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Sales Analysis Tool for Schiedel Savuhormistot

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Bachelor's Thesis
Degree Programme in
International Business
2019

Haaga-Helia
University of Applied Sciences

Abstract

25 May 2019

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Degree programme
International Business

Report/thesis title
Sales Analysis Tool for Schiedel Savuhormistot

Number of pages and appendix pages
48 + 5

The purpose of this thesis is to provide a sales analysis tool for a commissioning company, Schiedel Savuhormistot Oy. The company is a part of Schiedel group, Europe's leading chimney manufacturer and supplier, known for its high-quality steel and ceramic chimneys.

The outcome of this thesis is a business intelligence solution for the commissioning company which will facilitate analysis and decision making by providing dynamic Excel tool tables and charts from sales data. The solution is built with MS Excel, SAP Business Warehouse and Visual Basic code that automates data retrieval. The tool is built for the management, sales personnel, and finance personnel of the commissioning company, and with slight modifications, it can also be used by other group subsidiaries. The tool helps the sales department staff with their daily sales activities, as it provides them with sales analysis on several different levels, as well as makes suggestions on which customers need attention. On the other hand, the tool will provide the management, and Controller automated charts and an analysis dashboard to facilitate monthly reporting to the mother entities. The tool is made so that users who are not proficient in Excel can also easily find the information they need. The basis of the tool is a previously created sales report made by the author.

The thesis involves desktop research on financial and managerial accounting, as well as business intelligence. The improvement suggestions from the company were collected through qualitative methods and personal experience: Key users of the sales report were interviewed to find out what they needed from the tool, and, as the author is a user of the current tool as well as the resulting tool, some of the improvements were provided by her.

The resulting tool is much faster and simples than its predecessor, and it can be used in various ways. It supports the users' needs and only contains specific charts and tables, which the users have requested.

After project implementation, the outcome was evaluated and suggestions for future development were provided. Overall the tool was found well implemented and easy to use, and it has met all requirements set to it at the beginning of the project.

Keywords
Sales analysis, Revenue, Business Intelligence, BI, Report, Analytic Tool, Managerial Accounting, Excel, Pivot, Dashboard, VBA

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1 Introduction

In this chapter, the reader is first introduced to the case company and the background of this project: what the tool is about, who it is for, and why it is important to the company. The next thing in this chapter is introducing the project itself: the project objective, phases, and scope. The strengths and weaknesses of the project are also analyzed, and key concepts are defined.

1.1 Introduction to case company and project background

Schiedel Savuhormistot Oy, the case company, is a daughter company to Schiedel, Europe's leading Chimney manufacturer. The headquarters is located in Nußbach, Austria, and it has production facilities in 18 European countries. In 2016, Schiedel had approximately 1400 employees, and the group's revenue was 176 million euros. Schiedel is part of Standard Industries, a USA based corporation, which specializes in roofing solutions. (Schiedel 2018.)

The company sells its products (ceramic and steel chimneys) to several types of customers, such as hardware stores, stove shops, and stove installers. These three main types of customers offer very different possibilities and challenges for the business. The company has an office in Espoo and production facilities in Turenki.

The goal of this thesis project is to revise and improve a sales analysis tool has previously made for Schiedel Savuhormistot by the author. The tool is critical for proficient business planning, as it helps management, financial department, and sales department analyze sales from various viewpoints. It improves the company's ability to evaluate the current situation and possible business tactics in a more agile manner. For example, it tells if a certain customer has decreased their purchases, which in turn should prompt the responsible sales manager to find out why and act accordingly. It also helps with planning campaigns, and with analyzing the current product mix for the whole company, a particular area, or a single customer.

The prototype or alpha version has these dimensions: time (three past years, on yearly and monthly level), single customers, business lines, and products. The prototype is partly in English, partly in Finnish, because the data is in English, and the users are Finnish. In addition, the products are grouped as they are used by the group, but this does not serve the local users, as a different way of grouping is used in Schiedel Finland.

The Managing Director's wish is for the translations and groupings to be fixed, and there are several ways the tool can be developed further. One useful aspect is a possibility to analyze the customers on different levels. With the prototype, only single customers could be analyzed, but the commissioning party wishes to add customer groups and sub-groups to the analysis. Another valuable information is the contribution margin or gross profit. A contribution analysis is required for the group reporting on a monthly basis and having a faster way to conduct this analysis saves hours of work each month.

1.2 Project objective and scope

The goal of this thesis is to build an improved version of a sales analysis tool made previously for the case company Schiedel Savuhormistot Oy, thus improving the resources for business analytics and managerial decisions. The project is carried out with the following project tasks:

PT 1. Writing a theoretical framework

- Setting up RefWorks
- Reading and writing about:
    - Strategic and operational management accounting
    - Sales and pricing strategy where applicable

PT 2. Defining the project outcome with the prospective users

- Finding out what information do the users want and need
- Getting feedback on the usability
- Using findings from the theoretical framework for further improvements

PT 3. Implementing the Beta version

- Finding out how to get the additional data established in task 2
- Retrieving and checking the data
- Adding the additional charts and tables
- Working on the tool usability with Visual Basic and MS Excel

PT 4. Testing the Beta

- Giving the beta version to the users for a test round

PT 5. Finalizing the Release version

- Making the improvements gathered in the Beta testing
- Creating user instructions

PT 6. Making the tool presentable

- Adjusting the tool figures, so that it can be presented in the thesis
- Writing about the process of making the tool

PT 7. Analyzing the outcome

- Analyzing the final tool
- Making recommendations for future use
- Writing about the outcome

Table 1. Overlay matrix

Project task	***Theoretical framework***	***Project management method***	***Outcome***
PT 1. Writing a theoretical framework	Financial and managerial accounting and BI	Research	The theoretical framework, chapter 2 ready
PT 2. Defining the project outcome	Managerial accounting, Business intelligence	Interviews with prospective users	Clearly defined project scope and outcome
PT 3. Implementing the Beta version	Financial and managerial accounting and BI	Working with Business Warehouse, MS Excel and Visual Basic	Beta version ready for testing
PT 4. Testing the Beta	Business intelligence	Interviews, Working with Business Warehouse, MS Excel and Visual Basic	Improvement suggestions
PT 5. Finalizing the Release version	Financial and managerial accounting and BI	Working with Business Warehouse, MS Excel and Visual Basic	Final version ready
PT 6. Making the tool presentable	The outcome of previous tasks	Working with Business Warehouse and MS Excel	Model version and chapter 4 ready
PT 7. Analyzing the outcome	The outcome of previous tasks	Project and outcome analysis	Chapter 5 ready

The project scope consists of making a highly automated, dynamic, and interactive sales analysis tool, which is built from the ground up. The tool is implemented with excel, and the data comes from Business Warehouse, an SAP extension. A customized data query is built in Business Warehouse to facilitate data retrieval. A data transformation file automated with a macro is built for data retrieval and version management purposes. The file

includes a data transformation table that fixes all issues with the source data, such as making translations, regrouping data to account for changes in the organization, adding information like geographical locations, customer hierarchy and so on.

1.3 International aspect and risks

This project has three international aspects. The tool serves the needs of the local sales department as well as help finance department and management generate reports to the mother entity. This requires translating the data into Finnish or English whichever is suitable for that function. The product families are slightly different in the parent company, and thus the data needs to be converted to meet local standards so that it is understandable to local employees and customers. Secondly, the tool is made so that it can be easily used in other country organizations than Finland. Lastly, the theory part includes discussion on both Finnish and international accounting standards.

The biggest risk for this project is how the project scope fits in with the tools available. It might prove difficult to handle so much data with basic Excel tools. If the number of tables slows the tool down too much, then project scope might have to be adjusted. Another risk is not being able to conduct the product testing interviews since the interviewees are busy people and might have conflicting schedules. Careful scheduling is in order, to mitigate this risk.

1.4 Expected results and benefits

There are three types of results that stem from this thesis work. There is the actual output of the project: a dynamic and interactive excel tool which is used in several functions inside the organization and can easily be adapted to be used in other country organizations apart from Finland. The resulting tool, in turn, has the potential of **changing the way** sales department approaches sales negotiation and how they form their tactics. It also enables the finance department to allocate their time more efficiently in activities that generate value to the company instead of doing routine tasks. Lastly, and most importantly the output and possible resulting changes have the potential of improving the case company's **performance**, as it helps with producing insights which in turn helps with forming astute sales strategies and tactics.

This thesis work offers benefits to many stakeholders, including the author, the case company, and the customers and sister organizations of the case company.

The author gains important skills including Visual Basic, project management, communication, academic writing, and research skills. Creating a tool like this demonstrates important professional competencies, such as time management, automating one's own work, and creating useful tools with advanced MS Excel skills.

The case company gains two kinds of benefits. The first benefit is the saved time in periodic financial reporting. One sheet on the tool automatically generates six charts that are required in monthly reporting procedures. Generating those charts manually each month, combining data from different sources has taken approximately two hours of work per month. In addition to the charts, the monthly reporting requires an analysis of the monthly figures and explaining the drivers behind them. Another sheet on the tool has preset calculations for the effects of product mix, customer mix, and other key drivers. Having this feature will make analyzing figures faster and saves up to four hours of work each month. As periodic reporting is a busy time, the time left for analysis is limited. Saving time in routine tasks will make space for deeper analysis, valuable insights and more throughout the communication. The tool is made so that it can be easily adapted to **other countries** if needed. At the time of writing this thesis, at the tool has been requested by the finance team of Nordic countries and is provided to them when finished.

Apart from the finance department, the **sales and management personnel** will also gain a valuable tool. Previously there has been no fast way to analyze sales by customer, product, area, and so on. The only way has to been to retrieve a list from SAP or query the data in Business Warehouse, but the first option does not provide lists for all mentioned viewpoints, and the latter has not been accessible to sales managers. Both of these approaches demand an internal internet connection.

The tool is made fast and easy to use, and also visually pleasant and simple. It is made so that using the sales sheets requires no MS Excel skills. All of these aspects aim to **lower the barrier of data-analytics**, which can, in turn, increase the use of actual figures for the purposes of sales negotiation and short-term business decisions. The tool is made so, that it can be also shown to customers, which facilitates sales negotiations and provide additional service to customers, who sometimes request information about their purchases. All graphs that are meant to be shown to customers or used in group reporting have been done by using brand colors.

In the future, the tool can also provide an interactive interface for analyzing the effect of different types of sales visit and their frequency. This is something that no other tool

provides currently for the company and will contribute an important way of analyzing sales performance and activity.

1.5 Key concepts

The following concepts are the core concepts on which the tool depends. First, managerial accounting and some general accounting concepts are defined. The concept of business intelligence is defined last. All of these terms are discussed more in depth in chapter 2.

Managerial accounting focuses on internal reporting. It provides managers whichever analysis they need in order to make good business decisions. Unlike financial accounting, managerial accounting does not simply report what has happened, it also tries to explain **why** things have gone the way they did. (Braun & Tietz 2015, 20-22.)

For the purpose of this thesis, the words **revenue**, or **sales**, mean total net sales invoiced from a customer during a certain period of time. The amount excludes value-added tax and rebates given to the customer. No manual adjustments or variable considerations are visible in the data. The reason for this difference, as well as revenue and its components, is explained in the next chapter.

Gross profit is a profitability ratio which is calculated by subtracting costs of the inventory sold from the sales revenue. **Gross margin percentage** is calculated by dividing gross profit by the sales revenue. The ratio can be of help in forming and analyzing the results of a pricing strategy. (Horngren & al. 2012, 173-176.)

Azvine, Cui, Nauck, and Majeed (2006) define **Business intelligence,** or **BI,** as capturing raw data and transforming it into actionable information which will help to improve business. They also mention that BI can be defined as data reporting and visualization or business performance management. All of the definitions above align with the purpose of the tool.

2 Combining the theories of sales and analytics

The objective of this chapter is to establish the theory behind the sales analysis tool. The chapter answers the questions why the tool is necessary, where the analyzed figures come from, what the figures mean, how they are formed and why the tool is built the way it is. This chapter is essential for understanding the implications of the insights the tool reveals.

The theory is formed of five parts: financial accounting, managerial accounting, key figures revenue and variable costs of goods sold, and business intelligence. All of these themes are important: Financial accounting defines the data processed by the tool. Managerial accounting is the meaning behind the analysis - it defines why managers need this information, and what they should concentrate on. Definition and causal effects of the two key figures are essential information for users of this tool. Business intelligence is the method used to form and improve the analysis tool. It converts the numbers into a form that allows users to get the maximum value out of them. The figure below displays how the main aspects of the theory are interconnected.

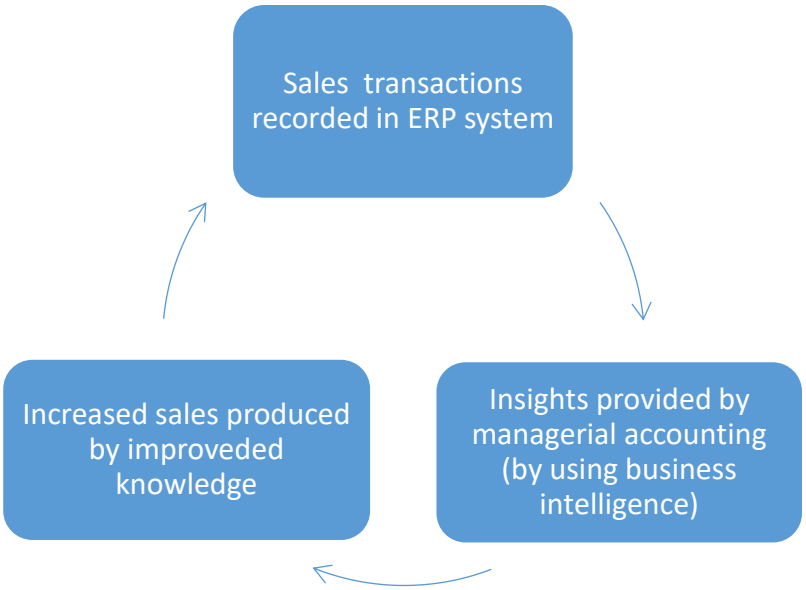

Figure 1. The interdependence of financial accounting, managerial accounting, business intelligence, and business performance

As the thesis is written about sales, all accounting concepts that have to do with other financial statements than the income statement are excluded. Items that appear “under” contribution margin in the income statement are also left out. This includes items such as fixed costs, depreciation, finance costs and tax. Cash flow or working capital will not be

analyzed nor included in the theory since those are not relevant for the purposes of the sales analysis tool. Since accounting standards are a very relevant part of the key figures, the original IFRS standards are researched for this theory, especially standards IFRS 15 and IAS 2. The managerial accounting part of this theoretical framework includes topics such as budgeting, performance measurement and the role of managerial accounting in modern business. All of the aforementioned topics are closely connected to the tool. The business intelligence part will introduce the general concept of BI, and more specific topics, such as ETL-process, data models dimensions and hierarchies. Aspects such as data warehouses and in-memory computing which will not be explicitly used are left out.

2.1 Financial accounting – what is it, and why it is done?

It is important to understand some essential financial accounting concepts for one reason. The definitions of revenue, gross margin, and their building blocks come directly from financial accounting standards.

Barker (2011, 7, 47) defines financial accounting as “comprising a single model for measuring financial position and financial performance.” He specifies that an accountant’s job is to arrange a mass of transactions into a set of accounts. Financial statements are high-level summaries – single line on a financial statement can consist of thousands of individual transactions. At this point, it should be noted that those single transactions that have to do with sales are the focus of this report, but unlike in financial accounting, the sales analysis tool aims to extend and compare the information.

