A new Lean accounting system for a small Nordic IT company
Case company X

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Abstract

Date

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The thesis is a research on an effective accounting system for a small-sized Nordic IT company with the application of Lean Philosophy.

Lean theories from Lean Manufacturing, Lean Thinking of Lean Enterprise to Lean Accounting are covered to deliver an in-depth understanding of Lean Philosophies which serve as a strong theoretical background for the research.

The research consists of the application of various Lean methodologies ranging from Value Stream Mapping, and Waste Analysis to Process Capacity Study in order to identify problems faced by the case company. The aim is, then to suggest a strategy to eliminate those problems by addressing the roots underlying and finally provide Lean improvement actions such as Work Standard, Mistake Proofing, Autonomation and Automation as well as the integration of supporting systems to tackle those roots and streamline the whole process across the entire organization.

The final result of the research is about the future of the accounting process with more automated processes substituting manual work, shorter processing times, reduced waiting time leading to a shorter cycle time of the whole process as well as all 100% completion rate and zero defect accuracy.

Continuous improvements and trainings have to be maintained in order to ensure the success of the implementation of the future system.

Keywords Lean, Value Stream Mapping, Mistake Proofing, Work Standardization, Automation

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1 Introduction

The introduction chapter presents the overview of the need for this workbook, an introduction to the related parties as well as related matters tied to the conduction of this workbook.

This workbook includes 6 main chapters. Each chapter has sections and subsections.

The first chapter will give a closer look at the thesis objective and how the research about it would be conducted. While thesis topic and investigative questions will help to give a general picture about which are the main objectives that should be studied in the thesis topic area, demarcation will differentiate thesis topic from other similar topics, narrowing the scope of the research, which, in turn will help researcher to go faster and deeper in the concerned subject. Besides, anticipated benefits should be also mentioned in order strengthen what is the purpose for this thesis to be conducted, who will receive benefits from it. Another important matter should be also included is the international aspect of the thesis. The reason for that is to fulfil the requirements for an International Business degree qualified thesis. Risk and risk management will help researcher can address the risks beforehand and have plans to tackle them effectively.

The second chapter presents theoretical framework of the research with key concepts which will it easier for readers to understand those mentioned concepts in later chapters. Theoretical framework lays the theoretical ground for the research to develop. Key concepts will provide theoretical elements to the better under-standing on the main thesis's objectives

The third chapter presents research methodology with research design, research method, data validation and reliability and research analysis methods. This chapter summarizes the methodologies the author utilizes to collect, validate and analyse the data for the research.

The fourth chapter summarizes the result of the research. In this chapter, the author combines theoretical background from chapter 2 with research methodology from chapter 3 and apply to collected data from case company.

The fifth chapter is a collection of recommended accounting software for case company.

The last chapter is the conclusion for the research and the self-assessment and learning for the author.

The overall goal for this research is to identify problems faced by the accounting department of commissioning company, thus to develop suitable and effective accounting solutions so that case company can apply.

1.1 Background

Proper financial system is a vital aspect of any business of any size in the world. It is a set of interrelated procedures consisting of measuring and summarizing business activities, interpreting and analysing financial data and finally reporting results under financial statement to serve a variety of purposes of company's stakeholders. Managers utilize financial information to assess efficiency of operation in order to make short-term and long-term business decision, which, in turn, improve company's profitability. As a result, company can attract more investments from potential investors who can compare financial data published from different companies, thus invest in the most viable enterprises. Besides, government and other regulatory entities can track company's regulation compliance based on tax performance as part of financial statements. Overall, building an efficient, reliable and transparent accounting system is an important solid part that lay down the foundation for any kind of business.

Lean Production approach is firstly introduced and developed by Toyota Japan in their 1960s Toyota Production System which aims to shift the focus of the manufacturing engineer from individual machines and their utilization to the flow of the product through the total process (McVay, Kennedy & Fullerton 2013, 4). In the late 1980s and early 1990s, pioneering companies in embracing lean production methodologies discovered that lean thinking is beyond manufacturing to other business aspects such as logistics and distribution, human resources, accounting and finance. This thought has been gradually recognized and applied widely around the world since then and lean accounting principles derived from here.

Acknowledging the Lean Philosophy as a continuous critical improvement business strategy that can leverage companies to achieve their operation efficiency, throughout of this work, the author utilizes this in the design of an accounting system for a small sized IT company based in Helsinki and Tallinn.

1.2 Thesis Topic

This section defines the topic for this workbook. The topic is "**Research on a new accounting system for a small-sized Nordic IT company: Case company X**".

1.3 Research Problem and Investigative Questions

This section defines research problem and investigative questions for this workbook with the reference to where to find theoretical framework, source of information and result related to each investigative question.

This thesis is to research on the feasibility of the application of Lean Accounting Philosophy and Methodologies in the development of new accounting system for commissioning company. As a result, the research problem is **how could case company apply Lean Accounting Philosophy and utilize Lean Methodologies as vital tools to improve their current accounting system?**

There are four investigative questions (IQs), which support the author to gather data, analyse data and eventually deliver the result, as follows:

- IQ1: Why should companies apply Lean Philosophy in the design of accounting system?
- IQ2: What are the problems and their underlying roots in accounting system faced by case company under the scope of Lean Philosophy?
- IQ3: How Lean Principles and Methodologies can be applied to improve accounting processes in case company?
- IQ4: Which is the suitable accounting software for case company?

Table 1 presents the overlay matrix of theoretical framework, sources of information and the chapter location of results in which each investigative question is discussed, analysed and finalized.

Table 1. Overlay Matrix

IQs	Theoretical Framework	Sources of Information	Results (Chapter)
1	Lean Production	Individual Research	2.1
	Lean Thinking – Lean Enterprise		2.2
	Lean Accounting		2.3
2	Value Stream Mapping	Interview Case Company	4.1 & 4.4
	Lean Waste	Observation	4.2.1
	Value-Added/Non Value Added Activities	Individual Research	4.2.2

	Defects per Million Opportunities		4.2.3
	Root-Cause Analysis		4.3.1
3	Process Streamline	Individual Research	
	− Word Standardization − One Piece Flow Technique − Value Stream Chart of Account		4.4.1 4.4.1 4.4.1
	Mistake-Proofing		4.4.3
	Automation		4.4.2 & 4.4.4
	Autonomation		4.4.5
4	Enterprise Resource Planning	Interview Case Company	5
	Cloud – based software	Individual Research	

1.4 Demarcation

This section defines the criteria needed to demarcate my thesis topic from other topics that are very close but do not belong to it as follows: this topic is to be narrowed into the scope of a research on an efficient e-accounting system which possesses specific features, required by commissioning company, that the current system does not. In other words, other functions of an effective e-accounting system in general can be mentioned in the way to strengthen the main objectives but not be mentioned too deeply or separately to make it become one of the main objectives.
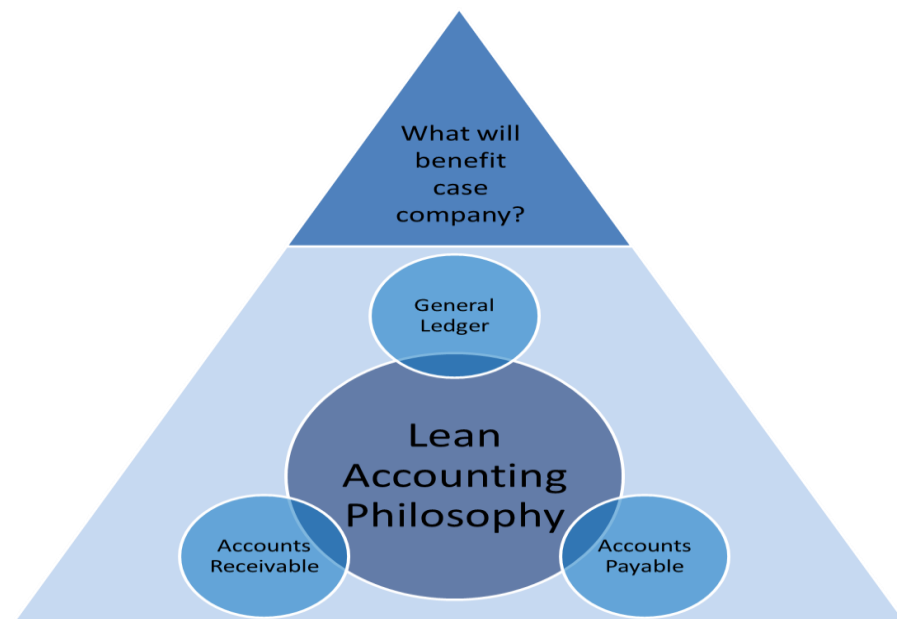

