

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<tr>
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<td><strong>Profitability data registered</strong></td>
<td>• TP</td>
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<td></td>
<td>• CNP</td>
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*Table 3. Key facts about local ERP system at the CC.*

**MO-database**
All machine orders are registered in the MO-database used by both product companies and customer companies. It gives access to all orders in the system and it is possible to receive specific information regarding each single order. The accessible information consists partly of TP, COGS, and CNP. (Gustafsson, 2014)
**GPS**

The Divisional Controllers use GPS to access compiled data on a GAC-level from the customer companies’ ERP systems and from Movex. This system displays sales, stock levels and COGS per division, company and GAC. (Pettersson, 2014)

**QlikView**

QlikView is a BI system in use at SDE. The system is today connected to the ERP system Movex, from which QlikView can extract data, make calculations and provide reports and graphs. (Gustafsson, 2014) QlikView provides visual graphs and reports of high quality (QlikView, 2014) and is perceived as a system that is easy-to-use according to the employees at SDE (Gustafsson, 2014).
4.3 The business process from order to product sold

Order generation
The customer company handles the contact with end customers and manages the process prior to, and when, a deal is approved and agreed upon. Once a deal is decided, the customer company places an order that is sent to the product companies and registered in the MO system. According to the PLM and the PCC, the customer company is required to communicate the required product model and the agreed CNP by adding this data in the MO system, which becomes linked to the specific order. (Gustafsson, 2014) However, the reported CNP data is not perceived as reliable, and in frequent cases, the information is not filled in at all. (Kvist, 2014)

Production
The production process starts when the product company has received an order. (Kvist, 2014) SDE records all the business transactions related to the production in Movex, where the production cost is compiled and registered in the system. The production cost per product is also accounted in MO, connected to each
particular order. Both Movex and MO generate the sum of COGS by adding the overhead costs according to a predetermined overhead rate. (Gustafsson, 2014)

Production cost and COGS are logically two variables that depend on various factors, as for example the required product model and number of chosen options, or unexpected production stops in the production process. These factors, and more importantly the reasons behind them, may affect profitability of single products a lot. (Gustafsson, 2014)

**Internal sale**
The product company sells the product to the customer company to a TP that is recorded in Movex and the product is transported from SDE. (Gustafsson, 2014)

**Order changes**
A rig arrives to the customer company and is stored there until it is transported to the end customer. After the deal has been communicated from the customer company to the product company the first time, the end customer may have required changes in the order regarding physical changes to the product or regarding the additional service. The customer company manages these changes administratively, and has a workshop where the physical changes can be made. The extra costs that arise from the order changes are reported in the ERP-system in use at the particular customer company; however, this is often not communicated in MO. The original CNP may be modified as a result of these changes and should be changed in MO, but the interviewed persons from the product company claims that this is not done in all cases. (Kvist, 2014)

**Invoicing**
When all order changes are performed, the rig is transported to the end customer and a final invoice is sent. The information of the invoice is registered in the customer company’s ERP system, which data is linked to the particular order and rig. The local ERP systems are linked to the GPS system in which the financial accounting reports are made. The CNP communicated to GPS is thereby the correct and final CNP. (Pettersson, 2014)
Correction
A Business Line Manager placed at the customer company is responsible of making corrections in the MO system with respect to any changes that occurs in CNP and product costs to make sure that all data is updated in correct. This part of the business process is not always done correctly as stated by the interviewees. (Kvist, 2014)

4.4 Profitability measurement business processes
Three main processes of calculating profitability are identified at the case company and the next section will describe these, answering the first research question of this study; what are the existing business processes for tracking profitability at the case company? The processes differ depending on the aimed usage of the result, and data is retrieved from different systems.

Atlas Copco pursues its business in a complex business environment, referring at the complex organisational structure and complex product assortment. The large number of product variants and the variation of added options make it very difficult and extremely time consuming to calculate the costs and profitability for each product. (Kvist, 2014) In the job of calculating the product cost, a cost average of a standard rig is therefore calculated, including a set of standard options, to simplify the process and to make it a valuable activity. (Gustafsson, 2014) This, and further consolidations of the data are made to facilitate systematic measurements. (Kvist, 2014)

This complexity contributes to the difficulty of tracking product profitability, and requires simplifications in the calculations, as consolidation of the data, to be able to make systematically measurements. (Kvist, 2014)

4.4.1 Divisional profitability process
The profitability calculations made in this business process are done for the purpose of financial accounting and to compile financial reports of Atlas Copco’s overall result provided for the external investors and other stakeholders. These
calculations are made at a GAC-level and are used to analyse the local profitability of the SDE division. (Pettersson, 2014)

![Diagram showing data flow between Movex, ERP-system, and GPS systems.](image)

*Figure 13. Divisional profitability process.*

The data that forms the basis of the calculations in this process is available in the system GPS. GPS collects the cost data from the Movex system at the product companies, while the revenue related data is taken from the customer companies’ ERP systems. The profitability is thereafter calculated according to this formula and provides the profitability on a GAC-level. (Pettersson, 2014)

\[
\text{CNP - COGS per unit} = \text{Gross GAC Profit}
\]

### 4.4.2 PC profitability process

This process is performed by the PCC at SDE Örebro, which is responsible for controlling of the plant. The output from this process is therefore a measurement of the profitability of the plant on a model-level. Without considerations about the entire product value chain, since it only is based on local data. (Gustafsson, 2014)
All cost and revenue data is collected from Movex into QlikView. However, since the measurements only concern the individual plant, the revenue data is represented by the TP. All data is collected into a pre-programmed Excel document to enable profitability to be calculated on a model-level. (Gustafsson, 2014)

\[
TP - COGS \text{ per unit} = \text{Plant Gross Model Profit}
\]

4.4.3 PLM profitability process
A third profitability calculation process has been implemented at SDE with the aim to satisfy the management accounting need of detailed and financial performance data about specific rigs produced at SDE, with the whole value chain taken into account. (Kvist, 2014)
The PLM is today using QlikView to get access to compiled cost data from Movex. It gives a detailed overview over COGS associated to each rig number. Simultaneously, CNP is manually retrieved from MO and compiled into an Excel-file together with the data from QlikView, where it is matched to the rig number. From this, the product profitability for each rig number is calculated. Orders that have a corresponding CNP with a value that is assumed to be irrational are not included in the calculations. Occasionally, ad hoc methods are made manually to obtain the accurate CNP. (Kvist, 2014)

\[ \text{CNP}_{\text{MO}} - \text{COGS per unit} = \text{Gross Model Profit} \]