Barker (2011, 7) suggests that accounting is subjective and that not everything can be measured. He states that there can be several assumptions that lead to different valuations, and thus a different amount of profit, but which are equally reasonable. There are, however, countermeasures to mitigate these issues. Horngren, Sundem, Elliott, and Philbrick (2012, 38.) state that to solve the problem of credibility of financial information an honorable expert third party is introduced to examine the financial material and provide assurance about the credibility of the statements. There are also four ethical rules that are associated with accounting: prudence, consistency, objectivity, and relevance (Dyson & Franklin 2017, 31). The third factors that make accounting more objective are different standards and legislation, which are discussed in the next chapter.

2.1.1 Relevant standards and legislation

To bring a measure of reliability and uniformity to accounting decisions, governments of developed countries have established their own accounting standards. These standards are referred to as Generally Accepted Accounting Principles (GAAP). While it is good to have a set of rules to follow, the issue of incomparability between companies from different countries still remains. To solve this problem the International Accounting Standards Board (IASB) was formed in 2001. IASB's objective is to develop a single set of high-quality standards, called IFRS or International Financial Reporting Standards, to facilitate decision-making in the global capital market. (Harrison, Horngren, Thomas & Suwardy 2013, 7.) Currently, 156 jurisdictions all over the world are publicly committed to supporting IFRS as the global accounting standards. Of these jurisdictions, 144 require the use of IFRS Standards and the remaining 12 permit the use of the Standards. (IFRS 2018.)

As the case company operates in Finland, it is subject to Finnish accounting legislation. Finnish law recognizes IFRS standards and allows entities to follow them excluding some exceptions, which do not concern the scope of this thesis. Chapter 7a of the Accounting Act states that “A reporting entity referred to in section 2 subsection 1 may prepare its financial statements in accordance with international financial reporting standards.” The case company keeps two sets of books or ledgers. One ledger is done based on Finnish Accounting Standards, and one is done based on IFRS standards. All reporting done to the mother entity is done based on the IFRS ledger.

2.1.2 Time periods in accounting

Businesses report their performance over periods of time, most popular of which is a calendar year. Companies can also choose to use annual time periods that differ from a calendar year. These are called fiscal years. Financial statements are often prepared more often than once a year: Some companies use monthly reporting; some use quarterly reporting. These shorter time periods are called interim periods. (Horngren & al. 2012, 61.)

In the case company financial statements are prepared 12 times a year. These 12 interim periods, however, are not based on calendar months, but on 12 periods that last four or five weeks each. This method, called 4-4-5 period or calendar, is mostly used in retail. It divides the 52-week year into four 13-week quarters, all of which contain two four- week periods and one five-week period. One stated advantage is better comparability year on year as each period contains the same amount of each weekday as the same period in

the previous year. On the other hand, 4-4-5 reporting can cause difficulties for system adaptations as well as cost allocations. (Nakisa 2019.)

Most businesses do not record business transactions based on when money changes hands but based on when the goods or services were delivered. This is called accrual accounting. It shows the impact of a business transaction on the period when the performance has happened. (Harrison & al. 2013, 140-141.) Recognition of costs and revenues is looked at in more detail in chapters 2.4.4 and 2.5.2.

2.2 Managerial accounting – how does it benefit the company?

Managerial accounting or management accounting generates, communicates and uses financial and non-financial information to control activities and to facilitate decision-making. It does not follow standards or regulations so organizations can freely choose how to generate and use the information. The needs of the organization define what type of information is generated and when. (Groot & Selto 2013, 3.) Horngren & al. (2012, 21) further differentiate managerial accounting from financial accounting by pointing out that unlike financial accounting which produced information for external stakeholders, managerial accounting serves internal decision makers, such as department heads and top executives. Dyson & Franklin (2017, 10) specify various functions of managerial accounting, including developing strategy, planning, controlling, information supply, funding, and governance.

2.2.1 Role of managerial accounting is changing

Managerial accounting was originally developed by engineers and industrialists during the industrial revolution in the 19th and early 20th centuries. The information was used to decide how resources could be best applied to increase profits. Since then various managerial accounting systems, such as forecasting and business analytics, have been invented to satisfy the needs of businesses that operate in increasingly complex and fast markets. (Groot & Selto 2013, 16.)

To recognize the fact that the role of managerial accounting is changing, Institute of Management Accountants (2008, 1), has issued a new definition of management accounting:

> Management accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy.

Similarly, Braun and Tietz (2015, 25) contemplate, that since management accountants are becoming free of mechanical routine tasks centered on recording past transactions, their role is changing towards business analytics and advisors who support business decisions with their data. They also note that it is still a management accountant's duty to ensure that financial records are justly reflecting the company's performance. Cokins (2013, 23) takes the approach of supporting business behavior even further by arguing that the purpose of management accounting is nowadays to influence all company employees and decision makers. He also implies that a management accountant should bring focus to important issues.

2.2.2 Breaking down management and decision making

There are three main responsibilities of management: planning, directing and controlling, all of which are connected to decision making. **Planning** means setting goals and deciding on ways to achieve those goals. **Directing** means overseeing operations and using a variety of information to determine the best course of action. **Controlling** in its core is estimating the current state of things, comparing it against the plan and if necessary, taking action to correct the course. For the purpose of this thesis, the most essential of these are **directing** and **controlling**. Figure 2 below depicts how these responsibilities relate to each other and decision making. (Braun & Tietz 2015, 20-22.)

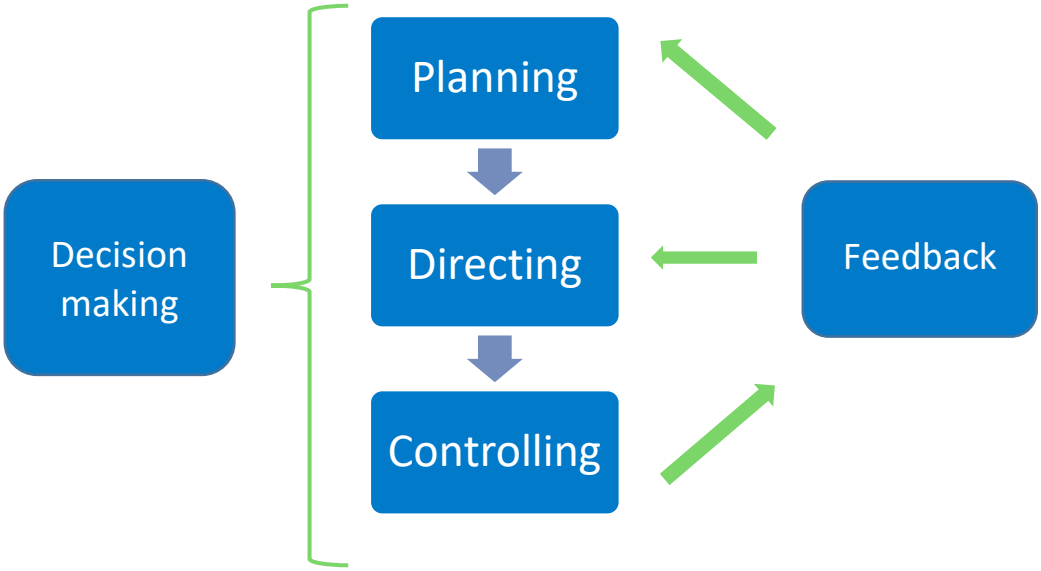

Figure 2. Managers' Three Primary Responsibilities (adapted from Braun and Tietz 2015, 20)

Providing data for **short term decision making** is one of the most important purposes of managerial accounting. There are many types of decisions managers have to make, such

as pricing decisions, closure and shutdown decisions, make or buy decisions and many more. **Closure decision means** closing a segment that is not contributing to the overall profitability of the company. A shutdown is a temporary closure. IT must be kept in mind however, that even if a product is not profitable in and of itself, it might help generate revenue for other products for example by acting as a supplement. (Dyson & Franklin 2017, 406-408.) A way of measuring the profitability of a cost object, such as a product or a customer is looked at more closely in chapter 2.4.

Profitability can also help with a **make or buy decision,** which means deciding whether to produce a good or service in-house or to buy it from an outside provider, which is called outsourcing. With these kinds of decisions, it is important to also consider other factors than monetary issues. An external provider might not be able to fully meet the company's needs, or the delivery times might be too long. If this is the case, better profitability alone should not influence the decision. (Dyson & Franklin 2017, 408.)

2.2.3 Budgeting

Groot and Selto (2013, 143) describe budgets as quantitative expressions of planned in- and outflows of money which are driven by business activities, which in turn are guided by business objectives. Similarly, Braun and Tietz (2015, 521-522) define budget as a "quantitative expression of a plan". They describe the budget process as something that starts with strategic planning, which is illustrated in a loose long-term budget, from which are formed short-term budgets of one fiscal year. These annual budgets are then broken down to monthly budgets. In the commissioning company, this is called phasing. Braun and Tietz (2015, 522) also mention that many companies use either budgeted or actual figures of the previous year as the basis of the new budget, and adjust for things such as new sales areas, products or customers, changes in costs caused by whatever reason, and the effects of changes in competition.

Groot and Selto (2013, 143) indicate that budgets are used especially to support the planning and control aspects of management. There are several aspects of planning which can be helped by budgets. Braun and Tietz (2015, 523) mention that managers are forced to think their plans through in much more detail if they have to participate in budgeting. Another benefit they point out is communication; company strategy can be communicated to employees partly through budgets. Groot and Selto (2013, 144) identify a third aspect: budgets help to illustrate causal relationships between planned activities and future financial position. They also state that this applies to the coordination of different organizational functions. Braun & Tietz (2015, 592) note this same thing and give an example of how

launching a new product might affect marketing, sales, production and customer service teams' activities. All of this can and should be illustrated in a budget.

A budget also helps with the controlling aspect: it is often used as a benchmark for performance. Controlling is somewhat more straightforward if performance can be measured against numerical figures. (Braun & Tietz 2015, 523.) The sales analysis tool is going to be an important factor in the controlling of the case company, as it allows benchmarking actual sales against both budget, and previous years.

2.2.4 Performance measurement

As mentioned in chapter 2.1, financial accounting provides a high-level summary of the company's performance. Managerial accounting, on the other hand, aims to dive beneath the numbers to find out why the performance is as it is. One way to do this is by breaking the company down in **responsibility centers.** Braun and Tietz (2015, 592) define responsibility center as a part of an organization that has a manager who controls and plans the activities in a particular part. These centers have their own budgets, and the managers of the centers report their performance to their own superiors (Braun & Tietz 2015, 592).

Braun and Tietz (2015, 592) identify four types of responsibility centers. These are cost center, revenue center, profit center, and investment center. Groot and Selto (2013, 312) identify these same four centers but call them organizational sub-units. They imply that these sub-units are used for decentralized organizations, as a way to reflect boundaries of autonomy. The mother entity of the case company uses all of these responsibility centers or sub-units, but only revenue centers and profit centers are relevant to this thesis.

Braun and Tietz (2015, 592) define profit centers as company parts where managers are responsible for both income and costs of the pertinent segment. They give an example of a product line, and this is also how profit centers are determined in the case company. How these profit centers are called varies by context, but in the sales analysis tool, they are called business lines. In Finland's entity, there are three main business lines: ceramic and steel chimneys, and stoves. Each profit center or business line is broken down to systems, which is to say products. Sales and contribution margins are budgeted for each business line and system.

Revenue centers are areas of business where managers are responsible for revenues only; they are often geographical areas (Braun & Tietz 2015, 592). This is also true for the case company. Each sales manager has their own sales area, called a sales group. The

sales budget is divided into each sales group. Groot and Selto (2013, 312) use the word sales center to describe revenue centers. They point out that companies evaluate sales centers based on sales growth, sales levels, and market share or its growth.

2.2.5 Sales performance control

Sales performance evaluation can be categorized in various ways. A study by Zallocco, Bolman, Pullins, and Mallin (2009, 605-606) classifies sales performance measurements in four categories, which are explained below, and depicted in figure 3.

- Internally oriented effectiveness measures, such as sales volumes, presentation skills and so on.
- Internally oriented efficiency measures which measure productivity, profitability, gross margin and so on.
- Externally oriented effectiveness metrics which include customer feedback, market share and so on.
- Externally oriented efficiency measures, which include closing ratios per number of calls and presentation. The matrix below depicts these four measurement groups.

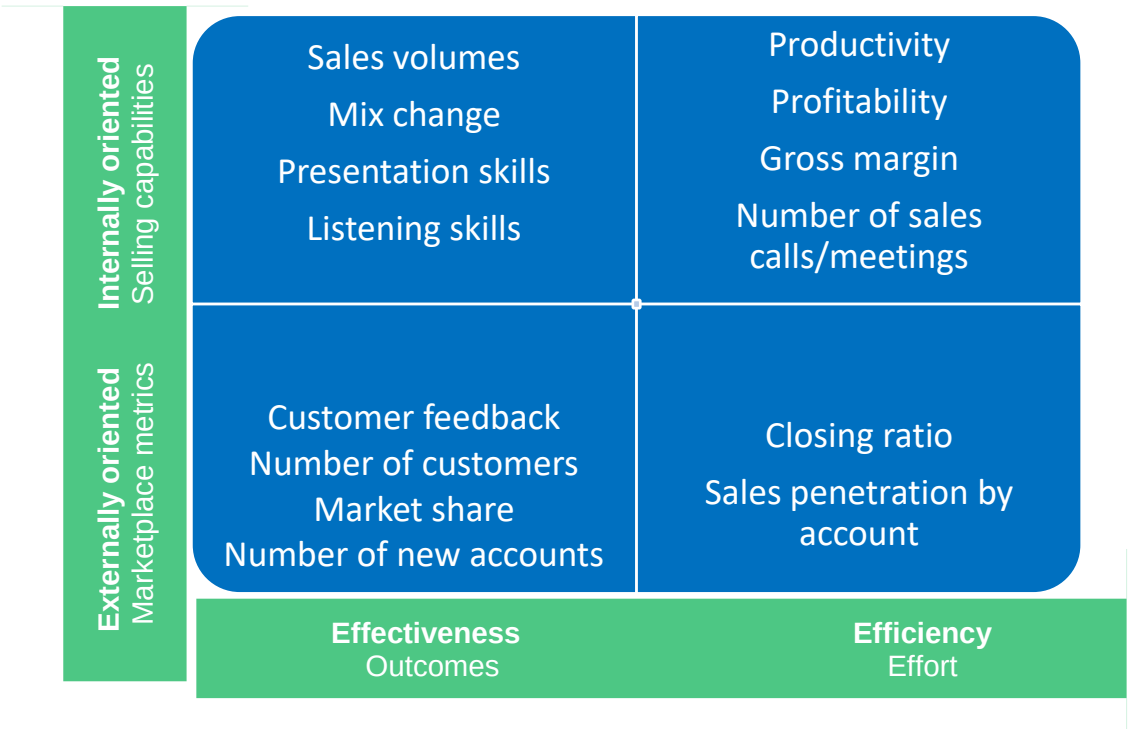

Figure 3. Performance measurement categories (adapted from Zallocco & al. 2009, 606)

Due to the fact that the data in the tool is coming from an ERP system, and not CRM or an external data source, this tool will offer mostly internally oriented efficiency measures. The only efficiency-related measure used is sales volume. Performance evaluation can be based on quantitative or qualitative data, and in the case of this thesis, the data is mostly quantitative. Different aspects of data analysis are further discussed in subchapter 2.5.