Figure 1. Demarcation of Workbook

Figure 1 presents the demarcation of this workbook. The author utilizes a triangle consisting of two hierarchical parts to visualize the scope of this research. The lower part, which serves the theoretical objective of this research, presents the focus on the application of Lean Accounting philosophy and methodologies in three main accounting processes in company X which are Accounts Receivable, Accounts Payable and General Ledger. There are, however, not all activities performed in these three processes are presented and improved in this workbook. The higher part of the triangle, which serves the empirical objective of this research, addresses the stated above matter as it narrows the research to the investigation and improvement of only what would benefit commissioning company given with provided data from case company.

On the other hand, this research also focuses on a computerized accounting system rather than the conventional accounting system.

1.5   International Aspects

The international aspect of this workbook is very clear in the sense that it is researched based on the data of an IT company conducting business in Nordic and Baltic countries with Finnish is the main market. The financial data of the case company has to comply with both Finnish and Estonian laws.

1.6   Anticipated Benefits

The stakeholders for this thesis are the case company, Haaga – Helia University of Applied Sciences, and the author. The author's goal is to conduct a valuable and applicable research which, in turn, fulfills both academic and practical purposes of all related parties. In other words, the author is able to apply knowledge gained from Haaga – Helia, broaden and deepen knowledge throughout the development process of the research and eventually deliver a qualified thesis to Haaga – Helia and a practical research for the accounting department of the case company.

1.7   Commissioning Company

Company X is a small-sized privately owned and cash flow financed Nordic company conducting business in Information Technology Solutions industry since 1990. The company has been developing mobile tools and solutions in Linux, Microsoft, Apple and Android environments for sales field companies in Fast Moving Consumer Goods industry for over 25 years. The target market is Nordic and Baltic countries with Finland being the main market. Company X also has few customers in South Africa. Headquarter, located in

Tallinn, takes charge of administration, accounting and service development. The Helsinki subsidiary is responsible for customer acquisition and services.

Company X has been using Axapta computerized accounting system, former version of Microsoft Dynamics AX, for over 10 years which has showed increasing disadvantages and inadequacies as business has grown, the circle of customers has expanded, as well as transactions has become more complex, which, eventually has led to unnecessary manual works from accounting department. Besides, while the maintenance cost is high to very high compared to other systems available in the market, the system does not possess up to date functions that needed to facilitate current business operations such as electronic invoicing, electronic banking etc. Thus, the need for a new effective computerized accounting system is crucial for company X to keep up with its current pace of business. [1]

1.8   Risk and Risk Management

This section addresses the risks faced by the author on the research conducting process. The potential risks come from the author, validity and factors in contextual environment.

What can threaten the completion of this research is that it is either the author or the company will lose the interest in it. Another risk is the inability to go deeper in the topic or go into incorrect direction due to the lack of valuable data for the research or the overwhelming flows of different data sources. Also, the potential lack of cooperation of the company poses another risk. Besides, another risk is the thesis might lack the reality because company might not provide to give needed information.

In order to manage those risks in advance, the author needs to design a clear research plan and set the goals for the outcome. Advises from Advisor would help the author to go in the right direction. Secondary data is only collected from trustworthy sources to guarantee the data validity and avoid the difference in data variances. To case company, in order to obtain a good cooperation from the beginning, the author has to have a clear plan on how the research can actually help the accounting department.

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[1] The specific problems and inadequate processes of the system are presented in detail in chapter 4, section 4.1 and 4.2.

2 Theoretical framework

This chapter presents theories and key concepts which serve as the theoretical background for the practical research in the latter chapters to grow and develop. The chapter provides answers for 1st investigative question "Why should companies apply Lean Philosophy in the design of accounting system?"

The Lean theories are presented in the chapter according to its history of development and transformation from Lean Production to Lean Enterprise and finally lead to the need of Lean Accounting. This theoretical framework structure helps to give a deep understanding of Lean in general and Lean Accounting in specific.

2.1 Lean Production

The very first Lean Philosophy originated from Toyota in 1960s when Eija Toyoda and Taiichi Ohno, former Toyota engineers, introduced Toyota Production System which was inspired by Toyoda's visiting trip to Ford's Rouge manufacturing plant in Detroit. The Toyota Production System is originally called as Just-In-Time which is known for Just-In-Time manufacturing nowadays. Womack, Jones & Roos labelled the term as "Lean Production" in their book, the Machine that changed the World, published in 1991. "Lean" means the reduction of everything, does more and more with less and less.
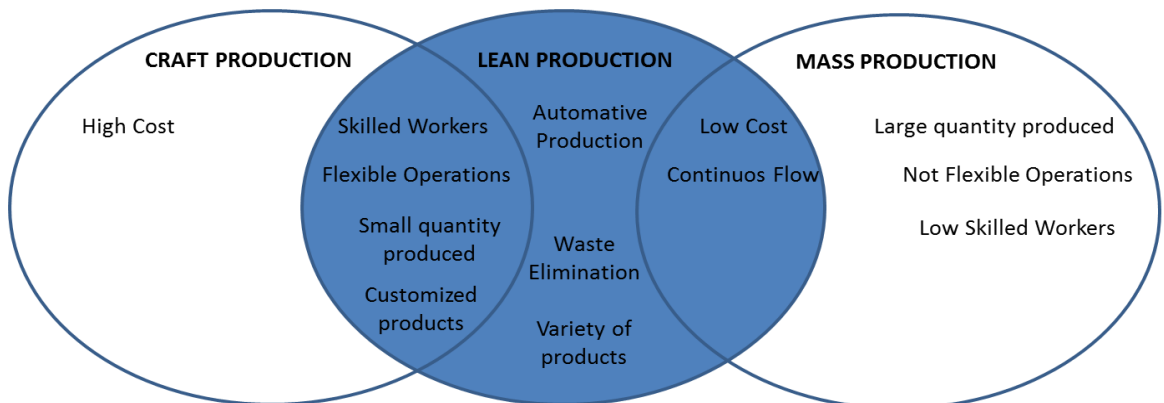
Figure 2. Lean Production, Craft Production and Mass Production

Figure 2 presents characteristics of Lean Production compared to those of Craft Production and Mass Production. The Lean Production Philosophy embraces advantages in craft production which was introduced by European manufacturing companies in 1880s as well as the advantages in mass production which was introduced by American manufacturers Ford and General Motors in 1920s. Similar to craft production, Lean Production focuses

on the use of skilled workers with a small amount of material to produce a certain amount of high quality products with flexible operation. Craft production, however, delivers very costly products. In the other hand, Lean Production embraces mass production's advantage as it utilizes the concept of continuous flow to reduce cost. As a result, Lean Production principle is aim to continuously reduce Waste[2] by utilizing of less material with highly skilled workers to produce a certain amount of high qualified products at flexible operation and at low cost. Thus, leads to positive effect in operation improvement, waste reduction, quality management and productivity. (Womack, Jones & Roos, 1990, 10-15.)