### 4.5 Strategic decision-making and product portfolio management

At Atlas Copco, the PLM is based at the product company and is responsible for the strategic decision-making and management regarding the product portfolio of their division. Product profitability is a key input for the PLM in strategic product management, and the fact that there does not exist any systematic process for tracking the profitability on a product level makes the PLM perceive the product decision-making process as a difficult task to perform. (Kvist, 2014)
Managing the product portfolio involves making strategic decisions regarding which products should exist in the portfolio. In this process the PLM must evaluate if existing products should be removed and if new products should be added. To decrease product complexity, the PLM strive to decrease the number of products and the number of options that can be added. This must of course be done under great consideration to not sacrifice customer needs and satisfaction. (Kvist, 2014)

To be able to handle the responsibilities in the role as PLM, it is important with solid information about each product’s performance on the different markets, and how it is changing. These changes are important to enable visibility of trends. Solid information that displays actual demand of the easiness to sell (i.e. if it needs extra sales actions to get it sold, or if extra options and service is added in the price) is important to acquire, so that the product competitiveness gets visible. Understanding of each product’s performance is acquired partly from knowledge about the complete deal that is delivered to the customer. Knowledge about the complete deal involves data about CNP, product model and additional options and service and all related costs. (Kvist, 2014)

The PLM claims that the fields in the MO system is not updated as they should be, that some orders totally lack data regarding CNP while some has data that the PLM interprets as irrational. The numbers may be so low that they are perceived by the PLM as not even being possible to represent a true CNP and sometimes the numbers are suspected being an average number or an expected sales price communicated in an early stage of the order process, and that most likely differs from the end CNP. The orders that, in the system, lack value of CNP or are associated with irrational values are removed from the calculations of product profitability. Still, it is suspected that values with risk of being incorrect are included in the calculations. This fact makes the PLM worry if his calculations make a solid and adequate basis in order to make good decisions. (Kvist, 2014)
“Without solid information about the product profitability there exists a risk of tricking ourselves” (Kvist, 2014). A concern is observed to exist among the managers at SDE, regarding the risk that if the plant and division shows positive numbers with good profitability, SDE believes that all the products are doing well, whilst this might be misleading. The portfolio might include some products that are unprofitable without SDE knowing about it, being held up by other very well performing products. (Kvist, 2014)

Another issue concerning the PLM is the ability to sort profitability calculations per segments as geographic markets or customer segments, which today is very limited due to the time-demanding process. It is, in QlikView, possible to sort the data retrieved from Movex in adequate manners, but all relevant data from MO must be extracted and sorted manually. (Kvist, 2014)

4.6 Tactical decision-making and operations management

At Atlas Copco, most of the tactical decisions and operations management related to specific products are made by PMs in consultation with the PLM who is responsible of, and provides information about, the measured values of each individual product’s performance. Each PM is assigned to be responsible for a few products, including ensuring the product performance and consequently the product profitability. This responsibility implies making needed actions of improvements to secure further prosperity. (Hjerpe, 2014)

Being responsible for the products’ profitability and performance implies logically ensuring high sales and streamlining the production, as well as making actions in line with these goals. It is in the PM’s desire to get feedback on made actions in regard of the impacts to enable evaluation of the decisions and to optimally continue the work of progress in the right direction. Continuous updates about sales levels, production costs and daily production issues are hence key factors in the work and highly desired by the PMs. (Santillán, 2014)
The PMs’ work involve visits at customers, customer companies and other production companies, during which they gather information about the market demands, issues regarding the products, and additional information, which is not revealed in the data that provided from the PM. The information that they gather from the customer visits is used to address issues and generate actions to solve them, as profitability and competitive ability increments through product modifications, production changes and changes in the sales processes. (Santillán, 2014)

The PMs are today missing continuous reports about sales and production cost on a product level to be able to identify individual product performance on specific markets, and they also show a desire and need of this type of data in a saved form that is not provided for them today (Hjerpe, 2014). The desired continuous information updates of products performance, and history data of this, come from the will of identifying to main issues; trends and emerging matters in the daily work. “You can't fix problems you don't know you have”. (Santillán, 2014)

The PMs stress the fact that single numbers and values don't reveal any information and are difficult for them to interpret, and they are concerned over the existing risk that problems may become invisible because they can't fix problems that they can’t see (Santillán, 2014). Provided information in form of single numbers and values implies a lot of extra work for the PMs to find the reasons behind these values in order to generate an understanding for needed improvement actions. A lot of information regarding specific production processes and production cost drivers, can be found in Movex, but it requires a high level of knowledge about the system and its codes to be able to interpret what has activated the production cost. (Gustafsson, 2014)

There is an obvious desire of tracking the production cost to make the factors that drive the costs visible, as changes in purchase price, changes in assembly
time and other factors affecting the total cost. In today’s process, the PMs can see a dangerous risk that monthly efforts can be useless. In a case where efforts have been made to lower the production cost, it must be visible and clear if the production cost suddenly are increasing so that actions can be made. Without historical values to compare to, the risk is very big that no one reacts on it when the costs are increasing again, and the efforts are useless. The PMs agree that they want the impact of their decisions to be visible so that they can evaluate the actions. “If we can’t see the results, we can’t evaluate the implemented actions and see what is working and what is not”. (Santillán, 2014)

Earlier this year a sales training program was executed at several customer centres to increase the salesmen’s knowledge about the division’s products to hopefully reach increased sales and profit, and to better ability to serve the customers’ needs as a result. The PMs express that they experience a problem to measure the impact of these types of actions when there does not exist any systematic process to track product profitability, and that it is hard to make tactical decisions without that kind of solid data. (Santillán, 2014)

The optimal goal would be to get correct and comprehensive information about each sold product to make accurate profitability analysis and also the optimal decisions in strategic and tactical management. The PMs agree that indications on actual numbers and facts would be satisfying information, as long as it is based on correct data. (Hjerpe, 2014)