2.3 Revenue, pricing, and their many aspects

This chapter deals with the most central concept of this thesis – revenue. Firstly, the main terms are defined, and then revenue recognition and measurement are discussed in detail. Furthermore, this chapter will discuss how a company may use different techniques and strategies to affect its revenue streams. As pricing is one key aspect of revenue management, different pricing approaches and strategies will also be discussed.

2.3.1 Definition of revenue

Beil (2013, 2) defines **revenue** as "the result of a sales transaction with a customer." He specifies that for revenue to be recognized, it has to be earned and realizable. But to further understand revenue we will first have to look at the different words that are used to describe economic inflows to a company. The Conceptual Framework for Financial Reporting (paragraph 4.29) distinguishes two types of income: revenue and gains. It states that "Revenue arises in the course of the ordinary activities of an entity and is referred to by a variety of different names including sales, fees, interest, dividends, royalties, and rent." From this, it can be seen that, unlike in Beil's definition, sales are only one of the possible sources of revenue.

Harrison and al (2013, 13.) distinguish revenue as something that arises from normal business operations as opposed to gains which normally arise outside of the ordinary course of business. As an example, they give sales revenue as opposed to gain on a sale of a subsidiary. On the contrary, The Conceptual Framework for Financial Reporting (paragraph 4.30) does not make this sort of distinction but states that gains may or may not arise from ordinary course of business. For the purpose of this thesis, terms sales and revenue are used interchangeably. Product sales and freight income are the only sources of revenue relevant to this thesis.

2.3.2 What can be recognized as revenue?

Recognition of a business transaction (in this case, sales), is a process where an item is incorporated in to balance sheet or income statement if it meets the criteria of recognition. The recognition of revenue is further defined in International Financial Reporting Standard 15. This standard is only applicable to revenue arising from contracts with customers, which is to say that activities, where the contract parties share risks and rewards of the activity are outside the scope of the standard (International Financial Reporting Standard

15 paragraph 6). All sales in the sales analysis tool arise from contracts with customers and are thus inside the scope of this standard.

International Financial Reporting Standard 15 (paragraph IN17.) distinguishes five steps that need to be applied to recognize revenue: Identifying the contract, and performance obligation, determining transaction price and allocating it to performance obligation, and finally recognizing the revenue to the correct time or period of time. Step one is not relevant to this thesis, steps from two to five are discussed in subchapter 2.3.3.

2.3.3 When can revenue be recognized?

As discussed in chapter 2.1.3, in accrual accounting the business transaction is recorded to the period when the performance has happened. What does that mean for sales revenue? The Conceptual Framework for Financial Reporting (paragraph 4.31) states that “An entity shall recognize revenue when (or as) the entity satisfies a performance obligation by transferring a promised good or service (ie an asset) to a customer. An asset is transferred when (or as) the customer obtains control of that asset.” There are two things in this statement that will need further clarification. One of them is a performance obligation.

A **performance obligation** is a promise to deliver the customer a good or a service, or a series of goods or services. An activity which a company has to perform in order to deliver the good or service that is the performance obligation is not a performance obligation in and of itself. Such an activity could be administrative work done in order to set up the contract. (International Financial Reporting Standard 15 paragraph 22, 25.)

Revenue can be recognized either over time or at a point in time. The point of time where the revenue should be recognized can be determined by when the control of the asset is transferred from the company. This can mean, for example, that the physical possession and the significant risks and rewards of the ownership of the asset have been transferred to the customer. (International Financial Reporting Standard 15 paragraph 33, 38.)

The case company recognizes its revenue at a point of time, which is determined by the Incoterms used to conduct the delivery of the goods. Jiménez and International Chamber of Commerce (2012, 43.) define incoterms as "standard international "trade terms" " which define clearly the risks, costs, insurance and customs duties of international transportation. There are 11 different incoterms, most of which have an individual combination of transfer of risk, costs, and insurance. (Jiménez and International Chamber of Commerce (2012, 46.) The case company uses FCA, CPT, and CIP in all of which the control is

essentially transferred to the customer at the point when the goods are transferred to the carrier. In practice, this means that the revenue is recognized on the day when the goods leave the company's premises.

2.3.4 Revenue management and pricing

Revenue management is a relatively new topic to business and finance management, originating from a pricing strategy of an airline company in 1985. It constitutes of various techniques, used to increase demand for product or services. One key aspect of revenue management is pricing. A company can increase demand on a low season by reducing prices through special pricing, such as discounts. Another type of revenue management is to give more visibility to products with higher gross profit. (Huefner 2015, 2-4, 20.)

Pricing can be a powerful tool in business strategy: a price increase can have nearly twice as much impact on EBIT as a similar increase in revenue (Liozu 2015, 19-21). These measures have to be considered carefully, though: continued discounts can lead to increased demand for lower prices, which can affect the company's revenue negatively in the long term. In the worst-case scenario, lower prices can become the industry standard. A company should also take into consideration the price elasticity of the industry. If there's little price elasticity, i.e. if prices do not affect demand considerably, it is not lucrative to engage in discounting. (Huefner 2015, 79-84.)

There are two main types of prices: list prices and quoted prices. List prices are fixed for all customers, normally for a period of time, and quoted prices are calculated for each order, or project or situation separately. This is the most fitting type when the products or services are custom-made. Construction industry commonly uses quoted prices. (Huefner 2015, 39-40.)

How is a price determined then? There are several approaches to pricing, which base the price on different aspects. **Cost-based pricing** determines the price from the cost of goods sold, plus a mark-up to cover overhead costs and generate profits. In **competition-based** pricing, the price is determined by how much other sellers are charging for similar products. As mentioned previously, this kind of pricing is hazardous, as it can lead to a price competition between vendors, which can, in turn, lead to unsustainable pricing and decreased profitability. **Value-based** pricing sets the price based on how valuable the product is deemed to be for the customer. This approach is good for it is very customer oriented. On the other hand, measuring the value of the product to the customer can be difficult. (Liozu 2015, 19-21.) Product qualities and the industry partly dictate how products

can be priced. The more unique the product, and the less competition, the easier it is for the company to determine the prices freely. A company which is not forced to follow market prices is said to be a price setter as opposed to a price taker (Braun & Tietz 2015, 470).

Pricing can also be used to support a strategy. One example of this is **penetration pricing**, where a company uses prices lower than that of competitors to enter a market and to gain a market leading position. A company can also use **price adjustments** to regulate the amount of revenue they get from a sales transaction. These adjustments can include additional fees which are not shown while initially stating the price. On the contrary, customers can be offered price reductions, such as discounts, rebates, bonuses or other incentives to buy and keep buying from the company. Different customers can also be offered different prices or discounts, but if this **customer-pricing** is done, one must keep in mind that this can lead to prices being driven down permanently, as discussed before. (Huefner 2015, 43-44.)

2.3.5 IFRS on pricing

The International Financial Reporting Standard 15 (paragraph 76-80.) also recognizes various pricing methods, including but not limited to adjusted market assessment approach, expected cost plus a margin approach, residual approach, or a combination of these. The transaction price must be allocated separately to each performance obligation in the contract, and for this purpose, the stand-alone selling price must be identified (The International Financial Reporting Standard 15 paragraph 73, 76). If there's a discount given to the customer which cannot be attributed to one or more performance obligation, the amount of discount shall be evenly distributed to all of the performance obligations (The International Financial Reporting Standard 15 paragraph 81).

Furthermore, International Financial Reporting Standard 15 (paragraph 46.) states the company must exclude **variable considerations** when recognizing revenue. Considerations, i.e. income from a customer can be variable due to discounts, credits, rebates, incentives, performance bonuses or other such items (International Financial Reporting Standard 15 (paragraph 51). This could mean for example a cash discount, contingent on an early payment by the customer, or a bonus that is paid out to the customer in case a certain milestone is achieved.

2.3.6 How sales figures are formed in the analyzed data?

The sales data used in the tool has three key sales figures: gross sales and net sales including and excluding freight income. **The gross sales** figure is composed of stand-alone prices allocated to each individual performance obligation excluding all reductions, such as discounts. In other words, gross sales used in this tool are list prices. **Net sales including freight income,** on the other hand, are quite close to the figure reported as revenue in the company's income statement. They are composed of all sales net of any discounts given to customers, or to put it simply, it is the amount invoiced from the customer. The net sales amount is exclusive or all variable considerations, such as incentives or rebates, that are contingent to an occurrence of an event which may or may not occur. For some analyses, only the product sales are relevant, so a figure called **net sales without freight** is used.

2.4 Gross profit analysis

One way to assess the profitability of a company, or any of its sub-organizations, customers or products, is to find out the gross profit, also called gross margin. This can be done by subtracting the costs of goods sold from sales revenue. The cost of goods sold is the same amount as the value of the goods in inventory. (Horngren & al 2012, 292.) In the tool, gross profit is called contribution margin, since that is the term used by the group.

2.4.1 Inventory valuation of goods purchased for sale

Inventories are assets held for sale. (International Accounting Standard 2 paragraph 6.) There are many approaches to inventory valuation (Dyson & Franklin 2017, 296). The case company follows IFRS valuation rules for its inventory. There is a different valuation method specified for goods produced and for goods purchased and held for sale. International Accounting Standard 2 (paragraph 10) dictates that "Inventories shall be measured at the lower of cost and net realizable value." The data in the tool only contains the cost of inventory and not the net realizable value, so the concept of the latter is outside the scope of this thesis. It is further defined in the standard, that the cost of inventories should comprise costs of purchase, and all other costs incurred to obtain the product to the inventory. For purchased goods, this amount can include items, such as inbound freight, import duties, handling, and other costs, and the amount should be net of any discounts. (International Accounting Standard 2, paragraph 10.)

As the price for purchasing goods does not always stay constant, it must be decided how the value of a good in inventory is determined. There are several methods one can use, but the one used at the case company is a method called weighted average. The method calculates the value of a single item by dividing the cost of all acquisition costs of that inventory by the number of units in inventory. (Horngren & al 2012, 302.)

2.4.2 Cost classifications

To understand how the value of produced goods is determined, different types of costs must first be defined. A cost can be classified by its relation to a **cost object**, which can be anything that one can put a price on, such as a single product, a service, a plant or a process. Costs related to a cost object can be divided into direct costs and indirect costs. **Direct costs** can be feasibly traced to the cost object, whereas **indirect costs** cannot be easily traced to that particular cost object, even though they are related to it. An example of this would be a manufactured product: the price of the raw materials used for the product can be easily traced, but the lease of the plant where the production took place would be an indirect cost. (Horngren, Datar & Rajan 2015, 51-52.)

Costs can also be classified based on how they behave. Costs that vary based on the number of products sold are called **variable costs**, and costs that stay the same regardless of the volumes that are produced or sold are called **fixed costs.** (Horngren & al. 2015, 54.) To use the example from the previous paragraph, the raw materials would be variable costs as their cost is almost directly proportional to the number of goods produced. The lease of the plant would be a fixed cost, as its amount does not change, regardless of the amounts of goods produced.

2.4.3 Inventory valuation of manufactured goods

Goods produced for sale are valued in inventory with the costs of conversion. These are costs that are directly related to the production of the good, but also the indirect variable and fixed overhead costs allocated to the production of the good. The allocation of the overhead costs should be based on the normal capacity of the plant. (International Accounting Standard 2 paragraph 6).

The method used for calculating the value of manufactured products is called standard costing. To determine the standard cost or standard price one must evaluate what the total cost to produce one unit of the good is in the future. This includes direct costs: direct labor and direct materials as well as indirect overhead costs. Indirect costs can be divided

into fixed costs such as factory lease, machinery depreciation, etc. and variable costs, such as factory energy consumption and indirect labor costs. (Dyson & Franklin 2017, 356).

The standard cost per unit is calculated by estimating:

- the quantity and price of materials used
- the wage of labor used
- the total amount of variable overhead the production absorbs per hour of production
- the rate of fixed costs absorbed per hour of production

The three latter are then multiplied by the standard number of hours used per unit of goods produced. (Dyson & Franklin 2017, 356).

2.4.4 Implications of gross profit analysis

As mentioned in the subchapter 2.4, gross profit can be calculated by subtracting the value of the sold products from the generated revenue (Horngren & al. 2012, 292). A gross profit margin, on the other hand, means dividing the gross profit with the sales. As mentioned in subchapter 2.2.2 profitability, and thus gross profit margin can act as a guide towards more informed business decisions. (Horngren & al. 2012, 173-176.) For a company with significant variable costs, such as a manufacturing company, it is important not only to grow sales but also to grow sales in a manner that increases profitability. Gross profit will indicate how much of the revenue growth has actually generated profits. (Huefner 2015, 18-20, 138.) It needs to be kept in mind though when making these decisions, that gross margin does not show the whole picture. Costs such as advertising and credit loss are not captured in costs of goods sold but are significant factors when making decisions about sales. (Huefner 2015, 18-20.)

2.5 Business intelligence

Even though the purpose of this thesis lies within managerial accounting, it is important to analyze why and how the tool is implemented the way it is. This is where accounting theory meets business intelligence theory. This chapter defines business intelligence first and looks at how and why it is being used. Then the solutions and models are explained, as well as the central terminology of business intelligence.

2.5.1 What is business intelligence?

The term business intelligence can be used for a variety of processes, software, technologies, and applications. Because of this, it can be defined in many ways. One definition would be a way to empower businesses to make better decisions faster. Another definition concentrates on how this goal is achieved, which is by converting raw data into useful information. A third way to characterize business intelligence is a rational and fact-based approach to decision making. (Luckevich, Misner & Vitt 2008.)

Lönnqvist & Pirttimäki (2006, 32) state that the purpose of BI is to identify and then to process the information so that it is useful for managerial knowledge. They also point out that to succeed or even survive in the fast-changing world of business, it is important to have timely and effective business information. Hočevar & Jaklič (2010, 89) contemplate that using business information to make effective decisions is nothing new. They state that the novelty of BI is the fast manner in which the users are able to analyze data and produce ad hoc queries.

2.5.2 BI architecture

Business intelligence system usually consists of multiple components, rather than one single application. The main goal is to select, analyze and aggregate data and display the results in a way that is easy to understand. (Hočevar & Jaklič 2010, 92). BI solutions can be structured in various ways. Below, figure 4 shows a model with three layers:

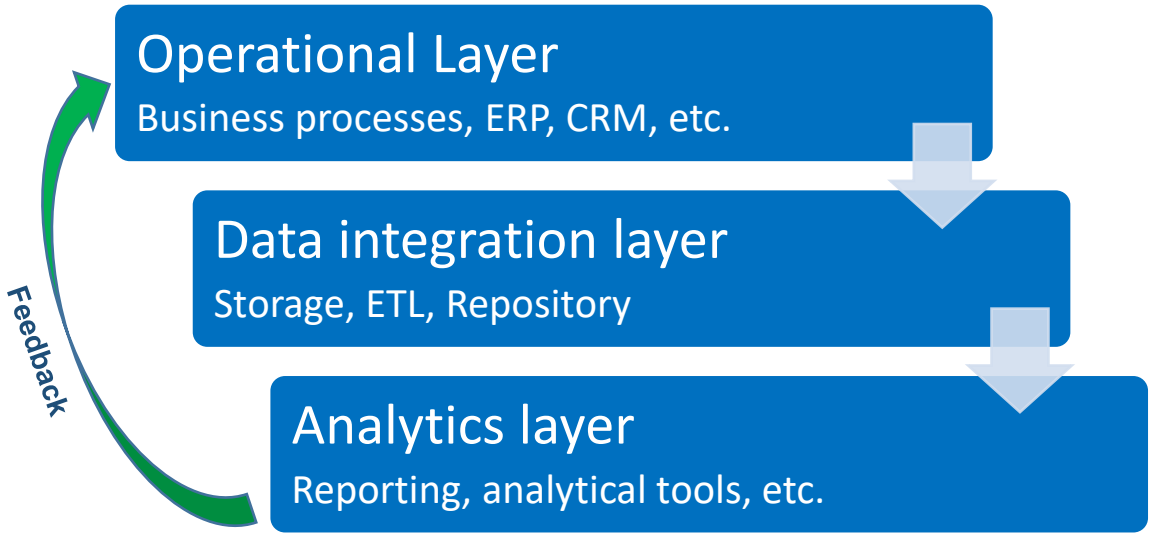

Figure 4. Three layers of BI stack (adapted from Azvine & al. 2006)

Unlike in Azvine & al's model depicted above, Hočevar & Jaklič (2010, 92) describe a BI solution that has four components: Operational data source, the extract, transform, load process, a data warehouse, and an analytical tool. The solution for this tool is built on neither of these two models described above. It does have similar components, but instead of three or four layers, it has five. Chapter 3 will discuss in detail why this type of model was built for the tool. The following paragraphs will look at each of the three layers depicted in figure 4, after which there are subchapters for the ETL process and data transformation.