2.1.1 Waste

Waste "Muda" is a key concept in Lean Manufacturing as its core is to identify Waste into different categories and then eliminate Waste to create a continuous flow of operation, thus, add value to business. Womack & Jones (1996, 15) define Waste as any activity or action that absorbs resource, time or space without creating any added value to product or service.

In 1965s, Taiichi Ohno, former Toyota executive, identified 7 types of Waste in lean manufacturing process in the Toyota Production System which are: Transport, Inventory, Motion, Waiting, Overproduction, Over Processing, and Defects. Table 2 presents those types of Waste.

Table 2. Taiichi Ohno's Waste Types of Lean Manufacturing

Types of Waste	Description
Transport	Transport of materials, goods and tools, movement of employees from one place to another place without any purpose.
Inventory	Stored and remaindered good/items piled up.
Motion	Processing steps, unnecessary motions
Waiting	Waiting from downstream activity caused from upstream activity has not performed on time
Over Production	Produce more products/services than the necessary needed to satisfy customers.
Over Processing	Effort that adds zero value to product or services
Defects	Mistakes that require rectification, error that makes the product or delivering service not successfully the first time

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[2] defined in subsection 2.1.1

In 1996, Womack & Jones added another type of waste contributed to 8 types of waste in their Lean Thinking: Banish Waste and Create Wealth in Your Corporation book. The 8th Waste is described as abundant goods and services which do not meet the needs of the customer.

When lean concepts go beyond manufacturing perspective and start being applied in other business perspective[3], another new type of Waste has been raised and addressed which is Talent. Cudney, Furterer & Dietrich (2014, 43) describe Talent Waste is the not utilization of people's skill, metal, creative or physical ability.

2.2 Lean Thinking

Lean Thinking or Lean Management Philosophy was introduced and developed by Taiichi Ohno 1988, Womack, Jones & Roos 1990, and Womack & Jones 1996, which is the concept, derived from Lean Production capturing the essence of Lean approach into critical principles and expands beyond automotive production to demonstrate the transition from Lean Production to Lean Enterprise.

Womack & Jones (1996, 15) define Lean Thinking as a method to specify value by eliminating waste or converting waste into value and arrange value-creating actions in the best sequence, then conduct these activities without interruption and perform them in the way that it is more and more effective to bring value to the Customer.
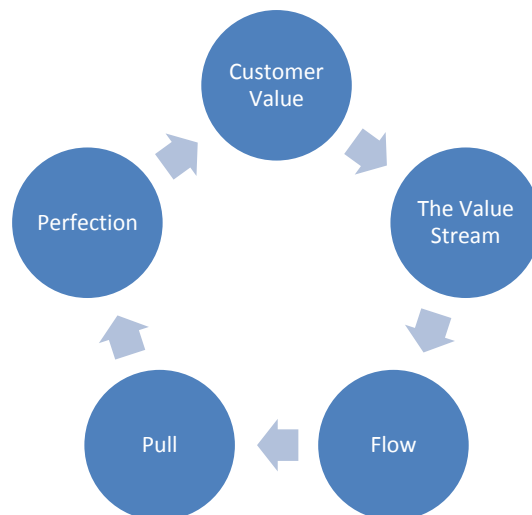
Figure 3. Lean Thinking

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[3] discussed more in section 2.2 and 2.3

Figure 3 presents 5 critical principles of Lean Thinking which was introduced by Womack, Jones in 1996. Womack & Jones (1996, 19-25) describes these values as follows:

- **Customer Value**: company identifies value which is desired by the customer. To be more specific, value is specified in terms of specific products with specific capacities offered at specific prices through a dialogue with specific customer.

- **The Value Stream:** value stream is a visualization of specific activities in a specific process which are performed to deliver a specific product through three critical management tasks: the problem-solving task which includes the formation of product idea, design, engineering to product launch, the information management task runs from taking order from customer, scheduling delivery to customer, and the last task is physical transformation which transforms raw material to finished good which is ready to be delivered to customer. The most common types of activities in value stream as follows: clear step that creates value, step that does not create any value but unavoidable, and finally step that does not create any value and avoidable. As a result, obvious wasteful steps are detected and can be eliminated.

- **Flow:** Make the product flow continuously through value - creating steps.

- **Pull:** pull is applied between all steps where continuous flow is possible to reduce waiting time among value – creating steps by letting customer pull from company.

- **Perfection:** Manage toward perfection to balance all the four mentioned steps.

2.3   Lean Accounting

This subsection presents the need for Lean Accounting, what is Lean Accounting, what are the benefits Lean Accounting brings to organizations.

2.3.1   The need for Lean Accounting

Maskell & Baggaley, 2003 introduce Lean Accounting as a critical business strategy to support manufacturers on the path to transform to Lean Manufacturers or companies on the way to embrace, develop and implement Lean Thinking to become Lean Enterprises. In other words, Maskell & Baggaley also describe Lean Accounting as control, accounting, measurement, and management methodologies which reflect Lean Thinking and Lean Practice.

Regarding Lean manufacturers' perspective, the radical changes from traditional manufacturing to lean manufacturing require new accounting methodologies possessing similar

and consistent principles with underlying principles in lean manufacturing[4] that cannot be found in traditional Management Accounting System[5].

Regarding Lean enterprises' perspective, the transition from traditional enterprises to lean enterprises requires the application of Lean Thinking in entire organization. Besides, accounting and finance is considered critical source for decision- making. Thus, Lean Accounting is vital for Lean transformation. (Maskell & Kennedy, 2007.)

2.3.2 What is Lean Accounting?

As mentioned briefly in subsection 2.3.1, Lean Accounting is the critical strategy utilized in control, accounting, measurement and management to support Lean manufacturing and Lean Thinking in Lean enterprises.

Figure 4. Lean Accounting

Figure 4 presents matters that Lean Accounting addresses according to Maskell & al. (2011, 12).

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[4] Aforementioned in section 2.1

[5] This matter is presented more detail in subsection 2.3.2.

Lean Accounting helps to identify clearly financial impact of Lean improvements as it is built upon similar principles with Lean improvements. Thus, it is able to synchronize with changes in Lean Manufacturing. As mentioned in section 2.2, the principle of Lean Improvement is to eliminate waste to create continuous flow. Lean Accounting understands the underlying principle of waste elimination is to free up capacity which is not recognized by traditional cost accounting. Once those available capacities have been visualized, organization can develop strategies to deal with.

Lean Accounting helps to provide better methodologies to understand costs compared to traditional Management Accounting System The problem with embracing traditional Management Accounting System into Lean Manufacturing is that its principles are laid on standard costs that based on the premises grounded in mass production, which, in turn, can lead to incorrect behaviours such as over production, excess inventories and reduced production flow. Lean Accounting lays on Value Stream Costing which identifies costs based on Value Stream[6]. (Maskell & al.2011, 3.)

Similar to Lean Production and Lean Thinking, Lean Accounting seeks for the way to eliminate Waste occurring in accounting and control transactions. Accounting and control systems are built to serve the purpose of tracking, recording and monitoring every transactions of business aspect, which, in turn help to control of chaos and provide information for inspection in case of errors or mistakes occur. As a result, these systems cost a considerable amount of time and capital to maintain. Lean Accounting seeks for the methods to render those transactions unnecessary, and then gradually eliminate them from the whole process, which, in turn leads to save time and capital. (Maskell & al. 2011, 11.)

Lean Accounting motivates long term lean improvement by providing Lean – focused information and Lean Performance Measurements. Lean Performance Measurements are simple and well-designed to serve the purpose of providing understandable and efficient operational and financial control, motivate people towards Lean behaviours, drive continuous flow and lead to better decision making, thus leads to profit maximization. (Maskell & al. 2011, 9.)