4.7 Motivational aspects of performance management and feedback
Each PM is mainly responsible for their products and is thereof keen of knowing the individual product performance to be able to adapt work process and actions in order to create better conditions of their own and for their products. (Hjerpe, 2014) The interviewed and observed employees at SDE Örebro shows a great concern over the lack of systematic feedback on product profitability, but also show great internal drive and will to improve the business to overcome the
issues that they face. As a part of this, the PMs get feedback concerning sales and customer needs and requirements when they conduct visits at the customer companies, information that is not continuously communicated in any other ways. (Santillán, 2014)

Today, the PLM uses other ways to motivate the employees working with product related tasks, like encouragements and verbal credit. Despite this he is confident that a more systematic process for product profitability would be more concrete and give an even better motivational boost. He is aware of that clear quantitative goals to work against, together with continuous feedback of work performance in relation to the goals, probably would increase the high motivation of the employees even further. (Kvist, 2014)

"Of course the lack of more tangible feedback measurements could have an effect of the performance of the employees, but we do our best to complement this type of feedback with other types of credit and encouragements.” (Kvist, 2014)

4.8 Internal benchmarking: URE
Underground Rock Excavation (URE) is another of the five divisions in the business area Mining and Rock Excavation Technique. URE develops and manufactures worldwide tunnelling and mining equipment for various applications. URE, just like SDE, has a large product portfolio, consisting of several product types and variants of rigs, with high degree of customization. Since SDE and URE have similar business conditions, URE has been used in this study for internal benchmarking. (Edhammer, 2014)

The PLM at URE has a different process to calculate the product profitability than SDE. The process has earlier been similar to the PLM profitability process on SDE, but a new process has recently been implemented, now including a new way of using the BI system QlikView and a further focus on tracking product
performance and the ability to make assortments of the product profitability. (Edhammer, 2014)

In the existing process, QlikView is not only connected to Movex, from which cost data is imported, but also to the MO system that enables extracting of revenue data. By afterwards exporting the data from QlikView to a pre-programmed Excel document, the data can be sorted on geographical market, product segment, or other segments, and reports can be created based on various preferences. (Edhammer, 2014)

This work process enables URE to generate calculations of profitability on a product-level because each data value is associated to the product that it relates to. Also at URE they have the issue that some orders have data related to the CNP that is not believed to be the real value. (Edhammer, 2014)

**Tracking product profitability is important**

The information that is extracted is very valuable for the PLM in their strategic work and decision-making. The reports are saved to make it possible to track (and graph) the product profitability from year to year and from that identify specific products or market-segments that perform badly in order to make needed actions, and this has created an opportunity for the employees to see cause and effect of the work they do. (Edhammer, 2014)

**Monthly joint meetings**

To be able to explore all the possible value that the newly implemented BI-system at URE can have, URE have also adjusted their business processes related to the product performance management. A big part of this adjustment is monthly product-meetings with participants from the purchasing, production and market department. The reports including product profitability is naturally a fundamental input to these meetings and they also create a good cross-functional forum to discuss the effects of implemented actions and potential future actions related to the specific products and specific markets. These meetings create an opportunity to deal with identified issues related to the products. If, for example,
the production cost for a specific product has increased, the participants of the meeting can discuss potential causes and potential tactical actions that can be implemented to solve the issues. (Edhammer, 2014)

Product profitability is however not the only information required to make strategic decisions about the product portfolio. The PLM stresses that he perceives that it is important to consider additional factors, like customer satisfaction, and not only financial performance before removing a product from the portfolio. URE is particularly cautious about these types of decisions since the aim is to offer the customers an end-to-end-solution by providing a wide range of products to fulfil all the customers’ needs. Making decisions about removing a product requires the PLM to be aware of how much of the sales of one product depend on the sales of other products in the portfolio. (Edhammer, 2014)
5 Analysis

5.1 Profitability measurement processes
It is stated in the problem discussion that the PLM has insufficient business processes and routines, and is unable to access crucial data to perform comprehensive product management. The empirical data shows that three different business processes are performed in the organisation for calculating profitability. The next section will analyse these three business processes with the aim to understand what each process lacks in order to enable product profitability calculations that can act as sufficient support in the decision-making concerning the product portfolio.

5.1.1 Divisional profitability process
The aim with this business process is to provide the top management and external users with financial statements (e.g. profitability measures) related to individual units in SDE, and the total division, according to financial accounting principles. The recipients require perspicuous information about the financial statement to quickly and easily acquire understanding of the overall performance of the firm. To facilitate this, the information provided, and hence, the data used, is at a GAC-level.

The data is accessible in GPS, where it is frequently updated, and compiled every month into financial reports, making it a systematic process. Since the profitability calculations are based on financial accounting data, the data reflects the actual situation and is assessed as accurate and reliable.

In summary, this business process is designed in a manner that its purpose is achieved. However, it is not a sufficient process in the perspective of the PLM due to its unsatisfactory level of detail in the data. Data on GAC-level does not provide the necessary information that is needed to support strategic decision-
making regarding the product portfolio. Apart from this, the process is systematic and provides reliable data, which is highly desired.

5.1.2 PC profitability process
This process generates profitability measures from a plant perspective, with the purpose to support the PCC with financial statements. The cost and revenue data that is used in this process is accessible in a manageable form in QlikView, retrieved directly from Movex in which all business transactions performed at the plant is recorded. This gives reliability to the data that is provided related to each rig number. The data is easily accessible for everyone at the factory, and the information is frequently updated, facilitating the compilation of plant performance data in a systematic manner. Due to the fact that only data related to the plant is used (i.e. revenue data is represented of the TP), the measures only consider one part of the total profitability that each product provides to the firm.

The purpose of this process is, like the previous, achieving its purpose. The main issue with this profitability measure, from a product management perspective with the total product profitability in interest, is the limitation of the data. It does not take the entire value chain, and thus not the total profitability of the product into account, making the measures only internal and not truthful enough to serve as a base for strategic and tactical product decisions of the PLM and PMs.

5.1.3 PLM profitability process
The data that supports the calculations in this process is taken from several IT systems. Revenue data is collected manually from the MO system, in which revenue data to some orders or products is lacking or assessed as not reliable. When this data is eliminated from the calculations of product profitability, the result risks to become biased and hence likewise not reliable. The ad hoc data collection is a good complement to enhance the reliability in the measures, but it is time demanding and quickly becomes out-dated. The cost data, on the other hand, is well compiled and accessible in QlikView, containing reliable and rig
specific data from Movex. Systematic collection of reliable and rig specific revenue data is the main issue that is lacking in this existing process.