The **operational layer** is where the data comes from. As depicted in Azvine Al's BI structure, the data can come from multiple sources inside business processes. It can be extracted from an ERP system, a CRM or any other business system. Part of the data can also come from an external source, such as the internet or official databases (e.g. the U.S. Census) (Sharda 2018, 164)

A **data warehouse** is a repository of data that could be of interest to business managers. The data in a data warehouse is usually structured so that it is available to be used in analytics. (Sharda 2018, 157.) A data warehouse can also be defined as a place where a large amount of historical information can be consolidated from different sources. As the form of information coming from different sources can vary, a good ETL needs to be set up to transform the data into a uniform format and to keep the data up to date. (Watts 14 December 2017). This process is looked at in the next subchapter.

The final level, **the analytics layer** is the end user layer. These analytical tools show different data to different users, depending on their needs. This layer is looked at more closely in subchapter 2.5.8.

2.5.3 The ETL process

ETL is the process of Extracting, Transforming and Loading data from the data source into the destination e.g. a data warehouse. In the data extraction phase, the data is retrieved from the source, such as an ERP. The most important part of this step is to pick the correct data. The next step, transformation, in this phase the raw data is transformed into the form where it can be used in the data tables. The process involves many steps. Paragraph 2.5.4 discusses this phase in more detail. The last step is loading the data into the destination (Sharda 2018, 174). Watts (14 December 2017) outlines the same three steps of ETL, but he also underlines that the three-step process is a simplification. The actual process is broad and includes various actions.

2.5.4 What is (good) data?

Data is a collection of facts, in a form of numbers, words, images, etc. which work as a measurement of a set of variables. For data to be usable in BI, it generally needs to be re-processed, which is a five-step process. (Sharda 2018, 87-92). There are many data types, such as currencies, integers, strings and so on. To use data effectively in BI it important to accurately define the data type in each column. (Ferrari & Russo 2017, 217.)

Data transformation is a crucial step of the ETL process, in which the data goes through multiple step process, depicted in figure 5 below, which aims to ensure the correctness, form, and scope of the data. The first step is to decide which data is relevant, keeping in mind, that more data to choose from gives the analysts more freedom. The second step ensures the data is "clean" of duplicates, outliers, and anomalies, which might distort the results. It is recommendable to have this step set up with the help of an expert, who can tell which values are anomalies and which are not. The third step is to discretize and normalize the data, which will make it more easily computable. Another purpose of this step is to give data more fitting attributes or meaning. The last step is to yet again limit the amount of data, now that calculations have taken place. (Sharda 2018, 94.)

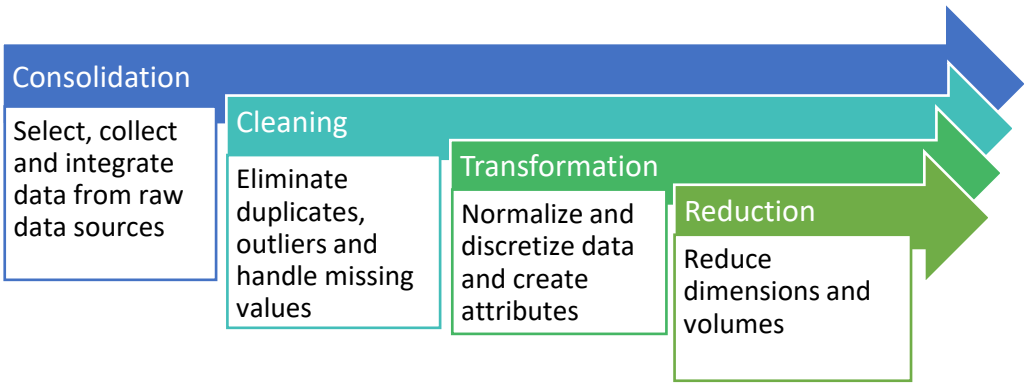

Figure 5. Process of data re-processing (adapted from Sharda 2018, 92)

In order to get the maximum value of the BI process, the data has to be accurate. The GIGO rule (Garbage In, Garbage Out) dictates that if the input data gives an incorrect picture, the output observations made based on the data is incorrect too. The consequences of incorrect data are twofold: it can lead to misinformed decisions, which are of no use to the business, and it can cause distrust between the information users and the BI solution. (Scheps 2008.)

2.5.5 How data models are structured

A data model is built on fact tables and dimension tables. **Fact tables** contain usually only numeric values, such as keys to dimensions and values you want to aggregate. They usually consist of thousands or millions of rows. A **star schema** is a type of data model the model where there's one fact table, surrounded by multiple dimension tables. (Ferrari & Russo 2017, 221). In the case of this thesis, the values are mostly sales figures. For this tool, one dimension could be a product line, and a user would then look at the sales from that point of view. The project design chapter will explain why the tool is built with the simplest data model possible.

A **dimension** is a characteristic of the data (Scheps 2008). Dimensions give a perspective to the numbers and are useful to slice data aggregated from fact tables. Dimensions can include, for example, customers, time and products. (Ferrari & Russo 2017, 221-222).

Hierarchies are formed when dimensions are broken down to different levels of **granularity** (which means the level of detail). For example, the dimension of time can be broken down on different levels, which relate to each other hierarchically: Years can be broken down to quarters, which can be broken down to months, which can be broken down to weeks, which can be broken down to days. (Scheps 2008.) Many dimensions in the tool are structured hierarchically, including products, time, customers, and so on. Figure 6 below shows a simplified version of the case company's customer hierarchy.

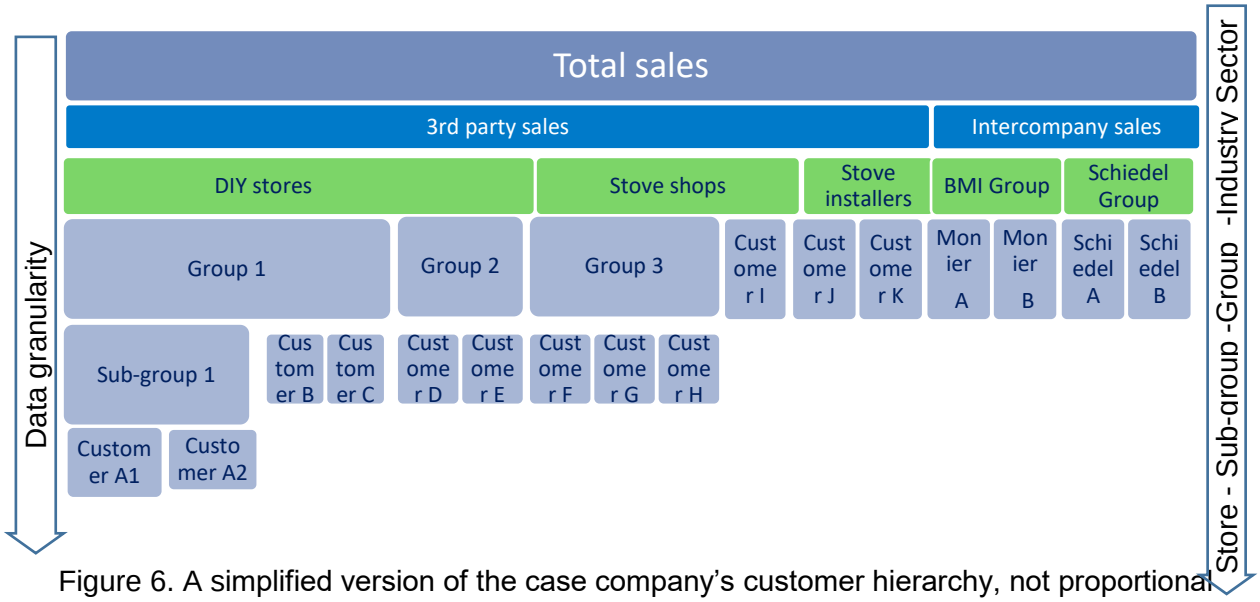

Figure 6. A simplified version of the case company's customer hierarchy, not proportional to actual sales

2.5.6 Reporting layer and visual analytics

As previously mentioned, the reporting layer is the user interface for a business intelligence solution. In the case of this thesis project, the Sales Analysis tool is the reporting layer. When designing an analytical tool, one must take several things into consideration. Firstly: users from different levels of organizational hierarchy will need different aggregation levels of data (Ong, Siew, & Wong 2011, 6).

Secondly one must consider which kind of intelligence or analytics is required. Analyses can be categorized into three groups: descriptive, predictive and prescriptive. **Descriptive Analytics** is what makes up Business Intelligence. It is the simplest of the three approached, as it "merely" states what has happened or what is happening. **Advanced analytics** encompasses **predictive** and **prescriptive analytics**, which answer the questions "what will happen and why?" and "What should I do and why?" respectively. (Sharda 2018, 49.)

The third aspect to consider is how the user will want to view and process the information. Once the data model is set up, the data can be analyzed in several different ways. Jiawei, Jia, and Kamber (2011, 26) list several ways to operate a dataset:

- **Drilling up** means moving to a more aggregated data level either by going to a higher level of a hierarchy or by decreases the number of dimensions viewed.
- **Drilling down** is the opposite of the above, decreasing the level of aggregation towards more detailed data.
- **Slicing** the data means to divide the information into smaller parts, such as selecting only one value of a specific dimension.
- **Pivots** enable users to view the data from different viewpoints, for example, by letting them swap the dimensions to the opposite axis.

The tool offers possibilities of slicing data and pivoting it. Drilling up and down as such is not supported, but similar effects can be gotten by adding or deleting dimensions in pivot tables.

3 Overview of the project

This chapter demonstrates to the reader how the thesis project was planned what methods were used to carry out the project and build the tool. This part does not include an evaluation of the project as that is covered in chapter 5.

3.1 Project design

This project had two main activities: writing the theory and implementing and writing about the practical part. The timeline was planned so that after finishing the written and practical work there would be a two-week period of finalizing activities, such as grammar check, before the final submission. The Gant chart below depicts the two main activities, broken down to seven project tasks, which have then been broken down to sub-tasks. As the figure 7 shows, the two main activities were planned to be parallel at times, due to the fact, that part of the thesis project was to be carried out during the author's working hours. Some room was left for a delay, both for the theoretical framework and the whole project.

Thesis start week	Thesis end week		Planned
1	17		Actualized

						January					February				March				April			
						Weeks																
No.	Task	No.	Subtask	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Theory	1.1	Setting up refworks	1	1																	
2.		1.2	Reading and writing about management account	1	2																	
3.		1.3	Reading and writing about financial accounting	3	4																	
4.		1.4	Reading and writing about sales and pricing strat	5	6																	
5.		1.4	Thesis advisor meet 1	7	7																	
6.		1.5	Finalizing theoretilcal framework	8	9																	
7.	Defining project	2.1	Interviewing future users	3	5																	
8.	outcome	2.2	Deciding the further improvements based on fee	5	5																	
9.	Implementing	3.1	Adjusting the data query	6	6																	
10.	Beta version	3.2	Adding needed charts and deleting unnecessary	6	8																	
11.		3.3	Checking calculations	8	9																	
12.		3.4	Working on tool usability	9	9																	
13.	Beta testing	4.1	Giving Beta version to testing	10	11																	
14.		4.2	Gathering results by email guestionnaire or an in	12	12																	
15.		4.3	Thesis advisor meet 2	12	13																	
16.	Finalizing the	5.1	Making improvements based on Beta testing	13	13																	
17.	release version	5.2	Writing user instructions	13	13																	
18.	Making the tool	6.1.	Making tool figures and customer names present	14	14																	
19.	presentable	6.2.	Writing about making the tool	14	15																	
20.		6.3.	Possible thesis advisor meet 3	15	15																	
21.	Analysing the	7.1.	Analysing the final tool	16	16																	
22.	outcome	7.2.	Making recommendations for future use	16	16																	
23.		7.3.	Finalizing whole thesis	17	17																	

Figure 7. Gant chart for planned thesis activities

3.2 Project methods

The information to build this tool was collected using three separate methods. The project task number one, the theoretical framework, was conducted with desktop research. As can be seen in chapter 2, the research centered on five topics: financial and managerial accounting, revenue, gross profit, and business intelligence. This research forms the groundwork on which the tool is built, as it covers the theory of how the tool is formed, and what the figures in the tool mean.

While the tool itself uses quantitative data, the information used to develop it is qualitative. The origins and meaning of the quantitative data are explained in depth in chapter 2 and the calculations done in the tool are described in chapter 4 and further specified in appendix 2. The qualitative data was collected with four face-to-face interviews at different points of the project. In task 2, the managing director of the commissioning company was interviewed to form the project outcome so that it serves the company's needs. In task 4, the first version was demonstrated to a sales manager, who then gave feedback on the usability, and gave further suggestions on the development. Then, during task 5, the tool was shown to the managing director once again, so that she could evaluate the progress and give feedback on further development needs. The figure 8 below illustrates how the project tasks were planned out and what methods were used to implement them.