Another benefit of Lean Accounting is to free up Talents to do more strategic matters. This is the result of all aforementioned matters as unnecessary transactions and activities are

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[6] Value Stream is identified in section 2.2

constantly eliminated, people in general and accountants in specific have more time to perform more important tasks.

Lean Accounting also moves the focus of business from cost reduction in traditional accounting to customer value in Lean Enterprise[7].

2.4   Key concepts

Accounts Receivable is the amounts collected from customers from sales made on credit (Horngren, Harrison & Oliver 2012, 405). **Accounts Receivable module** in accounting software is an organized system for customer information maintenance, credit management and sales analysis (Visma, 2016).

Accounts Payable is the amount owned suppliers for a product or service purchased on account (Horngren & al. 2012, 497). **Accounts Payable module** in accounting software is an organized system for supplier information maintenance, credit management and purchase analysis (Visma, 2016).

General Ledger is the book that holding all the accounts or **Chart of Accounts** with their balances (Horngren & al. 2012, 63).

Deferred Revenue or Unearned Revenue is the amounts of goods or services the company owns to customers as revenue is collected but the action required to earn that revenue has been not happened (Reimers 2006, 105).

Cost Center is a unit determined by company responsible for controlling costs related to that unit (Reimers 2006, 559).

Value – Added Activity is the activity that generates value to customer (Womack & Jones 1996,16).

Non Value – Added Activity is the activity that does not generate value to customer Womack & Jones 1996, 16).

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[7] mentioned in Lean Thinking, section 2.2

Value Stream is a set of specific activities required to design, order and provide a specific product or service, from concept to launch, order to delivery, as well as raw material to the hands of a specific customer (Womack & Jones 1996, 38).

Value Stream Mapping is as a visual flow of all value-added and non-value added activities (Womack & Jones, 1996, 38). In value stream mapping, flows of material, information, people and processes are visible (Cudney & al. 2014, 66).

Key performance metrics are measures of performance serving as indicators to highlight conditions that give answers to our questions to yield objective performance fact. In Lean, they vary from process to process but usually are categorized as followed: total worked hours, overtime hours, cycle time to complete a transaction, transit time among steps and types of transit time, resources consumed by each activities, staffing, work shift and transaction error rate. (Smith & Hawkins 2004, 249.)

One piece flow technique aims to reduce the size of processed batch so that it can flow throughout the entire process quicker and smoother, thus reduce the processing time (Womack & Jones 1996, 352).

Work Standardization aims to create a standard work flow to reduce unnecessary waste and boost the continuous flow among steps in a process (Womack & Jones 1996, 352).

Mistake – Proofing (Poka – Yoke) is a lean methodology developed by Toyota with the aim to achieve zero defects to improve process quality. The Zero Quality Control System of Mistake Proofing works in the way that it prevents the occurrence of defects before they are produced by monitoring the process and correcting the errors at the source. (Womack & Jones 1996, 350.)

Automation is the use of automatic control over a process or machine to reduce the nature of human error as product or service is produced automatically without the interference of human being (Black & Hunter 2003, 273).

Autonomation (or **Jidoka** pioneered by Sakichi Toyoda) Automation with human touch or transferring human intelligence into machinery. This technique allows the machine stops when a defect detected and then informs the operator. The operator can oversee many operating machines working without risking of producing a vast amount of defects. (Ohni 1988, 108.)

Continuous Improvement (Kaizen) continuous improvements proceeded for a process to create more value while eliminating muda (Womack & Jones 1996, 349).

3   Research Methodology

The author applies qualitative approach as the research methodology to conduct this study as it deems to serve the best of the objective of the study. Merriam (2002, 5) defines qualitative approach as an inductive investigative strategy as qualitative researchers instead of deductively deriving hypothesizes and postulates to be tested, they build towards concepts and hypotheses from observations and institutive understanding drawing from gathered data instead. As a result, it is a richly descriptive end product of a search for meaning and understanding (Merriam 2002, 6). Creswell (2003, 18) describes the philosophical assumption that qualitative researchers use is constructivist knowledge claims as they collect open-ending emerging data with the intention to develop themes from those data. Considering this study's topic "research on an effective accounting system for a small-sized Nordic IT company", the author aims to produce a research result which is an efficient accounting model that can help case company to process accurately financial transactions for the purpose of internal management and external compliance (government, tax authorities, International Accounting Standard Board). In order to carry out such result, various accounting principles are examined and evaluated. Lean Accounting Principles are eventually chosen as the theoretical framework for the research.

The most common used strategies for qualitative research are: Phenomenology, grounded theory, ethnography, case study and narrative (Creswell 2003, 18). Grounded theory is the strategy that author aims for this research. Merriam 2002, 8 describes grounded theory as a research method to build substantive theory which is localized to the need of the studied object as well as deals with specific situation of the studied object. Author utilizes existing accounting theories, concepts to build a foundational accounting framework with common features that can be seen in any company's accounting system. Then, throughout the research on current trends in financial world: automated accounting, researcher build on specific concepts that are able to adapt to current world financial environment. Lastly, researcher will customize according to case company's need.

3.1   Research Design

Research design serves for the purpose of a guideline for the author to conduct the research. Research designs in qualitative approach are flexible rather than fixed (Robson, 2011), inductive rather than being deriving from initial or following strict sequences (Maxwell 2013, 2), and should be a reflexive process operating through every state of a project (Hammersley & Atkinson 1995, 24).

Maxwell (2013, 2) describes research design as actions conducted to collect and analyze data, develop and modify theory, elaborate the investigative questions and identify the data validity. These activities are conducted simultaneously and affect each other.
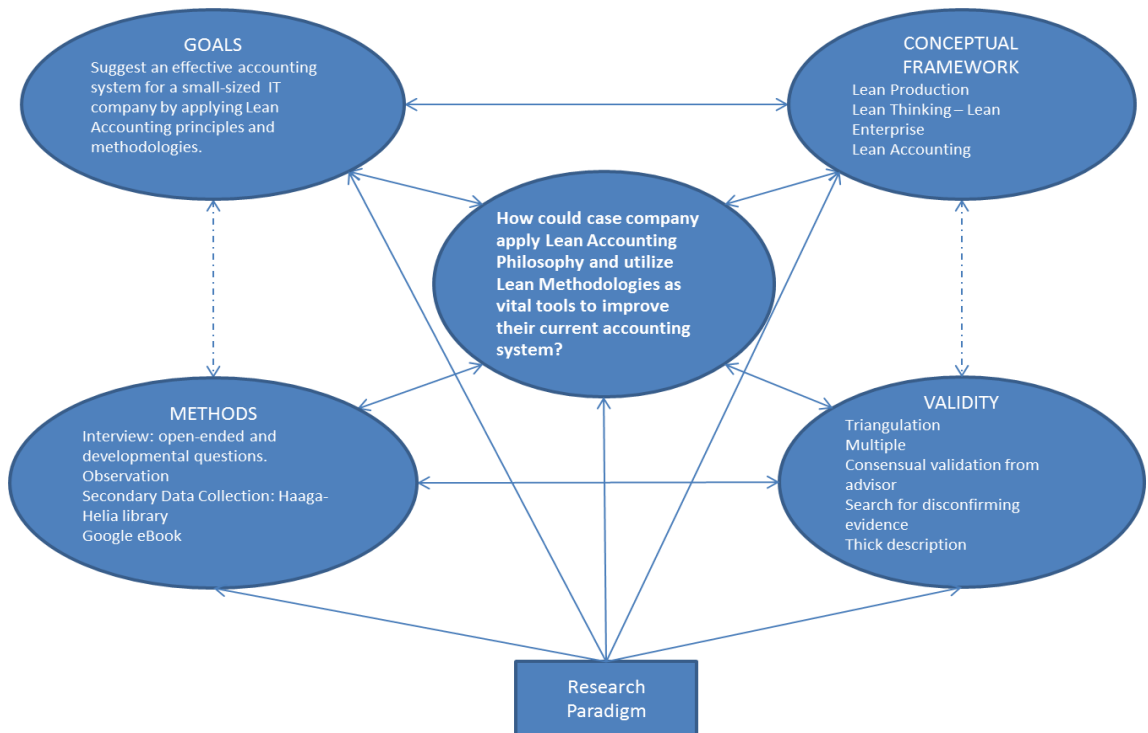
Figure 5. Research design

Figure 5 summarizes the research design for this workbook which includes 4 important areas contributing to deliver the answer for research question. Research goals are mentioned in chapter 1. Conceptual frameworks are mentioned in chapter 2. Research methods are mentioned in chapter 3. Research validity is mentioned in chapter 6.