5.1.4 Issues in the profitability measurement processes
In summary, none of the business processes for tracking profitability that SDE have implemented today is on its own optimal to satisfy the needs of strategic and tactical product management, and does not satisfy the expressed needs that the PLM and PMs have. The divisional profitability process lacks level of detail since it does not calculate profitability for specific rigs. The PC profitability process does not take the entire value chain into account and does not calculate the total product profitability for the company, but only for the plant. The PLM process is not systematic and relies on data with questionable quality and correctness. A further issue that concerns all three processes is that the information that they provide is not systematically spread out in the rest of the organisation.

5.2 Profitability
The analysis of today’s business processes for profitability measurement identified three problem areas that are lacking in the aim of satisfying the information need to support strategic product management. These problem areas are required in a process that is desired of the PLM, and are:

• sufficiently detailed data related to each specific product,
• product data that takes the whole value chain into account, and
• systematic compilation of data with high reliability.

In the following analysis model, it is desired to acquire an understand of why these problem areas arise, and therefore these three problem areas are matched against four areas from the theoretical framework in the aim to find the answer to research question 2 of this thesis; why is tracking product profitability difficult?
5.2.1 Sufficiently detailed data related to each specific product

**Complex business context**
High technology and customised product offering imply the fact that one order or rig is very rarely similar to another. This brings many dimensions to take into account when assessing the product profitability, referring to the amount of details related to rig structure and order content. If knowledge about all details and information is desired in profitability calculations, it creates a large amount of data that is difficult to transfer and to coordinate. If systematisation in handling the data also is desired, it arises a need to consolidate the data to be able to manage it, which is done by simplifying the data transfer process. In that type of process, a trade-off between the level of details and the degree of systematisation often occurs.

Also a complex organisational structure makes tracking of product profitability with a high level of detail more complicated. The theory states that the top management finds the organisation more difficult to control as it gets more complex. This trade-off between detail level and systematisation also arises in large and complex organisations with several units that have to share information.
Financial and management accounting
The theory expresses the difference of financial and management accounting and makes it clear that it is of highest importance to recognize the difference between the two because they aim towards different purposes, and are two processes that have differences between each other. The processes observed at the case-company confirm this fact.

From the theory study, it becomes clear that there is a significant difference between the financial accounting data and the data from management accounting and that it is used to distinct purposes. Due to the fact that the data generated from financial accounting is used to perform fast calculations of the overall profitability of a firm, it is desired to be in a form that facilitates this with high reliability. The data used in the existing business process to perform these calculations satisfies these requirements through providing accessible data in a consolidated form over products, companies and divisions. However, the detailed information related to specific products disappears, which inhibits the possibility to use the financial accounting data in product management.

This confirms the theory that implies that financial and managerial accounting require two different processes to handle them. The data retrieved from financial accounting is not satisfying the need of product management. The existing process that uses consolidated data is satisfying and sufficient to fulfil its own need, but is a factor that inhibits the possibility to access more detailed data about specific products that is needed in strategic product management. SDE lacks sufficient processes to enable management accounting to contribute as desired with information to support product management.

IT and Business Intelligence
The theory says that gross profit is one of the most important factors in assessing the product profitability, which is generated from subtracting the cost of the goods sold from the customer net price. According to the theory, the ERP systems are the foundation for collecting revenue and cost data, which is also corresponding to the findings in this case study. Without enough details in the
collected data in the ERP systems at the product companies and customer companies, it is impossible to reach a satisfactory level of detail in the profitability measures. The level of details of the profitability measure given from the made profitability calculations is dependent on the sophistication level of the IT system and BI system that provides the data that is used. If the ERP systems only track the data on a GAC-level, profitability for specific products will not be able to calculate.

The sophistication level of the ERP systems is obviously an obstacle that can hamper tracking of product profitability difficult. The BI maturity matrix shows that high technological maturity is necessary to achieve high maturity of the entire BI system. Since the detailed data is collected in the ERP systems, but later transferred into the BI system for performance measurement, both the ERP system and BI system must have a high degree of sophistication, technical maturity and detailed level of the data to enable satisfactory detailed level on the calculated product profitability. Not having such IT systems can be an obstacle for tracking of product profitability.

ERP transformation projects are expensive and time demanding. Making changes in the IT system to better align with the business process needs is therefore something that companies want to avoid. Being stuck with IT solutions that is not an optimal fit for the tracking of product profitability makes this process more difficult.

**Information-sharing between responsibility centres**

In the theory, it is stated that employees working at cost centres tend to focus on cost reduction, while employees working at profit centres tend to focus on increasing sales. Due to a different focus, they might lack understanding of the importance of information-sharing.

Measuring product profitability with a high degree of detail demands detailed raw data about both costs and revenues linked to specific products. The empirics
of this study show that this detailed data exists within the organisation today and that it thereby is possible to collect and use, but the detailed revenue data is compiled in a consolidated form to SDE that makes the data useless in a product management view. The issue is that the desired detailed revenue data is located at the profit centres, and SDE does not have access to it. Information sharing is hence a key factor to enable the access to the detailed revenue data.

This can result in a lack of understanding for the importance of information sharing and makes it more complicated to collect necessary data. Without incentives and understanding for sharing enough details about the product performance, tracking of product profitability becomes more difficult.

5.2.2 Product data that takes the whole value chain into account

*Complex business context*
An offer of customised products increases the number of order changes made during the product’s value chain at SDE. Options are added or removed during the production and also later on when the rig has arrived to the customer company, meaning that the different units has access to different information. The fact that the product profitability is calculated in one of these units (i.e. the product company) that does not have the total information about the product’s value chain complicates the tracking process of product profitability.

The complex organisation also contributes to the obstructed managing of data through the whole value chain. Since the customer companies manage and sell product from multiple product companies, the product data related to SDE must be extracted from each unit, and later at SDE must all data from the different units be compiled.

*Financial and management accounting*
To be able to calculate product profitability in a way that takes the entire story of the products into account, information must be tracked during the entire value chain from production to sold product. A large amount of products and values to
be recorded generates a lot of data to be stored and implies a complicated data handling.