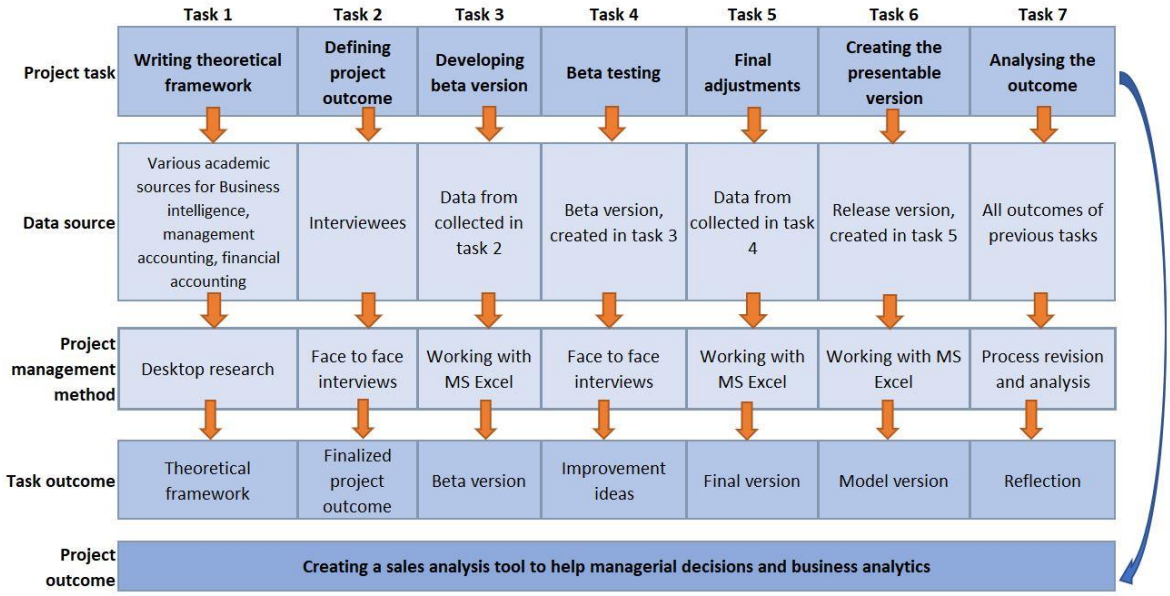

Figure 8. Thesis project design

4 Design of the tool

This chapter will introduce the starting point for the sales analysis tool and the resulting tool. The final product of this thesis project, the sales analysis tool was built to speed up and improve the analytic capabilities of many users in the commissioning company and its sister companies. When forming the project outcome with the managing director it was agreed that the priority would be to make the tool easy to use, fast and reliable. Keeping this in mind this chapter aims to explain how and why the tool was built as it is. All aspects of the tool are introduced, from the general architecture down to smaller details. This chapter contains several screenshots from the old and new tools, and the reader should keep in mind, that all pictures have been modified, so that they do not display actual sales data of the company.

4.1 **The starting point and objectives**

During 2018, the author of this thesis built a sales analysis tool for the commission company. Up to the end of this thesis process, the old tool has been used by sales, management and finance functions of the company, and it was found useful, yet slow and lacking some important functionality. Because of this, the company commissioned a new Sales Analysis Tool, which includes many improvements and additions.

The old tool had seven dashboard sheets, which all had a different viewpoint for analyzing sales. For each of the dashboard sheets, the tool had a pivot sheet from where the charts were originating. It also had sheets for instructions, a control panel, two sheets for data and three sheets for lists where the data modifications were coming from. While different viewpoints are important for efficient analysis, the big amount of formulas, sheets, and pivots meant big file size and complexity. The previous version of the tool did not have a separate file for data transformation. This had two unwelcome effects. First, there were tens of thousands of calculations that were done within the tool and the tool data included unnecessary data from which the transformations were done. Both of these factors contributed to the slowness of the tool. Figure 9 below has been taken from the data tab of the old tool, and it demonstrates how a product belonging to “additional products” business line is converted to the ceramic business line, where it belongs. Only the column “Business Line” is necessary for the actual analysis.

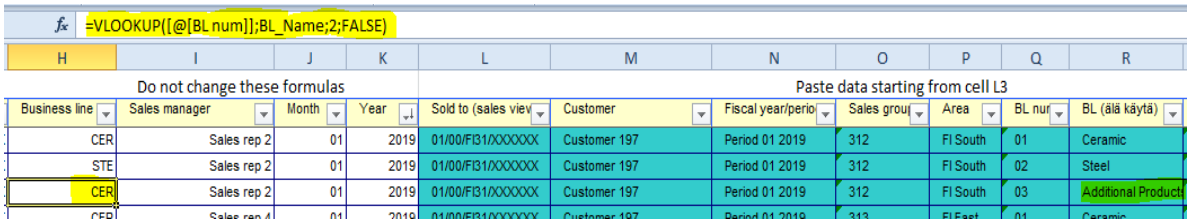

Figure 9. Data transformation in the old tool

To achieve a faster and simpler new tool, the data transformation was executed in a separate file, called “Data transformation file”. To make the tool simpler, the number of sheets was greatly reduced. Additionally, in order to improve tool usability, many changes to the contents of the data were agreed upon in the project task 2. The final change was the visual aspect. The old version of the tool was quite plain, as can be seen from figure 10 below, and the color schemes were not customized. In order to be able to present the tool to other than local employees, the dashboards are implemented with the brand colors of the commissioning company.

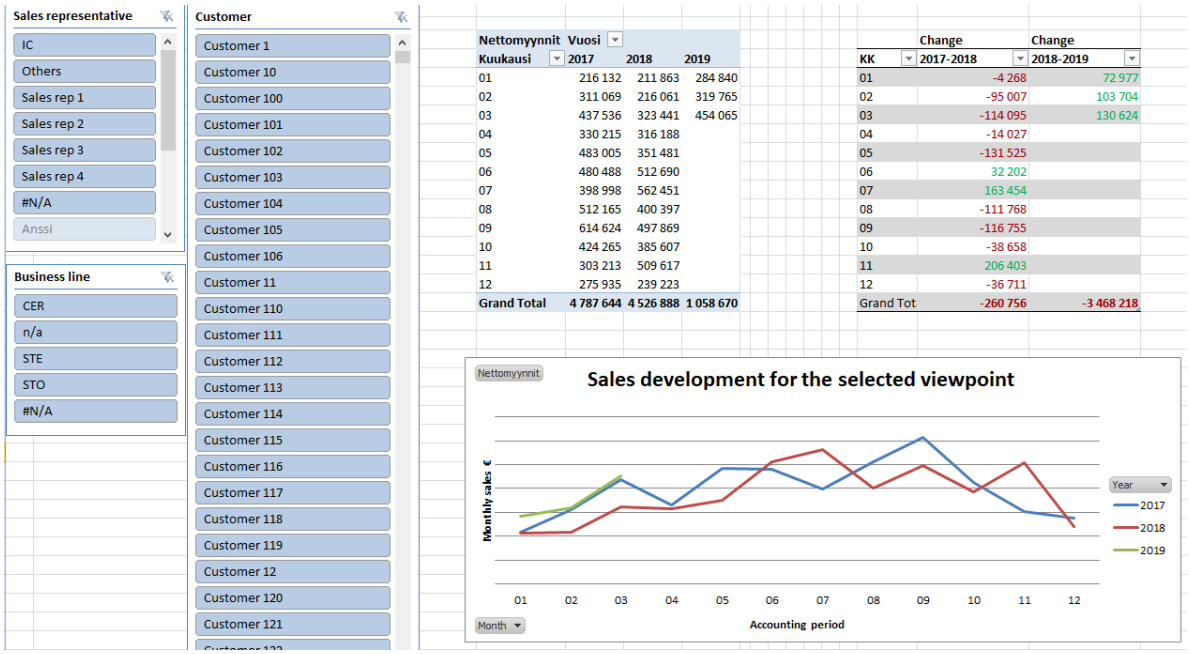

Figure 10. Customer analysis dashboard from the old version. Values are not proportional to actual sales

4.2 The BI solution in this tool

This subchapter demonstrates the overall BI structure of the tool, and the whole process flow from sales order to the analysis. The first three layers of the solution are shortly discussed, and the two layers generated solely for this tool are discussed in more detail in later subchapters.

Figure 11 below displays an overview of the whole process. The “Layer” row displays what the five analytic layers of this tool are, and the flowchart displays how the data flows through different processes and software. Although the structure might seem complex, most of it is automated, and it has all been formed so that the end product is as simple as possible.

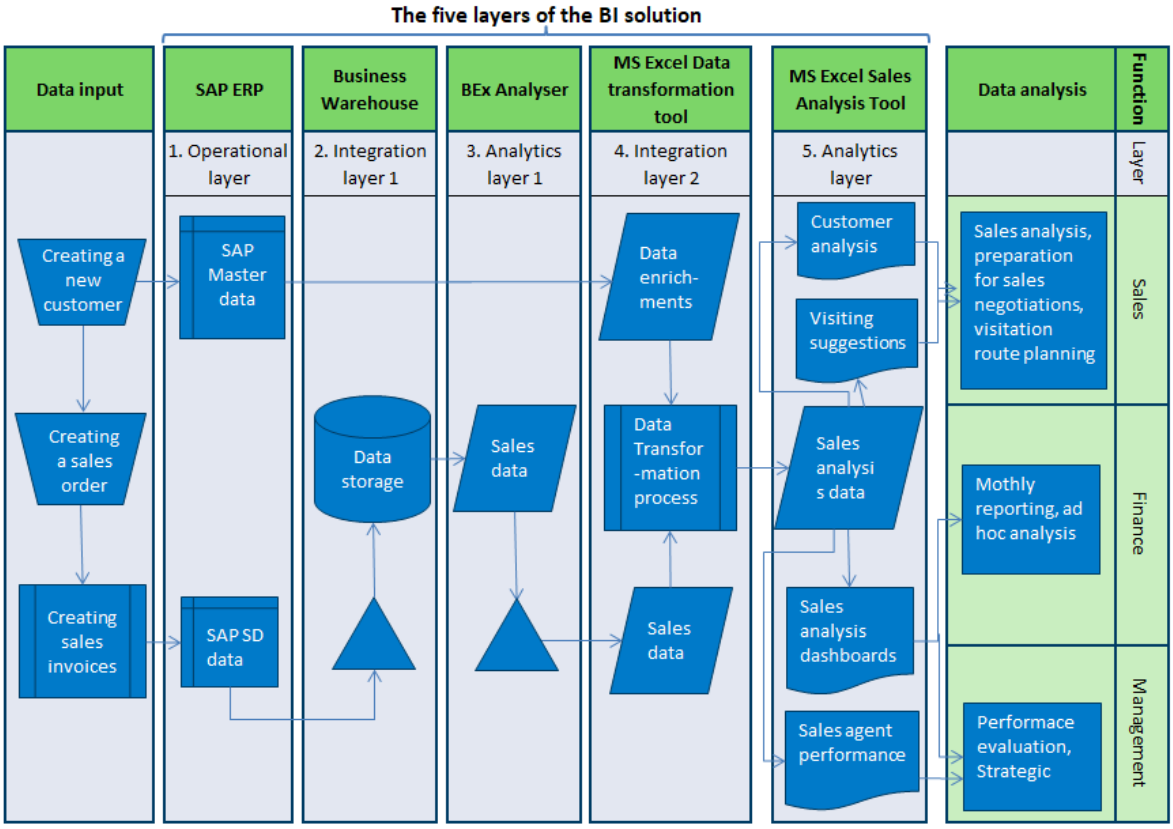

Figure 11. Data processing flowchart for the sales analysis tool

4.2.1 How the data flows from ERP to BEx Analyser

In this subchapter, the flow of data from SAP to BEx Analyser (from layer 1 to layer 3) is shortly explained. The first two layers have not been changed to accommodate this thesis; they are used as is. In the first phase, customer service inputs the data to SAP ERP in the form of sales orders. When the ordered products leave the warehouse to the freight carrier or directly to the customer, several documents are automatically generated. One of those documents is an invoice. Those documents form the sales data in SAP. The data is then automatically retrieved to Business Warehouse.

The layers 1 and 2 are both parts of Business Warehouse (BW), a supportive software for SAP. BW is a data warehousing solution, which stores the data in the BW Server, and has a reporting layer called BW Business Explorer (BEx) (Fu & Fu 2002). A normal user has no access to the server part of Business Warehouse. All of the user data processing is

done in BEx Analyser, which is an Excel add-in. BEx has two types of data retrieve options. There are queries which have been set up by key users and available to anyone who has the rights to view them. Then there are workbooks, which are queries or combinations of several queries generated and saved by any user, and only available for that user (unless shared). These workbooks can contain any Excel features, such as formatting, functions, macros, or pivots. For the purposes of this thesis, the author created a BEx Workbook, which automatically retrieves the sales data in the right form so that it can be easily saved and used by the data transformation file.

As one can see, SAP, BW Server, and BEx form a BI solution in and of themselves. However, this existing solution did not meet the local requirements for many reasons. First, using the BEx Analyser itself for sales analysis is slow, and always requires an internal internet connection. This is not good if anyone who is on a business trip or a sales call needs to use it. Using BEx also requires some practice and processing the data in it would require Excel skills. The data is not suitable for sales managers as such. Some additional info, data corrections, and regrouping are needed.

Skipping the Business Warehouse altogether and retrieving the data directly from SAP to the tool is not an option either. Taking the data directly from SAP would be very time consuming, and impossible to automate without developer rights and skillset. Also, the sold pipe meters are not displayed as such in any SAP application, so the BEx Analyser is a necessity. This is why a supplementary tool and data transformation file were needed. How the data is transformed is discussed in the next subchapter.

4.2.2 Data transformation file

As previously discussed, in order for the tool to function ideally, an auxiliary Excel file is needed. This file takes data from a saved Business Warehouse file, transforms the data into a usable form and adds some useful data that cannot be found from Business Warehouse, or even from SAP. Then the data is sent to the Sales Analysis Tool as plain values so that it does not slow down the tool. These transfers have been automated with a macro, which also saves copies of all files, and checks that the data values are all transferred. This process is shortly described in this subchapter, and a more detailed process description and user instructions are given in Appendix 2.

	C	D	F	H	I	K	M	O	P
4	Contains data up to		18.4.2019						
12		Checksum	16 576 431	Count of rows	Count of rows	Count of rows	Count of rows	Count of rows	Column total €
13									
14	Filter								
15	Billing doc. da								gross sales
16	Billing docume		Check date	Customer name	Billing doc. date	Area	Business Line	System	K4/2017
17	Billing type		2.1.2017	Customer 481	2.1.2017	FI Area 3	Business Line 1	Product 5	6 037,00 EUR
18	Bill-to party		2.1.2017	Customer 415	2.1.2017	FI Area 2	Business Line 2	Product 5	2 952,00 EUR
19	Cal. year / mo		3.1.2017	Customer 289	3.1.2017	FI Area 2	Business Line 1	Product 8	3 710,00 EUR
20	Cal. year / qua		4.1.2017	Customer 111	4.1.2017	FI Area 1	Business Line 1	Product 6	4 188,00 EUR
21	Calendar mon		4.1.2017	Customer 425	4.1.2017	FI Area 1	Business Line 2	Product 3	4 865,00 EUR
22	Calendar year		4.1.2017	Customer 455	4.1.2017	FI Area 1	Business Line 1	Product 6	3 905,00 EUR
23	Commission g		4.1.2017	Customer 489	4.1.2017	FI Area 1	Business Line 2	Product 2	7 762,00 EUR
24	Customer Par.		4.1.2017	Customer 233	4.1.2017	FI Area 2	Business Line 2	Product 3	3 913,00 EUR
25	Customer Part		4.1.2017	Customer 509	4.1.2017	FI Area 2	Business Line 1	Product 9	6 786,00 EUR
26	Customer Part		4.1.2017	Customer 181	4.1.2017	FI Area 2	Business Line 1	Product 2	6 292,00 EUR

Figure 12. Business Warehouse source data file. Values are not proportional to actual sales

There are two steps which have to be carried out to retrieve the up-to-date data to Sales Analysis Tool. The first one is to open the previously mentioned BEx Analyser Workbook and save it to a certain file location with a certain name. The user needs to check that the data is retrieved up to the date they want, from cell F4 as shown in figure 12. Then the user must open the Data Transformation File (depicted in figure 13 below) and click the button “Retrieve Data”. This will run the macro.