3.2 Research methods

Interview, observation and data collection are the research methods the author applies to conduct this study as they are, in combination, one of the most efficient ways to serve the purpose of this research.

3.2.1 Interview

Interviews are carried out to collect primary data for the empirical part of this research. The most important questions in qualitative interview are open-ended questions rather than closed-ended questions as the researcher aims interviewed participants to use their own words rather than those predefined by the researcher to gain in-depth information regarding the subject (Yin 2011, 135). Besides, developmental questions are designed to gain in-depth knowledge regarding the concerned objectives.

Three interviews are carried out to conduct this study from October, 2015 to March, 2016 to serve the purpose of collecting data for practical part[8]. Table 3 presents the overview of carried interviews.

Table 3. Interview Overview

Interview	Time	Participants	Content
1	23rd October, 2015	2 accountants	Overview of accounting system and desired functionalities for future system
2	2nd February, 2016	Lead accountant	Detail steps in all accounting processes, spent time in each step and waiting time among steps.
3	11th March, 2016	2 accountants	Detail steps in all accounting processes, spent time in each step and waiting time among steps.

The first interview was in October with accounting department in Tallinn office. The interview included interviewer and two accountants. The interview lasts for 1, 5 hours. The main purpose of this interview is for interviewer to get a general picture of the current accounting system on what are their main modules, how they functions and the disadvantages it causes to accountants. The last part of the interview is that accountants are asked for desired functionalities in the future system.

The second interview was in February with the lead accountant via Skype. The interview last for 2 hours. The purpose of this interview is to gain deeper and detailed information regarding all accounting steps that accountants have to perform. The accountant was also asked to give estimate on performed time and idle time among activities.

The third interview was conducted in March via Skype with lead accountant. The interview lasts for 45 minutes. The interview was conducted after the researcher finished first draft of value stream mapping – current phase (more details in subsection 4.1.1).The purpose

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[8] Attachments 1 & 2 give details about questions and results of the interviews.

of this interview is to gain missing data from second interview and to complete missing information in the value stream mapping.

3.2.2 Observation

As an employee of the case company, the author is able to utilize observation research method to collect data on related accounting activities performed by other employees outside accounting department, thus enriches research data and later account for the design of value stream mapping in subsection 4.1.1. Besides, author can also observe the roots behind accounting processes' problems faced by case company in subsection 4.2.5.

3.2.3 Data collection

Secondary data is collected through a variety of sources mainly deriving from Haaga-Helia University of Applied Sciences library and Google eBook. Books, e-Books, and articles in the scope of Accounting, Bookkeeping, Financial Model, Accounting Information System, Lean Manufacturing, Lean Enterprise, Lean Principles, and Lean Accounting form a solid foundation for the theoretical aspect of this research.

3.3 Data analysis method

In quantitative research, data collection, analysis and validation are processed at the same time. The analysis of qualitative research starts in the field as the same time with interview and observation as researcher has to identify occurring concepts, statements and problems in order to gain a deeper understanding of the current situations. Similarity, the analysis occurs as the same time with secondary data collection method which will reduce the risk associated with data validity and reliability as well as define the right path for researcher to follow to fulfil research's objective. (Adams, Khan, Raeside & White 2007, 325.)
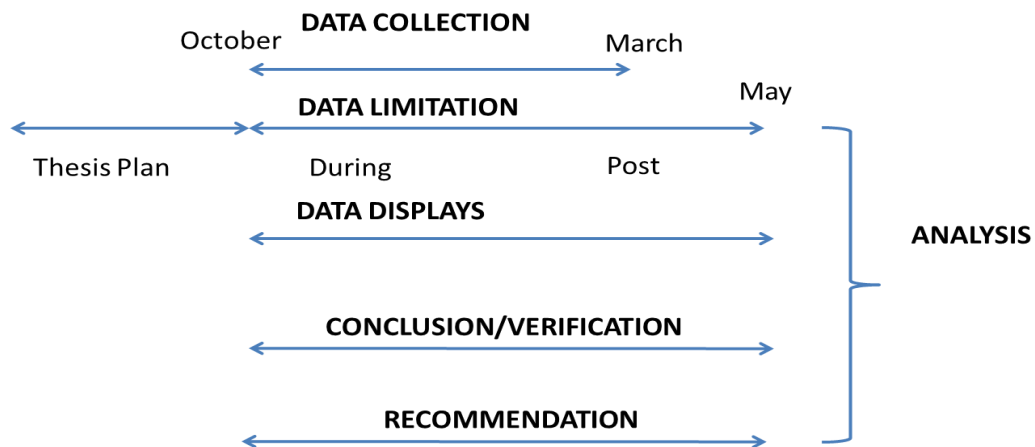
Figure 6. Flow Model of Qualitative Data Analysis Components

Figure 6 shows the analysis model that the author applies in the research. The first step in data analysis is documentation of all the collected data and data collection process. This step was processed from October, 2015 to March, 2016. The second step is to organize and categorize data into conceptual categories. Then testing the coherence of these categories in the research setting with more observation is carried out is the next step. Throughout the analysis process, researcher refines and links those categories together and finally build up a result that fulfills the objective of the research and complete it in May, 2016.

4 Data Result and Analysis

This chapter answers to the 2nd and 3rd investigative questions as follows: Sections 4.1 and 4.2 give answer to "What are the problems and their underlying roots in accounting system faced by case company under the scope of Lean Philosophy?" Section 4.4 and 4.5 give answer to "How Lean Principles and Methodologies can be applied to improve accounting processes in case company?"

This chapter is divided into 6 phases as follows: Current Phase, Analysis Phase, Problems Prevention and Elimination Strategy Phase, Improvement Phase, Control Phase and Future Phase. Current Phase concerns the current situation of the case company's accounting system. Analysis Phase concerns on investigate which part of the system needed to be improved. The Problems Prevention and Elimination Strategy Phase concerns which strategy company X should take to prevent and eliminate existing problems. The Improvement Phase concerns the matters of how to improve and which tools should be applied to improve. The Control Phase concerns the need of involving control to maintain the continuous improvement. Finally, the Future Phase concerns on the future situation of accounting system. Various lean techniques, tools and key performance metrics are applied to deliver the objectives of each phase.

4.1 Current Phase

In this phase, Value Stream Mapping is applied to connect and visualize all activities performed in the accounting department of case company. This Lean Tool drives problems visual and thus easily to be detected.

Activities performed by accounting department are narrated in this subsection. Problems concerned are not included.

4.1.1 Value Stream Mapping – Current Phase

The author utilizes value stream mapping to map all the activities performed by accounting department and related activities performed by other departments in case company. The benefit from value stream mapping is to help the author can see entire process rather than just a single step. By conducting this Lean methodology at the very first stage of this workbook, the author can utilize it as a platform to apply various Lean principles and tools in later chapters.