Financial accounting methods avoid this complication through consolidation of the data to achieve information in a more easily manageable form. On the other hand, management accounting may have the unconsolidated data in interest, as it is at the case company, and must handle the excessive amount of data that emerges.

The empirical data confirms the theory that states that it may be difficult to collect data from the entire value chain when the processes of management accounting differs between the different divisions and business units. One issue is the higher degree of detail that management accounting needs to collect from all the steps in the value chain. Another issue is the fact that there are less rules and guidelines for how the data should be collected and applied, and therefore the processes differs from each other. When the data is desired to be acquired and stored, there must also exist common rules and guidelines so that the data collection is well performed. Rules and guidelines (e.g. noting a change in an order in MO) are observably implemented and work well at SDE, but seem to lack at the customer companies, since CNP and changes in the order are not routinely noted. The lack of guidelines and control regarding management accounting at the customer companies makes it more difficult for SDE to systematically track the correct values of their products’ profitability.

**IT and Business Intelligence**

To be able to calculate product profitability, information about all costs and revenues linked to the product is needed. From an IT system perspective, this means collecting information from the ERP systems at both cost and profit centres because they contain different data.

As mentioned in the theoretical framework, collecting information from a high amount of systems can be difficult and the collected empirics confirm that this is
the case also at SDE. It is possible to access the information from SDE with a sufficient level of detail through use of QlikView that retrieves data from Movex and MO, but it is more difficult to access the information from the customer companies in a desired form. In fact, it is not difficult to collect the data from all customer companies, but to collect it in the right form with enough detailed level is what is making the problem exist. The only accessible data originated form the customer companies exists in GPS, in which it is presented in a consolidated form that does not satisfy the needs.

**Information-sharing between responsibility centres**
Cost centres and profit centres have different focus and, because of this, might lack an understanding for the company as a whole. The theory states that it is important for a firm in a whole, to reach the joint decision to put the company goals before goals that single units have. If this is not happening, sub-optimisation may occur and differences in goals may affect some units negatively.

The theory states that in an organisation with responsibility centres, the responsibility for generating sales and revenues are separated from the responsibility for keeping down the costs. The empirics confirm that this separation of responsibility also results in a separation of focus. The PCC at SDE Örebro, focus on the costs of the product, while the controllers of the customer companies focus on the sales and the performance of their unit alone. The result of this is that no controller focuses on the entire product value chain and no one can provide the PMs with information about the product performance that take the whole story from production to sales into account.

**5.2.3 Systematic compilation of data with high reliability**

**Complex business context**
The empirics show that SDE has complex products with many options and dimensions as e.g. warranty or other added service. Because of this, it is difficult to determine the cost and revenue data that is directly linked to the products because it depends on a lot of factors related to the total order. If the cost and
revenue data is not clearly linked to the products, the results of the calculations that are based on this data can’t be assessed as reliable.

A complex business context is clearly a threat for the data quality when tracking product profitability. The more complex product, the more information is needed to keep track of and to share, and the higher becomes the risk of the data not being reliable. This can also be applied on a complex organisational structure that involves many people in different geographical places, which also is a factor that increases the amount of data.

**Financial and management accounting**
Financial accounting processes have a high degree of reliability by nature, if they are performed correctly, since they are regulated by law. Management accounting processes on the other hand do not have the same regulations, and often lack clear guidelines, and could therefore face issues with data quality and reliability. The empirics from SDE confirm this statement because the management accounting processes bring problems as low data quality, which mainly depends on bad routines of updating the MO system when the order content or CNP is changed.

**IT and Business Intelligence**
One of the key take-aways from the theory study related to IT and BI is the importance of simplicity in the system to guarantee a high degree of usage and reliable data quality. When systems and business processes are complicated, they tend not to be used. The value of BI is greatest when most high technological maturity and high utilisation rate is achieved, putting a company in the “high maturity” quadrant in the BI maturity matrix. For a high utilisation rate to be achieved, using the system must be easy.

From the empirical data, it becomes apparent that SDE uses data from several IT/BI systems and compiles it to generate the product profitability measures. The data is compiled manually and there does not exist a full IT support system that facilitates compilation of relevant data. The manual handling of the data
makes the reliability of the compiled data to be questionable due to the human factor. The manual handling of compiling the data also penalizes the systematics of the process. Having a complicated process, where many different systems need to be accessed also makes the system more complicated and hard to use, lowering the utilisation rate.

A simplicity in the process of handling the data, meaning only having a few systems in use and replacing the manual handling with an IT or BI system would increase the reliability and systematics in the business process. It would also increase the utilisation rate, making the BI system at SDE more mature.

**Information-sharing between responsibility centres**

Due to the lack of reliability in the revenue data in MO, SDE struggles with acquiring high quality of the generated profitability measures that they provide. This is observably a result that arises from insufficient discipline in the customer companies’ process of reporting correct and/or updated CNP into the MO-database. When the employees at the customer company focus only on sales and on the performance of their own unit, they might not understand why it is important for them to share correct revenue data with the product company. This stresses the importance of understanding the whole picture, meaning focus on achieving the firm goals, but also shows the importance of knowledge about the firm goals in the different organisation units. When an understanding about the whole picture is formed, then routines and processes must be put in place to ensure that the information is transferred as desired.

**5.3 Potential risks of not tracking product profitability**

The theory clearly states that knowledge about product profitability is necessary information for managers to have to be able to make good strategic business decisions related to the products and the product portfolio. That arises questions about how strategic and tactical product management may be affected if total insight in product profitability does not exist. The following analysis compares the theory with the empirics with an approach shown in the model below, and
analyses the findings to reveal the answer to research question 3 of this study; *what are the risks of not tracking product profitability?*

*Figure 17. Analysis model to research question 3.*

### 5.3.1 Strategic decision-making and product portfolio management

The PLM expresses product profitability to be a key input of interest that enables him to perform his job duties in the best possible way since it is a measure of the products' performance. The fact that SDE do not have a well-implemented business process or system for tracking product profitability in a systematic manner was early found in this study, as well as the fact that it affects the strategic performance management at SDE today because of the lack of decision support it implies.