	A	C	D	F	H	J	K
1							
2	16576431	Count of rows	unt of rows	Count of rows	Count of rows	Count of rows	Column total €
3							
4	Retrieve data	Sold to customer name	Billing doc. date	Sales group name	BL name	System name	Gross sales 2017
5		Customer 481	2.1.2017	FI Area 3	Business Line 1	Product 5	6 037,00 EUR
6		Customer 415	2.1.2017	FI Area 2	Business Line 2	Product 5	2 952,00 EUR
7		Customer 289	3.1.2017	FI Area 2	Business Line 1	Product 8	3 710,00 EUR
8		Customer 111	4.1.2017	FI Area 1	Business Line 1	Product 6	4 188,00 EUR
9		Customer 425	4.1.2017	FI Area 1	Business Line 2	Product 3	4 865,00 EUR
10		Customer 455	4.1.2017	FI Area 1	Business Line 1	Product 6	3 905,00 EUR
11		Customer 489	4.1.2017	FI Area 1	Business Line 2	Product 2	7 762,00 EUR
12		Customer 233	4.1.2017	FI Area 2	Business Line 2	Product 3	3 913,00 EUR

Figure 13. Data Transformation file, figures not proportional to actual sales

The macro first opens up the saved copy of the BEx Workbook, which is now a normal Excel file. It retrieves all data from the Workbook and checks the checksum in Data Transformation file (cell A2 in figure 13) matches to the checksum in the BEx Workbook copy (cell F12 in figure 12). The macro will display a message if the figures do not match, and the user can check why there is a mismatch.

Once the data is in the Data Transformation file, a table automatically transforms the data into a more fitting form and adds some information. It takes its information from tab "Lists" in the same file, which contains several tables with additional information, such as

customer hierarchy, new sales areas, and product regrouping. One of the tables on the tab is called "Geographical_Location", depicted in figure 14 below, which links a postal code to the correct city, municipality, and province. The original geographical data was taken from Statistics Finland website. The admin user must bear in mind that these lists on the "Lists" tab do not refresh automatically. All of the tables should be updated at steady intervals, such as twice a year. The “Lists” tab includes information about each table. Where the data is from, how often it should be refreshed and when it was last updated.

Postinumero alue	Kunta	Maakunta	Suuralue
00100	Helsinki	Uusimaa	Helsinki-Uusimaa
00120	Helsinki	Uusimaa	Helsinki-Uusimaa
00130	Helsinki	Uusimaa	Helsinki-Uusimaa
00140	Helsinki	Uusimaa	Helsinki-Uusimaa
00150	Helsinki	Uusimaa	Helsinki-Uusimaa
00160	Helsinki	Uusimaa	Helsinki-Uusimaa
00170	Helsinki	Uusimaa	Helsinki-Uusimaa

Figure 14. Geographical location table in Data Transformation file (adapted from Statistics Finland 2019)

The transformed data is yet again automatically retrieved to the third tab, called "Transfer table". This tab contains only the necessary data in the correct order. If the data on this sheet matches the data on the Master data table, the macro moves forward and pastes the data of this table into the Sales Analysis Tool as plain values. At his point, the macro updates all time-filter selections, so that YTD slicers select data up to the same month as the data, and the month slicers only select the month up to where the data is. Then there is a final data check, after which the macro saves three copies: a safe copy of the tool into an archive, one copy to shared finance folder, and one to sales managers’ own folder at the common network drive of the commissioning company. The sales managers' copy only contains the tabs that are pertinent to their work. All files are protected with a password before they are saved. Admin users are given the password to unprotect the sheets.

4.2.3 Sales analysis tool – the analytics layer

There are eight tabs (or sheets) in the final tool, two of which are deleted and three of which are hidden for the sales managers' version. All of the sheets are shortly presented in this subchapter, in the same order as they are in the tool. The first sheet, called "Customer analysis" is mainly directed to the sales managers. The sheet is displayed in figure X below. It has been done in brand colors, and it has been made to show net sales figures

so that it is easy to see the sales development and business line proportions. The slicers, that can be seen on the bottom right of the picture affect the chart and all the tables on this sheet. There are four buttons on this sheet, all of which run a macro. The two buttons shown in figure 15 clear all slicers on this sheet except for time-related slicers which are not visible. The data can be sliced geographically, by three levels of customer hierarchy, by sales area, business line, and product.

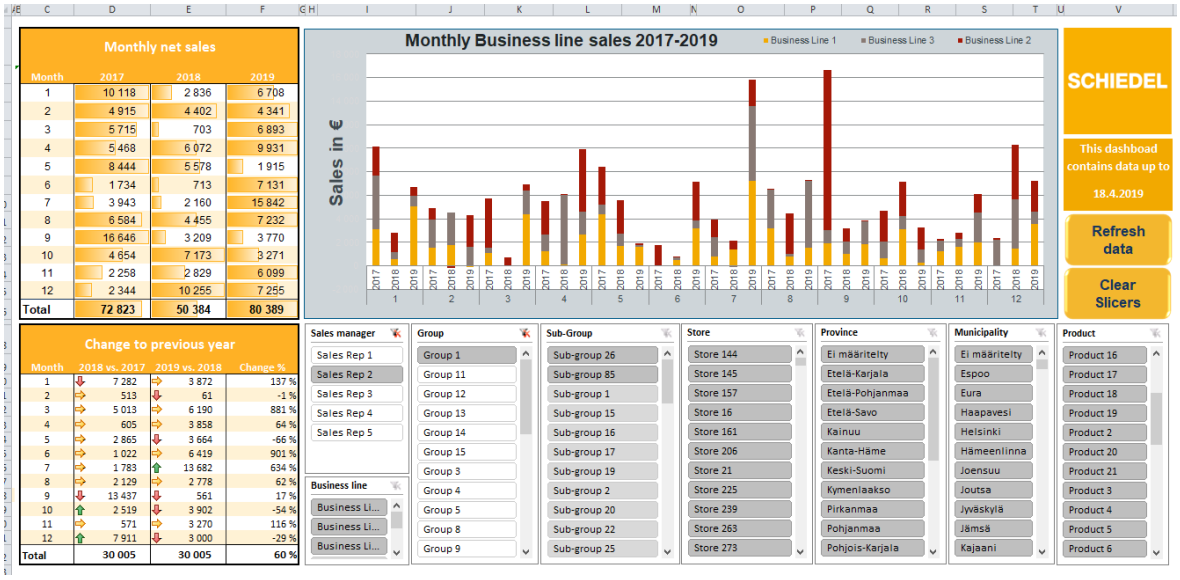

Figure 15. Customer Analysis tab. Values are not proportional to actual sales

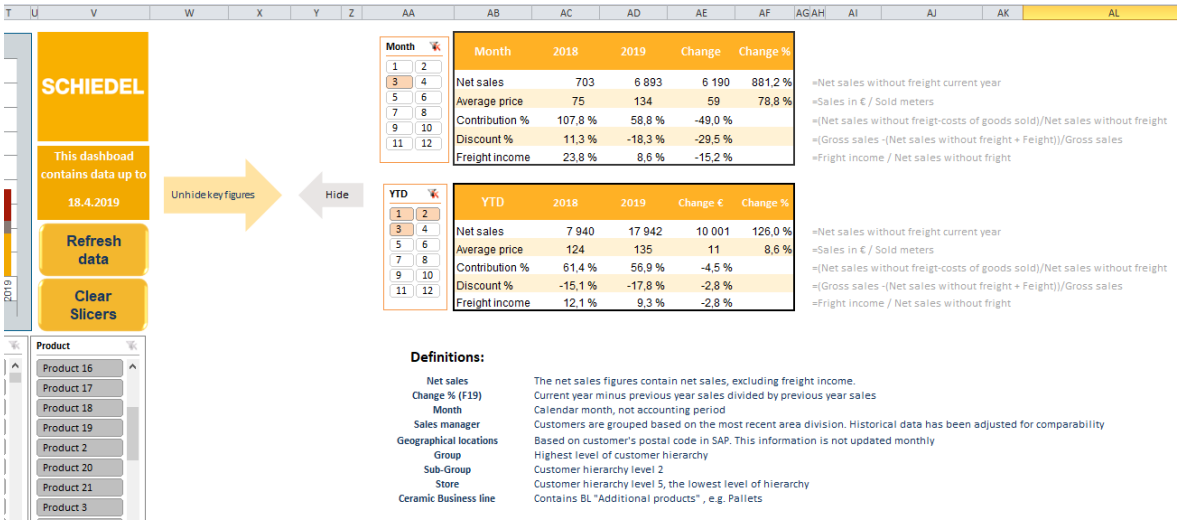

Figure 16. The hidden key figure pane of Customer Analysis tab. Values are not proportional to actual sales or costs

If a user clicks an arrow on the right of the chart, as depicted in the figure 16 above, some more information about the key figures for the selection is displayed, as well as definitions of all the figures of the sheet. The “hide” arrow hides the pane. These commands to refresh data, as well as unhide and hide columns have been made with macros because the

protection placed on the sheet prevents users from doing those actions themselves. The pivot tables for these charts and tables are hidden to the right and cannot be accessed without unprotecting the sheet.

The second sheet, displayed in figure 17 below, gives prescriptive visiting suggestions for sales managers. They can pick where they are going to, and the two pivot tables will tell the stores whose sales have increased and decreased the most. The clear filter button clears all filters but the “YTD” filter. The data in the first two tabs contain only product sales figures, so the freight income from customers is excluded. The periods are calendar months, as those have more significance for customers.

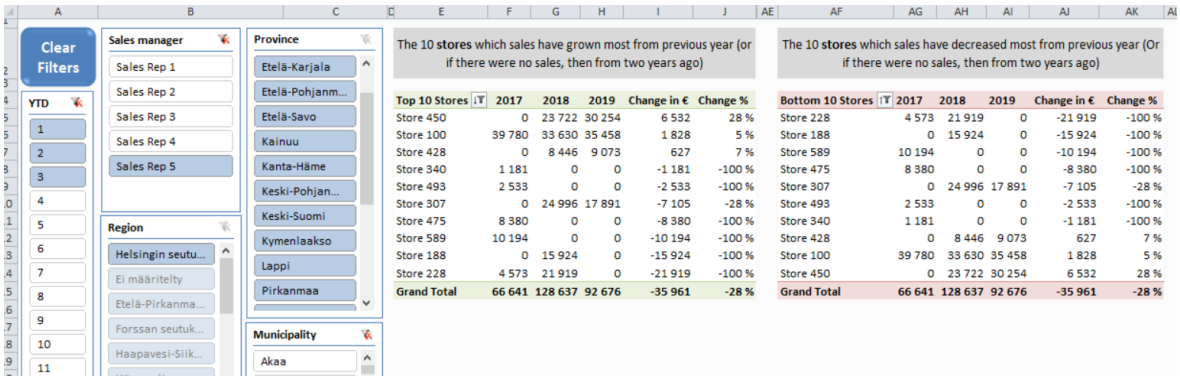

Figure 17. Where to visit tab of the Sales Analysis Tool

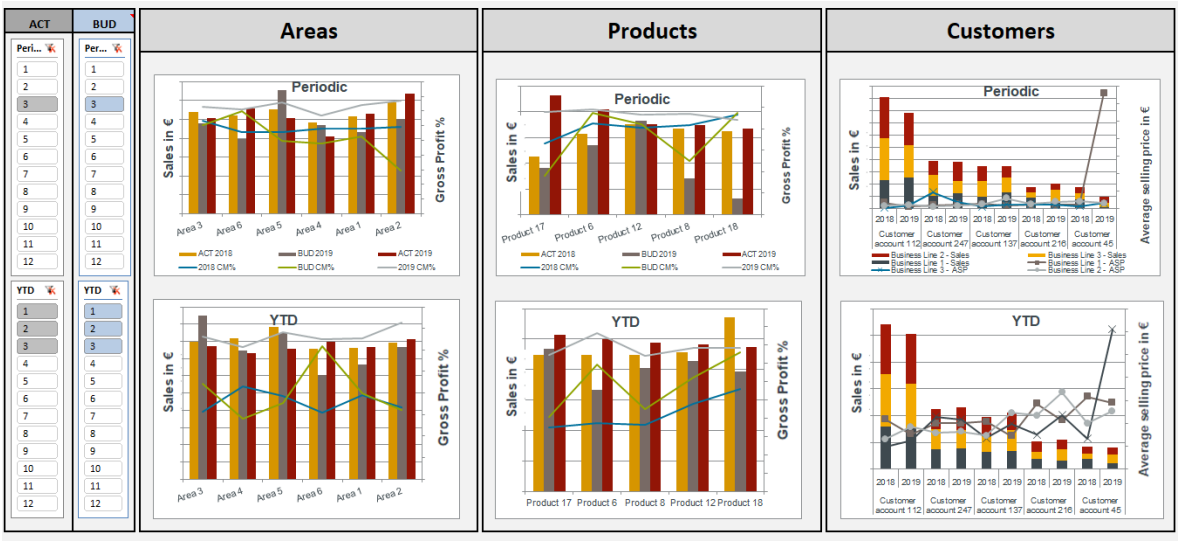

Figure 18. Monthly presentation tab. None of the figures, actual or budgeted are proportional to the real figures

The third sheet displayed above in figure 18, called Monthly presentation, has been made to generate six charts. Two charts to compare areas, two to compare the top 5 products, and two compare top 5 customer accounts. The sales and gross profits of these three

dimensions are compared against the previous year and budget, both on a periodic level, and year-to-date-level. Unlike in the two previous sheets, this sheet has been made for monthly reporting purposes, so it contains net sales including freight income, and the periods are based on fiscal periods, not calendar months. The fourth sheet, called MP Pivots contains six pivots to display the actual figures for the six charts, and another six pivots to display the corresponding budget figures. Then there are six tables that combine data from actual pivots and budget pivots. The charts on monthly presentation tab are formed of these tables. The MP pivots sheet is hidden from all saved versions.

The next two sheets contain actuals data and budget data. Actuals data is where the data from Data Transformation file is imported. It contains checksums for all columns and a button which runs a macro that saves finance and sales manager file version when clicked. The budget data tab contains a detailed sales budget. The data is copy pasted there manually once a year, in January. More details on where to get the data are discussed in appendix 2.

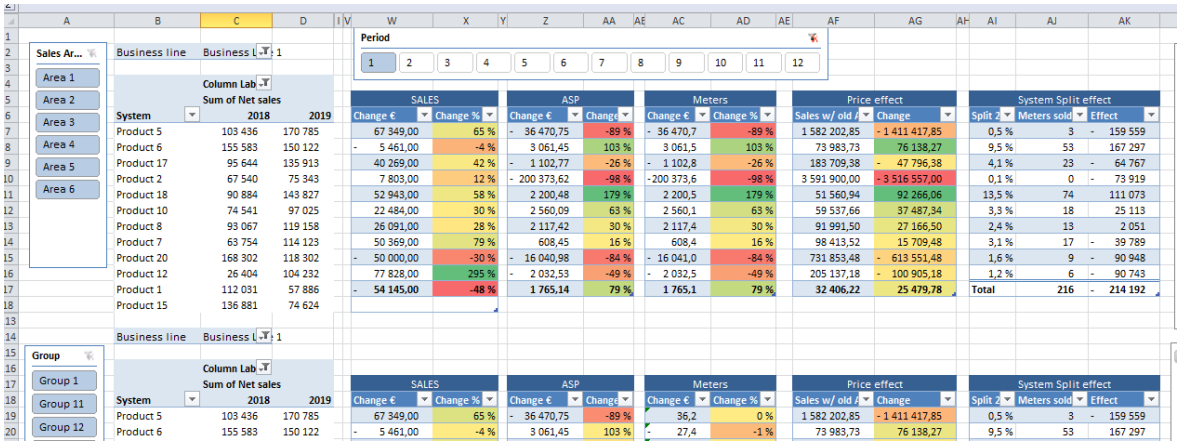

Figure 19. Systems analysis dashboard.