The value stream mapping is drawn from three most important account processes in case company which are Accounts Receivable, Accounts Payable and General Ledger. Each accounting process is divided into three stages: pre-invoicing, invoicing and after invoicing.

Due to the business characteristics of case company and its policies regarding customer invoicing, Accounts Receivable module is explored in more details than other modules.

Lean Performance Metrics

Performance metrics are utilized are: process time (PT), total process time, waiting time (WT), total waiting time, total cycle time, percentage of complete and accurate (%C&A), %Activity, %Waiting, %Rolled first past Yield (RFPY), Number of Steps. Lean Performance Metrics outputs in this workbook are relative rather than absolute as they are collected from experiences of accountants.

Process Time (PT) is the amount of time it takes to perform a unit of work/task from the beginning until the end of the unit of work/task without any interruption (Womack & Jones 1996, 351).

Waiting Time (WT) is the amount of time it takes from the end of completing a unit of work/task to the beginning of performing the next unit of work/task (Womack & Jones 1996, 351).

Cycle Time (CT) is the total amount of time from the beginning until the end of a whole process. Cycle Time includes total Process Time and total Idle Time it take to perform a complete process (Womack & Jones 1996, 349).

$$Cycle\ Time = \sum Waiting\ Time + \sum Process\ Time$$

Percentage of complete and accurate (%A&C) is the percentage of how complete and accurate process output is after process input passes through (Bhasin 2015, 129).

%Activity is the percentage of worked done passing through the system (value-added or non-value-added) (Bhasin 2015, 128).

$$\%Activity = (\sum PT : \sum CT)\ x\ 100\%$$

%Waiting is the percentage of time that no task in done in the cycle (Bhasin 2015, 128).

$$\%Waiting = 100\% - \%Activity$$

%Rolled first past Yield (%RFPY) is the percentage of value stream output that pass through process without any rework or mistake (Bhasin 2015, 129).

$$RFPY = \%C\&A \; x \; \%C\&A \; x \; \%C\&A \; x \; \%C\&A \; x\ldots.x \; \%C\&A$$

Numbers of steps are the numbers of steps it takes to perform a complete process.

Box Score is a table summarizing the outcome of Lean Performance Metrics which helps to evaluate the operation and financial effects of Lean. (Maskell & al. 2011, 63.)

Value Stream Mapping Guideline

Figure 7 and 8 below serve as the guidelines for how to use the value stream maps in this workbook. The author builds the guideline to make it easier to interpret the maps.
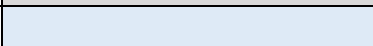
Type of Activity		Color Indicators
Activity Schedule	Weekly	
	Monthly	
	Quarterly	
Process Stage	Pre-Invoicing	
	Invoicing	
	After Invoicing	

Figure 7. Value Stream Mapping Colors Guideline

Value Stream Mapping elements	Icon Indicators
Manual Info Flow	
Electronic Info Flow	
Timeline Segment	
Timeline Total	
Outside Sources	customer

Data Box	
Electronic data system	
Other useful Info	
Automation	
Autonomation	
Loop: repeated processes	
Batch of electronic documents	

Figure 8. Value Stream Mapping Icons Guideline

4.1.2 Accounts Receivable

This process has the highest transaction volume in company X. Company X has two types of invoicing process which are monthly billable invoicing and quarterly regular invoicing.

Table 4 presents main differences in the two invoicing processes in company X. While the invoices in monthly billable invoicing are different from month to month, invoices in quarterly regular invoicing are similar among each quarter unless there are any changes in the terms and prices in the contracts with customers. On the other hand, although the volume of monthly billable invoices is less than that of quarterly invoices, billable invoicing requires more inspection as well as extra tasks such as obtaining infrequent Purchase Orders from Customers.

Table 4. Invoicing processes in company X

Billable Invoicing	Quarterly Invoicing
Weekly, Monthly	Quarterly
More extra infrequent tasks	Regular tasks
Heavy Inspections	Less Inspection
Lower volume of transactions	Higher volume of transactions

Billable Invoicing

Billable hours are collected and inspected on weekly basis but processed to be invoice and send to customer on monthly basis. Billable hours are the cumulative period of time employees working on projects which was agreed on contracts or requests that customers send to Helpdesk.
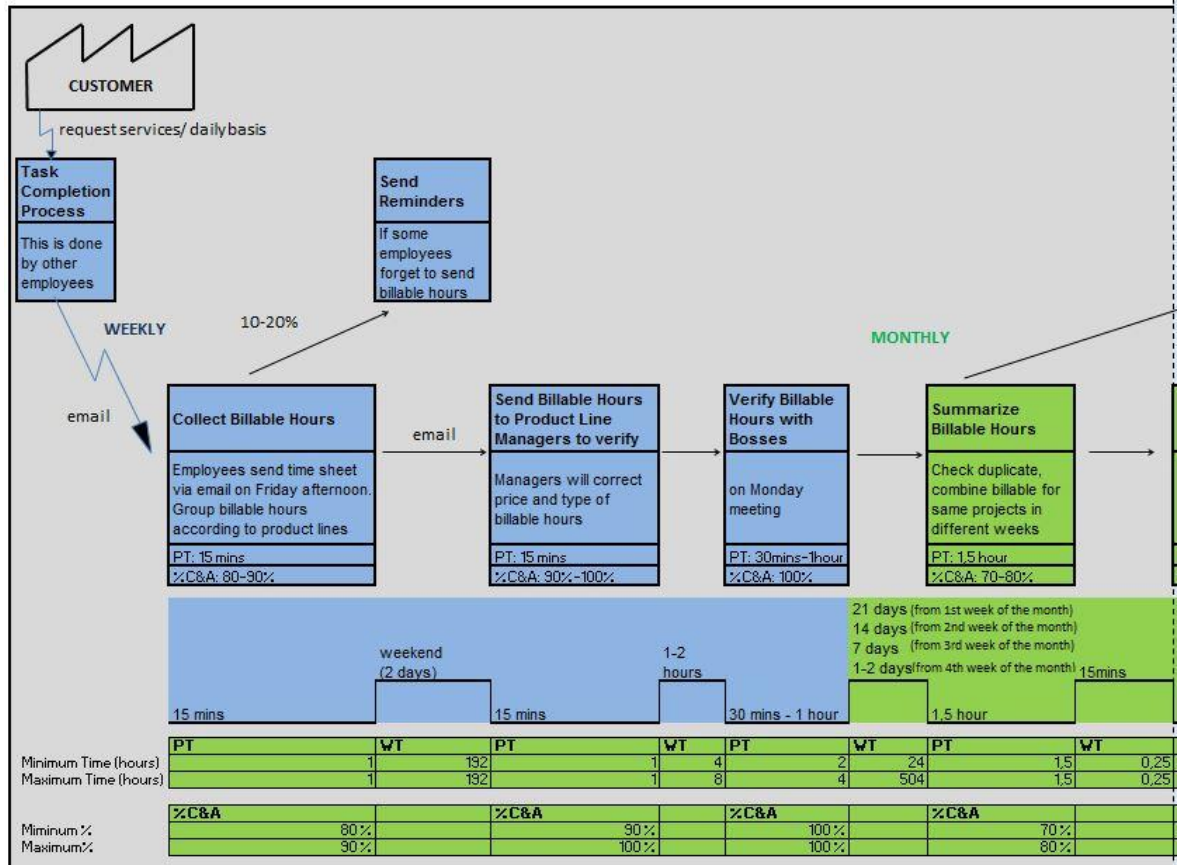
Figure 9. Current Phase – Accounts Receivable – Billable Invoicing – Pre-Invoicing Stage

Figure 9 shows activities performed during the Pre – Invoicing Stage of Monthly Invoicing Process. Employees collect those hours into time sheet and send it via email to accounting department at the end of Friday afternoon every week. Time sheet includes many lines of different tasks with time spent performed by a specific employee for a specific customer. On Monday morning, accountants collect those time sheets, group reported lines related to same product line, and then send them to product line managers to verify. Sometimes employees forget to send these time sheets, thus accountants have to send reminders to them to ensure all the hours of the week are collected, thus leads to delay in the verification process. Once the verification process has processed, product line managers send back to accountants for the final verification round with bosses on Monday meeting. This collection process is performed on weekly basis.