SDE has a very complex product portfolio with many different products and many different product options, and they strive to decrease this complexity by decreasing the number of products and the number of options without sacrificing customer needs and satisfaction. The theory brings up Pareto analysis as a useful tool for getting a better understanding of which products are contributing to overall profitability and which products that don't and can therefore act as a support in the decisions regarding eliminations of products or options. Incorrect profitability measures risk the assessment of the Pareto
analysis to be invalid and increase the risk of wrong conclusions. Decisions succeeding from these conclusions might imply that a product is removed from the portfolio in the belief that it does not contribute to the profitability when it in the reality actually does.

The theory also brings up the BCG matrix as a useful tool in product portfolio management. Without tracking the performance of specific products systematically and hence acquiring understanding of the value context, and neither being able to sort the profitability data on different geographical markets, the managers cannot use this strategic decision-tool in an appropriate manner. If they are not able to analyse their portfolio by means of the BCG matrix, there is no way for them to get a strategic overview of which products in the portfolio that might serve as cash cows etc. The empirics confirm these statements with a manager expressing concerns of fooling themselves when they believe that a product is performing very well, but the risk exist that the reality might be something else. Products with low growth and low profitability can hide behind very profitable products when the profitability is only calculated for the entire portfolio and not for specific products explicitly.

From the ability to see trends in the performance of each product, it brings the possibility of identifying what role each product has in the BCG-matrix since the visibility of the trends makes it possible to determine the rate of the market growth and market share. Without the trend recognition, there is a risk of not being able to identify which roles that the products will have in the future or even in the near future. For example, if a manager can identify a product to have low market share but high market growth, he is able to identify possible potential that it may have and to prioritize the product instead of divesting. Without the knowledge about the market share and market growth, but into a context that enables the manager to compare the product with other products and to identify trends, there is a risk that the manager divests this hidden future
star from the portfolio. That type of action could result in attenuated overall product profitability that was not needed.

Another issue with not tracking product profitability systematically and further on not being able to identify trends is that the managers cannot determine the positions of the products in their product life cycle. Being able to identify the position in the product life cycle enables the manager to analyse the situation regarding product competitiveness, and make decisions accordingly. When a product’s competitiveness is decreasing, the sales companies may be forced to add extra options to the order or offer unfavourable service-deals just to get the specific product sold. Due to the fact that the managers at SDE don’t have full insight in the product value chain today, they are unable to identify these situations and the PLM might still believe that the product is performing well and neglect necessary adjustments.

Establishing correct values of the measures is a fundamental factor in order to make correct decisions. Due to this, it is alarming that the PLM assesses the numbers that should represent the CNP as irrational. PLM eliminates the products with related irrational CNP-values from the calculations with the aim to achieve a more reliable result. However, not being able to use all elements in the calculations increases the risk of getting distorted results.

Today, the PLM cannot sort and filter the product performance data based on geographical market. This is a problem, since the markets SDE operates on are very different. For example, a product that has low profitability at the US market might be very successful in Brazil. Not being able to filter the data on geographical markets implies a risk of removing products from the portfolio entirely, when the optimal action would be to only remove the product from the offering to a specific market.
It is clear from both theory and empirics that without a systematic process for tracking product profitability there is a huge risk that PLMs makes the wrong decisions. A product might be removed from the portfolio too early or too late and the managers become very limited in their work of optimising the portfolio performance. This could bring very bad consequences for the overall profitability in the long run and be harmful for the company's success.

5.3.2 Tactical decision-making and operations management
When it comes to business decisions on a more tactical level, the lack of systematic process for tracking product profitability also has huge effects. The empirical data establishes the fact that the PMs do not have a systematic process for obtaining information about the product performance and an expressed need for more information regarding the products. The theory mentions tracking of trends as a fundamental process for making good tactical business decisions and to make sure that the PMs have the information needed to control the daily operations management. The empirical data shows that the managers' capabilities of managing the tactical and operational issues are affected today due to lack of trend tracking, which below will be analysed further.

The empirical data shows that the absence of systematic process for measuring product profitability and storing the historical data impacts the business on a tactical level in two major ways. First of all, lack of historical data disables the managers to see trends in the product performance and makes it harder to interpret individual values of the product profitability measures. Without any historical data, the managers cannot assess the metrics against other values and hence, not determine whether the performance is good or bad. This takes away the ability to make alarming efforts if a specific product suddenly starts performing badly. Secondly, the PMs cannot see or measure the impact of implemented actions that aim to improve product profitability, and therefore these actions cannot be evaluated. This is very alarming because evaluation of made actions is a vital element in any job responsibility in order to improve future decisions regarding what actions to make.
The PMs are today required to put in a lot of extra efforts to acquire the needed understanding of the profitability measures that the PLM provides them with. That would be unnecessary if the single values systematically were put into a context that facilitated trend identifications and comparisons to other values. The effort need would decrease also if the system in use would be easier to manage and interpret.

5.3.3 Motivational aspects of performance management and feedback

It is conducted from the theory that clear objectives and feedback on performance is fundamental to shape a motivating working culture with incentives for continuous improvement. Quantitative feedback like product profitability is a direct input of feedback to PMs that relates to the impacts of made actions in the previous time period, and is also an assessment of how successful the PMs’ decisions have been.

An absence of quantitative feedback in form of systematic tracking of product profitability would, based on the theory, affects the motivation of the employees in a negative way. Yet, observations made at SDE Örebro shows the opposite, and it cannot be stated that the absence of quantitative performance feedback automatically would result in unmotivated employees. Despite the fact that SDE do not have an implemented process for direct feedback in the form of quantitative product profitability, the employees seems very motivated and have incentives to keep improving their work.

The reason for the motivation and drive at SDE might be the implemented efforts to make up for the absence of quantitative performance feedback with an increased amount of qualitative performance feedback from the managers to the employees. By using encouragements and other motivational boosters, the managers seem to create incitements for continuous improvements even without the motivational aspect of being able to see the results in the product profitability.
Despite the fact that the employees of SDE appear to be motivated today, there still exists a risk that the absence of quantitative feedback might affect the employees’ motivation in a negative way in the future. Moreover, it is possible that the motivation would be higher if the qualitative encouragements and feedback was complemented with direct and tangible feedback, as the visibility of product profitability trends.
6. Conclusions

From the analysis made in the previous chapter, following conclusions have been made and are summarized below. These conclusions answer research question 2, 3 and 4 of this study.