The last two sheets are deleted from sales managers versions. They are called MC Systems and MC Customers. The letters MC come from Monthly Comments, which is the report where this information is used. They both offer various possibilities of analyzing how the sales figures have changed and why. On the MC Systems tab, displayed in figure 19 above, there is a pivot for each business line which shows all products belonging to that line. There are also several tables which analyze the change of sales, price, sold meters, and the effect of a price change and product mix change. There are also three slicers, which enable slicing both pivots by period, by area and by customer group. The sheet MC Customers is quite similar, but the pivots are organized based on customers. The tables in this sheet only calculate the percentage and absolute change for the customer on that row. The specific calculations for each table are introduced in Appendix 2.

4.3 Tool usability

One strength of this tool are the various analytic possibilities it offers to different types of users. However, this also poses a challenge, as different users and uses require many different viewpoints, which adds to the complexity of the tool.

As mentioned by Ong, Siew, & Wong (2011, 6) different user groups require different **aggregation levels**. This can be seen in the tool. The information displayed to a sales manager is much more granular than the information generated for monthly reporting purposes, where the total monthly sales are compared against the budget and the previous year. Different **viewpoints** are also offered. To facilitate the work of a sales manager who intends to visit a certain area in Finland, the tool provides a possibility of slicing the data by geographical dimensions, or by different levels of customer hierarchy. On the other hand, the monthly presentation dashboard shows the data on a high level of aggregation.

Another key difference between the user groups' needs are the **time periods.** As most of the sales managers' communication is directed towards the customers, it is of much more use to them to see information based on calendar months. The opposite applies to management and finance. As accounting, as well as reporting to the group is only done based on fiscal periods, the data provided for finance and management is based on 4-4-5 periods instead of calendar months. The word "**sales"** also means different things for these two user groups. The sales figures provided to the customers only contain the sales price of the sold products. Any invoiced freight or insurance fees are excluded, as they are a separate service provided by an external vendor. On the other hand, the company's total revenue consists of product sales and freight income. This is why the figure called "net sales including freight income" is used for group reporting purposes.

5 Discussion and recommendations for future improvements

This chapter summarizes the outcome and challenges of the project as a whole, as well as the project outcome. The realized benefits to the case company and the author are also evaluated.

5.1 Evaluation of project implementation

There were some adjustments to the original project plan, mainly the task priority and number of interviews. The specific schedule of the thesis project had to be reworked to fit with other priorities. Parts of the theoretical framework were postponed to be written later. The reason for this was that the tool was needed for period closing procedures as quickly as possible. The overall timeframe, however, remained as planned. Not all of the users were reached for face-to-face interviews due to differences in schedules. However sufficient feedback was gotten in task 1 to carry on to task 3.

5.2 Assessment of the project outcome

The tool has fulfilled the main expectations given to it. The final version is simple and fast and could not be much easier to use. It fulfills the usefulness and trustworthiness objectives as it gives accurate and relevant information on the sales of the company. The tool has also received positive feedback on its appearance. Although the tool currently meets the most important user requirements, some minor additions could improve the tool even further. These are addressed in subchapter 5.4.

The tool has already shown it can save up to four hours of the finance department's time during routine period closing procedures. As currently three countries in addition to Finland have planned to start using this, there would be around 16 hours of time saved each month. Figure 20 below shows how approximately two hours of time is saved each month, but also how the used time can be allocated to value generating deep analysis instead of monthly routine analysis. This is where the real value of the tool comes from: instead of routine tasks, the brainpower can be used towards generating valuable information for the company's management to support decision making and strategy. This outcome resembles the contemporary change in managerial accountant’s main duties discussed in chapter 2.2.1.

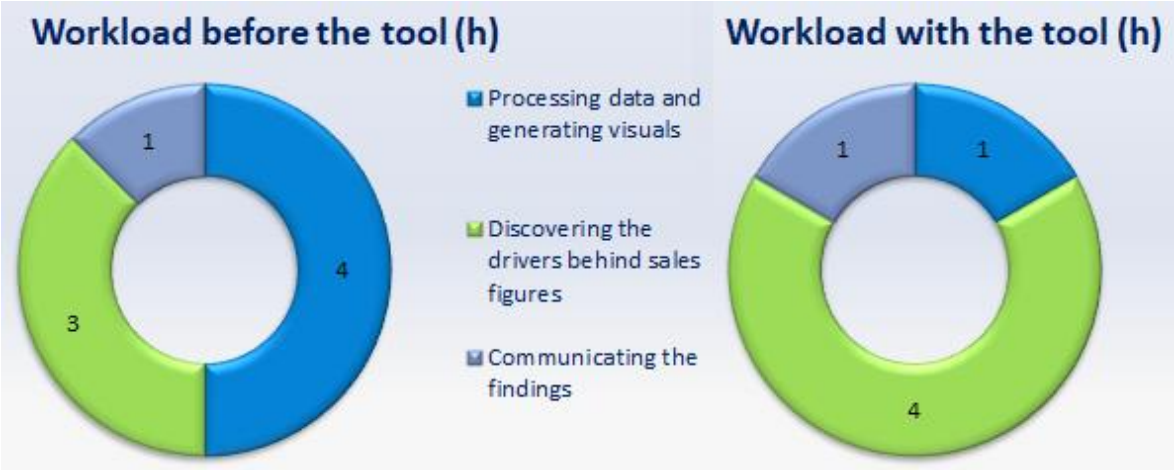

Figure 20. Monthly analysis workload before and after tool launch

This figure only includes the saved hours which can be measured with some certainty. Additionally, approximately one to four hours per month are taken up by different Ad Hoc analyses that have to do with sales. This tool can save up to 50% of that time, since processing the data with the tool is much faster than with BEx Analyser. So, with some reservation up to two saved hours per each month can be added up per each county.

As the tool has been launched to the sales department very recently, no realized benefits can yet be reported. However, as can be deducted from the company feedback, the tool has a real potential of adding value to sales work. The management plans obligate sales personnel to start using the tool on a monthly basis to find places for improvement as well as successes and the reason behind them. Over time the company expects these new routines and findings to result in improved sales tactics and increased sales.

There are some weaknesses that should be pointed out and kept in mind while using the tool. First of all, the tool can only be as accurate as the data it is built on. If any information is input incorrectly in SAP, the tool will also show this incorrect information. The Data Transformation does correct some data, such as sales area changes and the tool itself can filter out some redundant factors, such as closed customer accounts, but there is an infinite number of errors and inconsistencies that can occur.

Another point of weakness is that the additional data in the Data Transformation file is not automatically refreshed when changes occur. If there are changes in customer hierarchy, sales are or such, those might not be updated until some months after the change. This aspect will demand some active inquisitiveness from the admin user, so they keep on top of changes happening in sales and sales admin departments.

There are also vulnerabilities in the tool. One factor that will have a slight effect is year-end. Most of the tool could be built with dynamic formulas, which will update when the year changes. But Excel (at least Excel 2010, on which the tool was built), places some restrictions on the dynamic abilities of some Pivot tables. Pivot's calculated columns cannot be made truly dynamic. The admin user will have to update the formulas in each January. The macro is also vulnerable to some changes. As it opens up other Excel files and retrieves data from them, the location and name of the files need to stay exactly the same for the macro to work. Same goes for the folders to which the copies are saved. If the folder disappears, the macro will not function properly. Also, changes within the Excels, such as added or removed rows or columns, can affect the functionality of the tool. Most of these harmful changes can only be made by the admin user, so the risk of this happening is quite small. Also, the macro can be further developed to tell the admin user what the problem is and how to fix it.

5.3 Limitations and challenges

A complex tool like this would benefit greatly from business intelligence software, such as Microsoft Power BI, Click View, or an Excel extension called Power Pivot. However, as none of these were available at the time of implementing this tool, some creative ways to face the challenge were used.

The main **challenge** of the tool is the complexity of the functions, as demonstrated above. The more complex the analytical needs are, the more data is normally required. A more **extensive data** creates challenges for the tool usability as is tends to slow down the file. Especially keeping in mind that there is no in-memory computing available, this can be a problem. There are two solutions to this, which are both implemented in the tool. First one is that the data is kept as small as simple as possible under the circumstances. All excess columns are removed, and only numeric values and text are transported to the tool.

Only a few small tables contain formulas in the tool file itself. The tables for actuals data and budget data do not contain any formulas. Adding a formula to even one column would mean the formula will calculate thousands of times as it is done separately for each row. Instead, nearly all calculations are already done in Data Transformation Excel, as depicted in paragraph 4.3.3.

The second solution is to save the two versions of the sales analysis tool, both of which only contain the necessary tabs for the expected users. The tool version saved to sales personnel’s shared folder thus only has the following tabs visible: “Customer Analysis”,

“Where to visit” and if they wish, then also the “Monthly presentation”. The data tab and the pivot tab are hidden, and all other tabs are deleted. A similar procedure is done to the finance and management version, where only the relevant tabs are kept visible, and others are hidden or deleted. This reduces the file size and calculations and increases the speed noticeably.

Another challenge the complexity brings has to do with the **reliability of the tool**. The more charts and calculations the tool includes, the more it is at risk of becoming liable to errors caused by changes such as year-end. In the old tool, one had to chance many formulas throughout the tool in January, so that calculations that included numeric values representing the years (such as changes from the previous year) would not result in errors.

Figure 21 below represents the non-dynamic formula described above. The latter figure 22 depicts a formula where the year is not a numeric value, but a cell reference to cell E10. The value of E10, on the other hand, is the largest year in the "date" column of the actuals data minus one. This way, when the year values in the actuals data change, these tables and the formulas in it change too. No manual corrections are needed. Similar dynamic formulas are implemented throughout the tool, wherever possible.

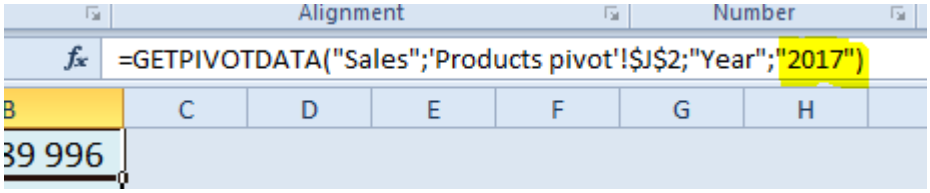

Figure 21, an Excel formula including a numeric year value

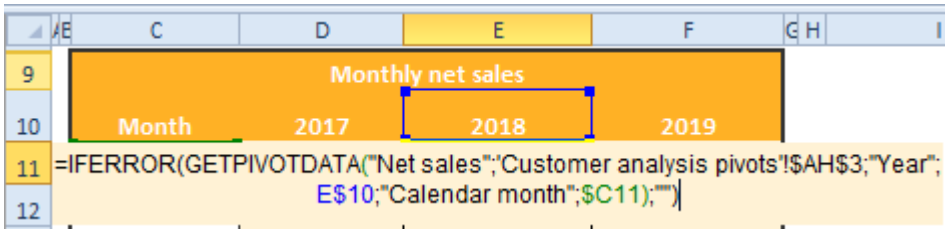

Figure 22, an Excel formula including a dynamic reference to the third largest year in the data

Another limitation to building the tool was the project scope. As the most important qualities requested of the tool were usability, simplicity, and reliability, some further developments had to be demarcated from this project and left in the part for recommendations for future development. It was deemed better to concentrate on reassuring the quality of the

tool instead of developing it further. As the thesis author is employers at the company, these future developments are likely to realize in the near future.

5.4 Recommendation for future development

The tool has been built so that it is relatively easy to continue developing it and adding functionalities. Some of these developments have been suggested by future users, and more suggestions are collected after the tool has been fully released to users.

The next big step for developing this tool is creating a visit analysis sheet. For this, it is necessary to create an additional logic that will collect and combine the visiting data with the sales data, and of course to create a dashboard that will visualize the results. This would be very useful to the commissioning company since there is no CRM currently, so this development will most likely be put to action shortly.

The visit analysis sheet will display at least two charts. The first chart will show the rolling 12-month average of customer visits and sales, displayed on a double axis chart. The chart can be sliced based on the type of visit, sales representative, customer group, area and any other relevant aspect available in the data. The other chart will benchmark the sales representatives against each other, and against last year.

There will also be several smaller improvements. Firstly, a possibility is added to view the Customer Analysis sheet figures based on the sold-to-party. This means the data can also be viewed based on who pays the invoice, as opposed to who placed the order. These are not always the same thing, and both types of information are needed depending on the situation. The customer data will also be enriched by industry sector. As discussed in subchapters 1.1 and 2.5.5 there are three main customer types for the commissioning company. At times it makes sense to analyze how the sales are developing in a particular sector. Both of these additions will need more data from the Business Warehouse. Another thing the company wishes to be added is a table where sales managers can see how they are doing against the budget. The situation is already depicted in the sheet “Monthly Presentation”, but Sales managers need a bit more detailed information.

5.5 Evaluation of learning

Overall the thesis project has strengthened the author’s professional knowledge. Writing the theoretical framework has helped her to not only deeply understand the terms used in her everyday work, but also to tie the theory to practice. She can now better understand

the practical implications of accounting and pricing decisions, and she can also see the connection to the bigger picture, the business strategy. All of this will greatly increase her professional ability to act as a consultant for management regarding sales and pricing. Having a deeper understanding of the two IFRS standards have also strengthened the author's ability to direct the financial accounting decisions.

On a more technical side, the author also gained a good amount of experience in Excel, especially macros. She had previously recorded some macros and modified the code only a little. This project has taught her to flexibly use a combination of coding and recording, and to troubleshoot errors, and apply outside examples to her own code. The basic concepts of VBA code are also familiar to the author now.

5.6 Feedback from the commissioning company

The Managing Director of the commissioning company states the tool resulting from this thesis project is implemented as a central part of the monthly sales analysis. The report enables the sales managers to analyze the sales themselves and on a very detailed level. The "Where to visit" sheet also helps to spot any customers that require attention. The report functions as a very visual tool for the sales managers. Previously they have had to retrieve sales statistics for customer meetings manually from SAP. Now they can present figures straight from this tool. This will both save their time and give a more professional appearance.

The Managing Director thinks the author has shown great judgment when deciding the contents and technical execution. Due to the inspirational insights, the author has accomplished a report with clear and easily understood, even though the master data in and of itself does not allow reports of this composition. The reprocessing of the data, as well the functionalities built skillfully with macros and pivots make the report easy to use. This was set as a priority so that the report can be incorporated into the active and comprehensive use of sales personnel. The report has exceeded expectations given to it.

5.7 Conclusion

Keeping in mind the limitations of project scope and available software the tool was a success. Both the author and the commissioning company are very happy with the result and are keen to use it as well as continue developing it further.

References

Accounting Act 1336/1997.

Azvine, B., Cui, Z, Nauck, D. & Majeed, B. 2006. Real Time Business Intelligence for the Adaptive Enterprise. Conference paper. E-Commerce Technology. CEC/EEE 2006 Joint Conferences. URL: https://www.researchgate.net/publication/4245759_Real_Time_Business_Intelligence_for_the_Adaptive_Enterprise. Accessed: 5 February 2019.

Barker, R. 2011. Short Introduction to Accounting, Cambridge University Press, Cambridge.

Beil, F. 2013. Revenue Recognition: Principles and Practices. Business Expert Press. New York.

Braun, K. & Tietz, W. 2015. Managerial accounting. 4th ed. Pearson Education Limited. Harlow.