Figure content:

CUSTOMERS — via email

MONTHLY

Resolve Mismatch
Check contract:agreed billable hours, customer's info
PT:1,5 hours
%C&A:90-100%

Get PO Numbers

via email
via customers' system: SAP
by post
by post

Manually Resend Invoices
Wrong address, PO
PT: 30 mins
%C&A: 100%

20-30%
20-30%
20-30%
10-20%
10%
90%
70%-80%

Input in Accounting System
Input to Axapta Choose customers, customer code, text message, PO
PT: 5-8 hours
%C&A: 70-80%

Finalize Invoices
Changes Cancellation Info
PT: 1,5 hour
%C&A: 70-80%

Create Invoices
Put invoice information in the right format
PT: 4 hours
%C&A: 80-90%

Print Invoices
For customers who will receive by post
PT: 30 mins
%C&A: 100%

Send Invoices
send 2 days before month end
PT: 2 hour
%C&A: 90%

2-14 days
21 days (most of customers)
30 days
45 days
60 days (very few customers)

30 mins   15 mins   15 mins   15 mins   15 mins

5-8 hours   1,5 hour   1,5 hour   4 hours   30 minutes   2 hour   30 mins

PT	WT	PT	WT	PT	WT	PT	WT	PT	WT	PT	WT	PT	
5	0,5	1,5	0,25	1,5	0,25	4	0,25	0,5	0,25	2	48	0,5	
8	0,5	1,5	0,25	1,5	0,25	4	0,25	0,5	0,25	2	1440	0,5	

%C&A	%C&A	%C&A	%C&A	%C&A	%C&A	%C&A
70 %	70 %	90 %	80 %	100 %	90 %	100 %
80 %	80 %	100 %	90 %	100 %	90 %	100 %

Figure 10. Current Phase – Accounts Receivable – Billable Invoicing – Invoicing Stage

Figure 10 presents activities performed during Invoicing Stage of Billable Invoicing Process. The invoicing process is performed in the last week of the month. This process involves heavy and time – consuming manual inspection and checking to ensure the accuracy of the data as well as fully compliance with agreed billing policies in the contracts with customers. Accountants combine, summarize and finalize those hours for the same project but performed in different weeks, then compare with contracts to make adjustments to ensure not overbill customers. Due to the nature of manual process, summarizing, finalizing and checking are performed simultaneously, as shown in the value stream mapping, to guarantee the accuracy. The next step is to input in Accounts Receivable module in Axapta. This step also consumes a large amount of time from accountants as they have to modify invoicing description, which was written by employees in time sheet, so that they can fit in text box. After ensuring all the data is correct, accountants send requests to customers to ask for Purchase Order in order to be able to bill. Once Purchase Orders have been obtained, accountants start creating invoices in Axapta. Due to the lack of e-Invoicing integration of the current system, accountants have to print out invoices to send to customer via post, or save invoices under pdf format to send to customers who requests receiving via emails. Few customers allow paying via their systems as accountants have to log in their system and fill in the invoice information. Sometimes, due to the

some mistakes made in the address of customers, accountants have to resend invoices after correcting or obtaining new address.
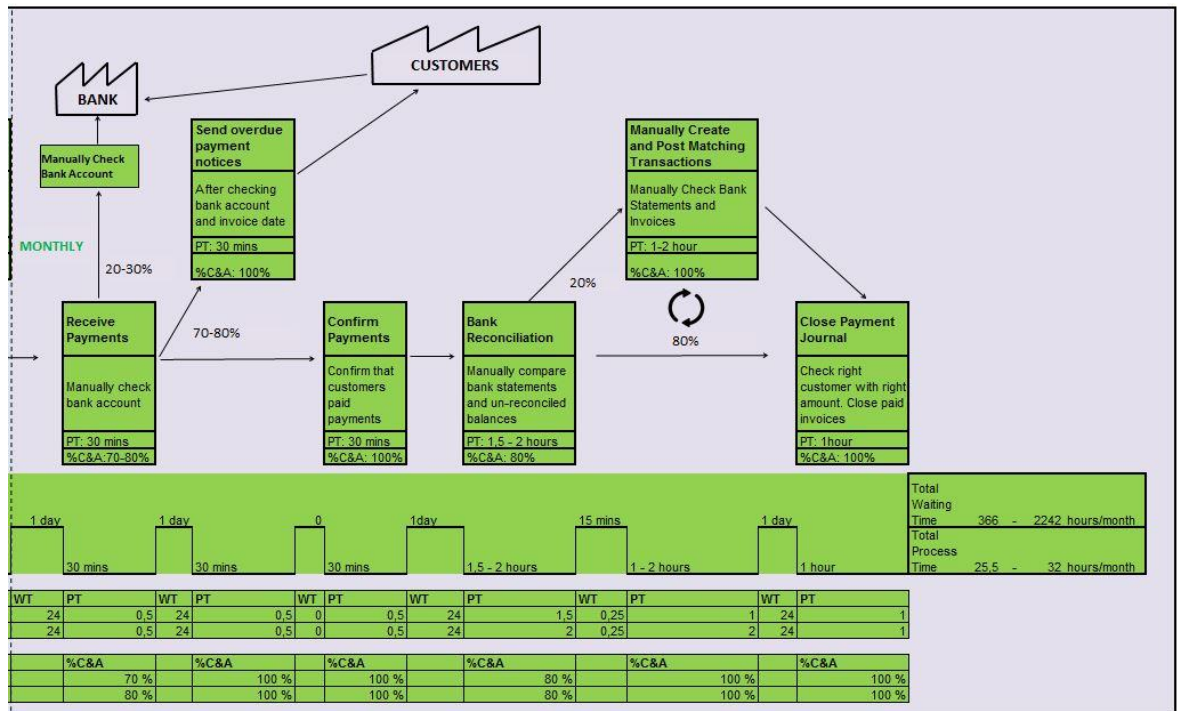
Figure 11. Current Phase – Accounts Receivable – Billable Invoicing – After Invoicing Stage

Figure 11 presents activities performed in the post invoicing stage of Billable Invoicing Process. The current system does not interfere and streamline with company's net bank account, thus accountants have to log in company's net bank, which is completely independent with the accounting system, to check manually if customers deliver payments. This leads to lengthy lead time to close payment journal. After acknowledging customer payments, accountants will record it in the system to prepare for bank reconciliation. If the payment period passes without receiving any payments from customers, accountants have to manually send overdue notices to customers via post or email. Bank reconciliation process requires accountants perform creating and posting matching transactions. This step is done manually as it is not enabled in the system. The last step is to close payment journal.

Quarterly Invoicing

This invoicing process is carried out quarterly for invoicing frequent and agreed services, agreed terms and agreed prices. The invoicing and invoicing stages are similar to the billable invoicing process. The difference is the process time accountants spend on each activities as well as lead time among steps.