6.1 Why is tracking product profitability difficult?

This study has identified five key reasons to why tracking product profitability is difficult.

- Complex product offering creates big data.
- Complex organisational structure complicates information sharing.
- Management accounting lacks guidelines and support.
- Individual business units tend to focus on self-interested goals rather than on company goals.
- Implemented IT-systems are not aligned with business needs.

**Complex product offering creates big data**

When a company offers high-technology products with a high degree of customization, tracking of product profitability becomes more difficult. Higher complexity of the products brings larger the amount of product-related cost and revenue data. Keeping track of many details is difficult, and to enable systematic and efficient product profitability calculations, it is therefore often needed to make simplifications of and defining of standard-products. There will always be a trade-off between having a systematic process and keeping track of all the detail levels in the product performance data.

**Complex organisational structure complicates information sharing**

Another reason that makes it difficult to track product profitability is complex organisational structures that hinder diffusion of information. Big, global companies have units located all over the world, which all interact with each other. The production and customer units are selling and buying products from each other during different stages of the product value chain, creating a very complex product flow. Cost and revenues related to the products occur during
different stages of the value chain and thereby occur at different company units all over the world. Coordination of collecting product performance data from all these units is a complicated task and a contributing factor to why tracking of product profitability is difficult. It puts high demands on IT systems that have to coordinate all information in a way that provides the data receiver with sufficiently sophisticated information details.

Management accounting lacks guidelines and support
Financial accounting is regulated by law and is therefore a prioritized activity at all companies. There exist many supporting guidelines and best practices about execution of financial accounting, in contrast to management accounting that is an internal activity not regulated by law. However, management accounting is not less important than financial accounting to reach firm success. This study clearly concludes that profitability measurements differ depending on the purposes, referring to financial accounting purposes and management accounting purposes. It is also shown that firms need to have implemented processes to conduct measurement calculations that achieve both purposes. These processes must be organized differently because they have different requirements. While consolidated profit is satisfactory for financial accounting purposes, management accounting requires profit calculations for specific products separately.

Determined guidelines and implemented routines in management accounting are important factors to facilitate calculations of product profitability. It creates the possibility for management and other employees to understand the need for separate data collection and profitability calculations in management accounting purposes.

Individual business units tend to focus on self-interested goals rather than on company goals
The product performance data is in possession of different responsibility units in a company, both product companies and customer companies, in which the employees have different backgrounds and responsibilities. The employees of a
customer company often have a sales background and since they only are held responsible for the revenue side of the equation, they tend to focus primarily on sales. The employees of a production company likewise focus primarily on production and costs. This natural difference in responsibility and focus of the different responsibility centres contributes to difficulties in information sharing between the units, and hence makes the process of tracking of product profitability hard to realize.

If the employees focus only on their own responsibilities and not on the company's overall goals and profitability, they might lack understanding of the importance of sharing accurate information across units. It creates a risk that inaccurate data is transferred, and affects the reliability of the product profitability measures.

**Implemented IT-systems are not aligned with business needs**

Tracking of product profitability is a complex business process that is dependent on support from IT-systems for collecting, storing and sharing product performance data. Large companies with many different units often have many different implemented IT-systems with complex linkages. Already implemented IT-systems do however not always support tracking of product profitability because they are not optimally designed so that they align with the business needs.

Making changes in IT-systems is very expensive, and IT transformation projects are very time demanding. This fact makes it very difficult for firms to improve the impact that IT systems have in order to track product profitability.

**6.2 What are the risks of not tracking product profitability?**

This study identified areas within strategic decision-making, tactical decision-making, and aspects within feedback and motivation, that can be affected if firms do not track product profitability. The summary below describes in what way these areas can be affected.
**Product portfolio optimization is not possible without profitability measures**

If a company do not track the profitability of its products, strategic decisions are made without a solid information base. This is a serious threat to the quality of the decisions. Not knowing which products that contributes to the profitability of the portfolio and which product that do not, implies a huge risk of removing wrong products or keep on venturing products that have already lost their competitiveness. Without knowledge about the product profitability, the product portfolio performance cannot be optimized.

Another effect is that PMs cannot use helpful strategic management tools like Pareto analysis, the BCG matrix or product life cycle analysis. In the long run, not being able to optimize the performance of the product portfolio could have a severe negative impact on the overall company profitability.

**The quality of tactical and operational management decreases without signs of trends**

Without following the trend in product profitability, PMs cannot evaluate whether a product's performance is good or bad. This takes away the opportunity to make alarming efforts if a specific product suddenly starts performing badly. Furthermore, PMs cannot see or measure the impact of implemented actions (e.g. sales efforts or cost reduction programs) that aim to improve product profitability, and therefore these actions cannot be evaluated.

**Not tracking product profitability can effect motivation negatively**

Feedback on performance is a quantitative feedback element that is fundamental to shape a motivating working culture with incentives for continuous improvement. Quantitative feedback can be complemented with extensive use of qualitative feedback like encouragements, but it is not sure that is can act as a substitute. It is hence possible that the employees’ motivation would be higher with qualitative encouragements and feedback, simultaneously complemented with direct and tangible feedback, as the visibility of product profitability trends.
6.3 How can the business process for tracking product profitability at the case company be improved?

Research question 4 of this study concerns improving the performance management at SDE today by finding a better solution for tracking product profitability. With the conclusions made from previous questions in this study as a foundation, some best practises for tracking of product profitability have been conducted. The final recommendations to the case-company are based on these best practises and on the analysis of the business processes for product profitability measurement at SDE today.

6.3.1. Best practice when tracking product profitability

It does not exist a single business process or system for tracking product profitability that is optimal for all companies. Despite this fact, this study identifies several factors that are fundamental for a profitability tracking process to work adequately.

The following factors together form the best practice for the process of tracking product profitability. The business process and the system used for tracking product profitability at a company should be:

- systematic and efficient,
- providing information with an adequate level of detail,
- including the entire value-chain,
- easy-to-use, and
- reliable.

With a business process and system being systematic process means a step-by-step procedure, and a high frequency in collecting the data and making calculations. Efficient is referring to the process to have a high ratio of input to output and that the data collected is done in the easiest way possible.