Carmichael, D & Whittington, O. 2012. Accountants' Handbook, Financial Accounting and General Topics: Financial Accounting and General Topics. John Wiley & Sons, Incorporated. Hoboken.

Cokins, G. 2013. Top 7 Trends in Management Accounting. Strategic Finance, 95, 6, pp. 21-29. URL: https://www.researchgate.net/publication/301317287_The_Top_Seven_Trends_in_Management_Accounting. Accessed: 3 March 2019.

The Conceptual Framework for Financial Reporting. International Accounting Standards Board. URL: http://eifrs.ifrs.org/eifrs/UnaccompaniedConceptual. Accessed: 16 February 2019

Dyson, J. Franklin, E. 2017. Accounting for non-accounting students. 9th ed. Pearson Education. Harlow.

Ferrari, A. & Russo, M. 2017. Analyzing Data with Power BI and Power Pivot for Excel. Kindle Edition. Microsoft Press. Available from https://www.amazon.co.uk/Analyzing-Power-Pivot-Business-Skills-ebook/dp/B0713N6BBW/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=&sr=. Accessed: 2 December 2018.

Fu, H. & Fu, B. 2002. SAP BW: A Step-by-Step Guide. Addison-Wesley Professional.

Harrison, W., Horngren, C., Thomas, W. & Suwardy, T. 2013. Financial Accounting. 9th ed. Pearson Education. Harlow.

Harrison, W., Horngren, C., Thomas, W. & Suwardy, T. 2014. Financial Accounting: international financial reporting standards. 9th ed. Pearson Education. Harlow.

Hočevar, B., & Jaklič, J. 2010. Assessing benefits of business intelligence systems – A case study. Management, 15, 1, pp. 87-119.

Horngren, C., Datar, S., Rajan, M. 2015. Cost Accounting, Global edition. Pearson Education. Harlow.

Horngren, C., Sundem, G., Elliott, J., & Philbrick, D. 2012. Introduction to financial accounting. 10th ed. Pearson Education. Harlow.

Huefner, R. 2015. Revenue Management: A Path to Increased Profits. Business Expert Press. New York.

IFRS Foundation. 2018. IFRS Foundation updates jurisdiction profiles to reflect decision by 17 African countries to adopt IFRS Standards from 2019. URL: https://www.ifrs.org/news-and-events/2018/01/ifrs-foundation-updates-jurisdiction-profiles-to-reflect-decision-by-17-african-countries/. Accessed: 23 March 2019.

IMA 2008. Definition of Management Accounting. Institute of Management Accountants. URL: https://www.imanet.org.cn/uploads/resource/2015-11/1447061510-17551.pdf. Accessed: 6 February 2019.

International Accounting Standard 2. Inventories. International Accounting Standards Board. URL: http://eifrs.ifrs.org/eifrs/PdfAlone?id=19292&sidebarOption=UnaccompaniedIas. Accessed: 20 March 2019.

International Financial Reporting Standard 15. Revenue from Contracts with Customers. International Accounting Standards Board. URL: http://eifrs.ifrs.org/eifrs/PdfAlone?id=19288&sidebarOption=UnaccompaniedIfrs. Accessed: 3 February 2019.

Jiawei, H., Jian, P. & Kamber, M. 2011. Data Mining: Concepts and Techniques. 3rd ed. Morgan Kaufmann. Burlington.

Jiménez, G. & International Chamber of Commerce. 2012. ICC Guide to Export-import: Global Standards for International Trade. ICC Services. Paris.

Liozu, S. 2015. The Pricing Journey: The Organizational Transformation Toward Pricing Excellence. Stanford University Press. Stanford.

Luckevich, M., Misner, S. & Vitt, E. 2008. Business intelligence. Microsoft Press.

Lönnqvist, A. & Pirttimäki, V. 2006. The Measurement of Business Intelligence. Information Systems Management, 23, 1, pp. 32-40.

Moulton, D. 2015. "Beating back stereotypes in accounting", Bottom Line, vol. 31, no. 6, pp. 9.

Nakisa. 2019. Benefits and Challenges of the 4-4-5 Calendar. URL: https://www.nakisa.com/blog/accounting-compliance/benefits-and-challenges-4-4-5-calendar. Accessed: 23 March 2019.

Ong, I., Siew, P. & Wong, S. 2011. A Five-Layered Business Intelligence Architecture. Communications of the IBIMA, 2011, 695619, pp. 1-11.

Scheps, S. 2008. Business intelligence for dummies ®. Wiley. Hoboken.

Schiedel. 2018. Our key figures. URL: https://www.schiedel.com/fi/meistae/avainluvut/. Accessed: 2 December 2018.

Sharda, R. 2018. Business intelligence: A managerial approach. 4th ed. Pearson. Harlow.

Statistics Finland 2019. Paavo data descriptions. Helsinki. URL: https://www.stat.fi/tup/paavo/paavon_aineistokuvaukset_en.html. Accessed: 9 February 2019.

Watts, S. 14 December 2017. What is ETL (Extract, Transform, Load)? ETL Explained. The Business of IT Blog. URL: https://www.bmc.com/blogs/what-is-etl-extract-transform-load-etl-explained/. Accessed: 30 March 2019.

Zallocco, R., Bolman Pullins, E. & Mallin, M. 2009. A re-examination of B2B sales performance. Journal of Business & Industrial Marketing, 24, 8, pp. 598-610.

Appendices

Appendix 1. Thesis planned and actual activities

Thesis start week	Thesis end week		
1	17		Planned
			Actualized

						January					February				March				April			
						Weeks																
No.	Task	No.	Subtask	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Theory	1.1	Setting up refworks	1	1																	
2.		1.2	Reading and writing about management accounti	1	2																	
3.		1.3	Reading and writing about financial accounting	3	4																	
4.		1.4	Reading and writing about sales and pricing strat	5	6																	
5.		1.4	Thesis advisor meet 1	7	7																	
6.		1.5	Finalizing theoretilcal framework	8	9																	
7.	Defining project	2.1	Interviewing future users	3	5																	
8.	outcome	2.2	Deciding the further improvements based on fee	5	5																	
9.	Implementing	3.1	Adjusting the data query	6	6																	
10.	Beta version	3.2	Adding needed charts and deleting unnecessary	6	8																	
11.		3.3	Checking calculations	8	9																	
12.		3.4	Working on tool usability	9	9																	
13.	Beta testing	4.1	Giving Beta version to testing	10	11																	
14.		4.2	Gathering results by email guestionnaire or an in	12	12																	
15.		4.3	Thesis advisor meet 2	12	13																	
16.	Finalizing the	5.1	Making improvements based on Beta testing	13	13																	
17.	release version	5.2	Writing user instructions	13	13																	
18.	Making the tool	6.1.	Making tool figures and customer names present	14	14																	
19.	presentable	6.2.	Writing about making the tool	14	15																	
20.		6.3.	Possible thesis advisor meet 3	15	15																	
21.	Analysing the	7.1.	Analysing the final tool	16	16																	
22.	outcome	7.2.	Making recommendations for future use	16	16																	
23.		7.3.	Finalizing whole thesis	17	17																	

Thesis start week	Thesis end week																									
2	19					January					February				March				April				May			
						Weeks																				
No.	Task	No.	Subtask	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19				
1.	Theory	1.1	Setting up refworks																							
2.		1.2	Reading and writing about financial accounting																							
3.		1.3	Reading and writing about management accounting																							
4.		1.4	Reading and writing about revenue and pricing strategy																							
5.		1.5	Reading and writing about Business intelligence																							
6.		1.6	Thesis advisor meet 1																							
7.		1.7	Finalizing theoretical framework																							
8.	Defining project	2.1	Preparing interview questions, and																							
9.	outcome	2.2	Interviewing future users																							
10.	Implementing	3.1	Adjusting the data query																							
11.	Beta version	3.2	Adding needed charts and deleting unnecessary ones																							
12.		3.3	Checking calculations																							
13.		3.4	Working on tool usability																							
13.	Beta testing	4.1	Giving Beta version to testing																							
14.		4.2	Gathering results by email guestionnaire or an interview																							
15.		4.3	Thesis advisor meet 2																							
16.	Finalizing the	5.1	Making improvements based on Beta testing																							
17.	release version	5.2	Writing user instructions																							
18.	Making the tool	6.1.	Making tool figures and customer names presentable																							
19.	presentable	6.2.	Writing about making the tool																							
20.		6.3.	Possible thesis advisor meet 3																							
21.	Analysing the	7.1.	Analysing the final tool																							
22.	outcome	7.2.	Making recommendations for future use																							
23.		7.3.	Finalizing whole thesis																							

Appendix 2. User instructions for the sales analysis tool: Setting up

First, you have to extract the compressed folder called Sales Analysis Tool you have been sent, directly to your C-drive. Now when entering the folder, it should look exactly like this:

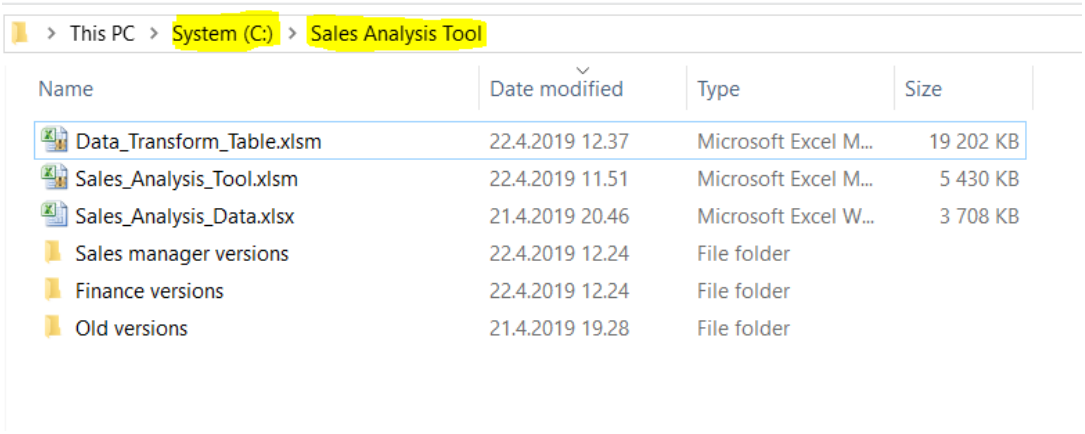

Figure 1. How the files and folders should be located on your computer.

Then you must open up the Data_Transform_Table to set up the lists. On sheet “Lists”, you can find several data tables. You can use these tables to convert Business Warehouse values into values that are more fitting to your purposes. Figure 2 below depicts an example of such a table. On the first column (with blue header) are the values found from the BW_Data table. The columns with red header are auxiliary columns, which are not used as such. The columns with green headers contain values which are retrieved to the BW_Data table in Master data sheet. The column header in green columns corresponds to the column header in the BW _Data table.

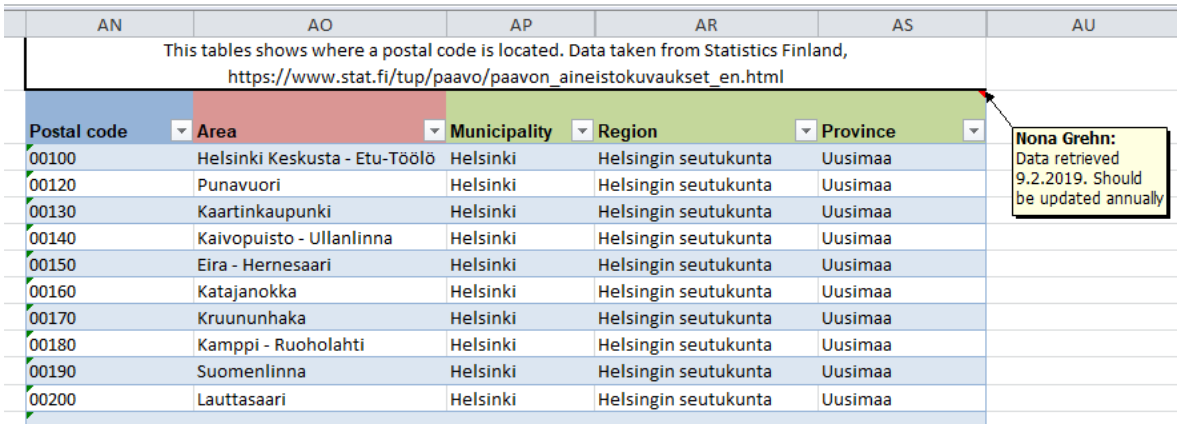

Figure 2. Geographical_Location table, with an explanation and data source on top, and retrieval date in the note

Some of the tables (such as changes in sales areas) have to be filled manually, some data has been retrieved from SAP with a transaction or with the help of IT department, and Geographical_Location data is from Statistics Finland website. On top of each table, one can see a description of the data, and where it was gotten from. The notes include details on when the data was retrieved.

At this point, you can also change the locations where different versions of the Sales Analysis tool are automatically saved. The existing settings are as follow:

- A copy of the BEx Analyser Workbook is saved to C:\Sales Analysis Tool\Old versions\BW Data files
- A copy of the Data Transformation Table is saved to C:\Sales Analysis Tool\Old versions\Data Transfer files
- A copy of the Sales Analysis Tool is saved to C:\Sales Analysis Tool\Old versions\ Sales Analysis Tool
- An unprotected copy of the Sales Analysis Tool is saved to C:\Sales Analysis Tool\Finance versions
- A protected copy of the Sales Analysis Tool, with fewer sheets is saved to C:\Sales Analysis Tool\Sales manager versions

Especially the last two versions can be saved to a different file location, such as sales managers' shared file on S-drive. Such a change needs to be reflected in the macro code in the Data Transformation Table –file. You can do it like this:

- Press alt+F11 to open up Visual Basic editor, and open Module 8
- Scroll down near the bottom, until you find Sub Save_copies()
- Replace the Finance version's file location with the desired location
- Do the same for sales managers' version
- You can also decide not to save either of these last two versions, by going to the top of the code, and removing this line:

```
Sub Main2()

    Data_Retrieval
    Break_links
    Table_Resizing
    Clear_data_outside_table
    Deleting_extra_rows
    Data_Checking
    Data_Sending
    Save_copies

End Sub
```

Figure 3. The line to remove if no extra copies are needed.

The budget must be copy-pasted manually to the sales analysis tool in January. There is an auxiliary file for this called "Budget data". You only need to clear the data from Table 1,

paste the sales budget upload CSV file, and update the lists on sheet lists. Please note that currently, the lists contain relevant systems and sales areas for Finland's budget, so additional system numbers and names might have to be added, and the sales groups should be changed. Once the data is correct, and there are no errors in columns "System name" or "Area name", you should clear the "Budget_data" table from the sales analysis tool and paste the new budget data **as values**.

Finally, you should open up the Sales analysis data file in BEx Analyser and save it to yourself as a workbook.

Appendix 3. User instructions for the sales analysis tool: Data retrieval

To retrieve new data after a period has ended, you need to

1. Open up the Sales Analysis Data Workbook in BEx Analyser, refresh, and select the correct time period.

2. Check the data is until correct date from cell F4, and save the file with name Sales_Analysis_Data.xlsx to the location: C:\Sales Analysis Tool

   Note that the file needs to be named exactly correctly, and as Excel Workbook, not Macro-Enabled Workbook)

3. Close the file and open the Data Transform Table

4. On sheet Master data click on the button “Retrieve Data”

5. Wait for the macro to run. This can take several minutes.

6. If there are any checking errors the macro will stop running. You need to find out why there is an error and click the next button to continue.