The system for tracking product profitability must satisfy the information needed from all working roles that have responsibilities connected to the
products. Some working roles, like divisional accountants, might be satisfied with a low level of detail, where only the consolidated profit is measured. Other working roles might need a more sophisticated level of detail and profitability measures related to specific products. The system for tracking product profitability must have an adequate level of detail to satisfy the business needs of everyone in the organisation.

It is important that the measures include the entire value chain in order to provide data that can be used as a base for making good business decisions. This implicates that the calculations include all revenues and costs connected to the specific product during the entire cycle from production to final sale. The product profitability measure must tell the whole story, and not only the product performance during parts of this cycle (e.g. in the production stage).

The sophistication and technical maturity of a profitability tracking system is irrelevant if the system is not used in the business. To get a high utilization rate, it has been shown that the system must be easy-to-use and that all employees involved in this business process have knowledge and implemented routines for how to use it, and how to exploit the benefits of the system.

Finally, the best practice deals with the reliability of the system and the data quality. The product profitability is a key input to both strategic and tactical decision-making related to the products. It is therefore of greatest importance for the managers to be able to rely on the data.

6.3.2 Recommendations
Based on the analysis of the current business processes at SDE, and the identified best practises for tracking of product profitability, the following recommendations are made. Notice that the recommendations are not ranked in any particular order. They are all equally significant, but the possibility to adapt these recommendations at the case company should be evaluated out of available resources in means of time and budget.
1. **Keep up the work with reducing product complexity**

By reducing the number of different rig models in the product portfolio and decreasing the number of options offered to every model, tracking of product profitability will get easier. Product complexity is one of the key factors identified as a complicating obstacle for tracking product profitability systematically, with high level of detail and with high accuracy. By decreasing the amount of detailed data to keep track on, the possibility to actually keep track of these details increases.

2. **Create a new BI-solution with corresponding business process**

The recommended BI-solution is based on QlikView. By connecting QlikView with the MO-database, revenue data can be extracted in a systematic and efficient way. Since QlikView is already connected to Movex, this new BI solution makes it possible to collect both cost and revenue data in one place without ad hoc and by-hand solutions.

The MO-database includes CNP from deals made by all customer companies, which makes the new solution including the entire value chain since product data from the production to product sold is compiled. The level of detailed data in Movex and MO is high and information of specific rigs can be extracted. QlikView is a valuable tool since it is very easy to use and can provide reports with visual graphs.

This new solution is inspired by the product profitability system used at URE, the division that this study used for internal benchmarking. Just like at URE, this new solution will facilitate provisioning of profitability reports segmented on different geographical markets that will support business decisions. It is also a suggestion that SDE imitates URE and implements monthly joint meetings to spread the information within the organisation, in a way that production, procurement, marketing and R&D can discuss the
new profitability reports. With all the data extracted by QlikView, SDE can implement a new business process for tracking product profitability that is systematic, efficient, detailed, easy to use, and that includes the entire value chain.

![Diagram of data flow](image)

*Figure 18. Recommended product profitability process.*

3. **Implement a new work role as “Product Controller”**

One of the key issues identified at SDE today is the lack of financial controlling function with both width and depth in the perspective. The Divisional Controller is responsible for the financial performance of the entire division and has a wide perspective that takes the entire value chain into account, but lacks depth and detail level in their financial reports. The PCC, on the other hand, produces financial reports with high level of detail and depth but lacks width since only transactions at the plant is included. To solve this problem, the recommendation is to implement a new controlling position, focusing on the products. The Product Controller should be responsible for the new business process for tracking of product profitability based on QlikView.

By doing so, SDE will get systematic reports of the financial performance of its products. These reports can be spread out through the organisation and
serve as a base for strategic and tactical decisions. The reports will have both width and depth since they include the whole story and transactions from all units, but also details about specific products and not just consolidated product groups. This will improve the quality of strategic and tactical decision-making made by PLMs and PMs. It could also have potential positive effects on the motivation of the employees, and create incentives for continuous improvements in revenue increase and cost reduction.

The new Product Controller is recommended to be located at the production company, and to interact a lot with the different customer companies that sell the products. From this, the Product Controller can be a great support to the PLM and PMs, and be supported with input from the Divisional Controller that is placed at the production company.

An implementation of a new job position will of course result in additional costs, but it is a small price to pay compared to the benefits that it will provide.

4. **Improve communication between responsibility centres**

Today, SDE has a problem with the fact that the customer companies sometimes not register the correct CNP in the MO-database. To ensure the data quality in the MO-database, and that the reported CNP is the final CNP, SDE must improve communication between their product companies and customer companies. To do, SDE must create an understanding of the importance of sharing information across units to decrease the risk of sub-optimization. All employees must be aware of the Atlas Copco’s corporate goals and have an understanding for the business as a whole.

Transparency and communication about the importance of the data quality in MO are key factors to build understanding of the corporate goals. Another important action is to ensure existence of the right incentives. If these
actions are well implemented, the revenue data in the MO-database will be more reliable. This is of highest importance since the new suggested business process for tracking product profitability collects the revenue data from MO.

If the data quality in MO is high, SDE will have a system for tracking product profitability that is systematic, efficient, inclusive, reliable, easy-to-use and that have an adequate level of detail. This is in line with the best practices for tracking of product profitability. Therefore, it will limit the risk of making bad strategic and tactical decisions and ensure motivated employees.
7 Further Research

This study is a master thesis with a limited time frame. This results in many topics and perspectives becoming out of scope, even though they are of greatest interest. These topics are worth mentioning as opportunities for further research within academic studies or by stakeholders in the industry.

Firstly, this study is executed as a case study on one company only. Similar studies on a greater number of case companies are of course very desired and needed to be able to make more general conclusions and proofs. We suggest that initial studies should be performed at companies similar to Atlas Copco, to see if the same patterns can be established there. If these studies are successful, we suggest an expanded approach with studies on companies from different industries acting in different contexts.

Secondly, it would be interesting to see further studies on the motivational impact on performance management and feedback. This topic gets limited attention in this thesis but has a great potential of creating value to both academics and industries. More extensive studies on this area are therefore suggested.

Finally, this thesis does not look into business processes for forecasting and how access to forecasting information affect business decisions and company performance. Further research within this area would be a good complement to the research performed in this thesis and would be very valuable for other companies and from an academic perspective.
8 References

8.1 Literature


8.2 Articles


8.3 Websites


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8.4 Interviews


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