Figure 12 diagram (Current Phase – Accounts Receivable – Quarterly Invoicing – Invoicing Stage):

CUSTOMERS

via email

by post

QUARTERLY

20-30%

20-30%

Resolve Mismatch
Check contract for agreed billable hours. Verify with managers
PT:3 hours
%C&A:90-100%

70% - 80%

via email

via customers' system: SAP

by post

10%

Resend Invoices
Wrong address, PO
PT: 30 mins
%C&A: 100%

90%

Prepare Invoices
Input to Axapta Choose customers, code, text message limit
PT: 1-2 days
%C&A: 70-80%

Finalize Invoices
Changes Cancellation Info
PT: 3 - 4 hours
%C&A: 70-80%

Create Invoices
Put invoice information in the right format
PT: 6 - 8 hours
%C&A: 80-90%

Print Invoices
For customers who receive by post
PT: 30 mins
%C&A: 100%

Send Invoices
Send 2 days before month end
PT: 2 hours
%C&A: 90%

2-14 days
21 days (most of customers)
30 days
45 days
60 days (very few customers)

	PT		WT	PT		WT	PT		WT	PT		WT	PT		WT	PT		WT	PT		WT	PT
1-2 working days		30 mins		3 -4 hours		15 mins		3 hours		15 mins		6 - 8 hours		15 mins		30 mins		15 mins		2 hours		30 mins
	7,5		0,5	3		0,25	3		0,25	6		0,25	0,5		0,25	2		48			0,5
	15		0,5	4		0,25	3		0,25	8		0,25	0,5		0,25	2		1440			0,5

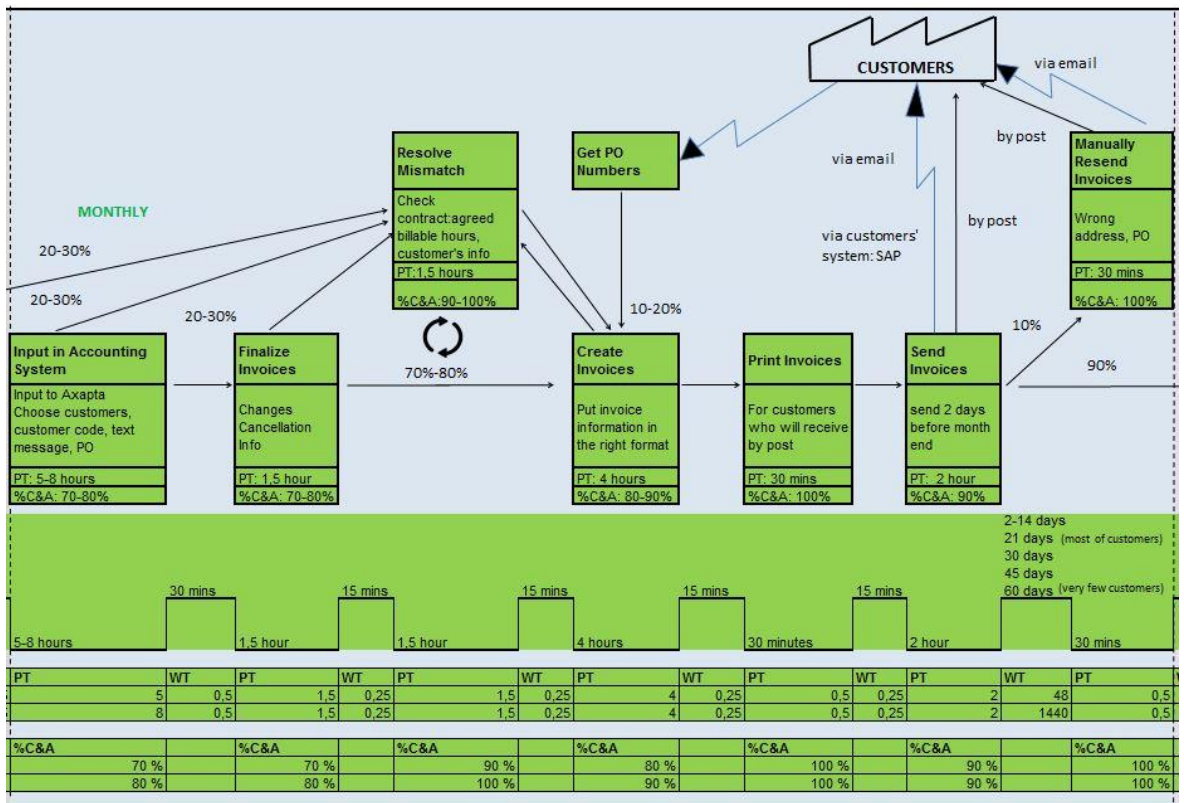| %C&A	%C&A	%C&A	%C&A	%C&A	%C&A	%C&A
70 %	70 %	90 %	80 %	100 %	90 %	100 %
80 %	80 %	100 %	90 %	100 %	90 %	100 %

Figure 12. Current Phase – Accounts Receivable – Quarterly Invoicing – Invoicing Stage

Figure 12 presents activities performed during the Invoicing Stage of Quarterly Invoicing Process including preparing invoices, finalize invoices, resolve mismatched information, create invoices, print invoices, send invoices and resend invoices.

Figure 13 diagram (Current Phase – Accounts Receivable – Quarterly Invoicing – After Invoicing Stage):

CUSTOMERS

BANK

Send Overdue Payment Notices
After checking bank account and invoice date
PT: 30 mins
%C&A: 100%

Create and Post Matching Transactions
Manually Check Bank Statements and Invoices
PT: 1,5 hour
%C&A: 100%

Manually Check Bank Account

20-30%

70-80%

20%

80%

Receive Payments
Manually check bank account
1,5hours
%C&A:70-80%

Confirm Payments
Confirm that customers paid payments
PT: 30 mins
%C&A: 100%

Bank Reconciliation
Manually compare bank statements and un-reconciled balances
PT: 4 hours
%C&A: 80%

Close Payment Journal
Check right customer with right amount. Close paid invoices
PT: 3 hours
%C&A: 100%

Total Waiting Time 146 - 1538 hours/quarter
Total 32,5 - 44 hours/quarter

	30mins -	1 day		30 mins	0 min		30 mins	1 day		4 hours	15 mins		1,5 hours	1day		3 hours		
WT	PT	WT	PT		WT	PT		WT	PT		WT	PT		WT	PT			
24	0,5	24	0,5	0		0,5	24		4	0,25		1,5	24		3	Waiting	48,6 - 513 hours/month
24	1,5	24	0,5	0		0,5	24		4	0,25		1,5	24		3	Process	10,8 - 14,7 hours/month

| %C&A	%C&A	%C&A	%C&A	%C&A	%C&A
70 %	100 %	100 %	80 %	100 %	100 %
80 %	100 %	100 %	80 %	100 %	100 %

Figure 13. Current Phase – Accounts Receivable – Quarterly Invoicing – After Invoicing Stage

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Figure 13 presents activities performed during the post Invoicing stage of Quarterly Invoicing Process including manually check bank account, receive payment, send overdue payment notices, confirm payments, bank reconciliation, create and post matching transactions, and close payment journals.

Box Score

Key Performance Metrics	Current State	
	Minumum Value	Maximum Value
Process Time (hours)	36,33	46,67
Waiting (hours)	414,58	2754,58
Cycle Time (hours)	450,9166667	2801,25
%Activity	8,1 %	1,7 %
%Waiting	91,9 %	98,3 %
%RFPY	75 %	80 %
Number of steps		34

Figure 14. Box Score of Accounts Receivable – Current Phase

Figure 14 presents Box Score as a summary of all activities performed in Accounts Receivable module. The proportion of process time to waiting time in both minimum and maximum value is very high.

4.1.3 Accounts Payable

Accounts Payable activities in company X are not as complicated as Account Receivable activities because they do not need to buy raw materials as they sell self – developed services. Main suppliers are companies providing infrastructure to maintain company's server and companies providing necessary office services such as rent, utilities, office supplies, insurance, health care, phone and internet bill, and daily expenses. Company X provides employees with credit cards to pay for small daily expenses.
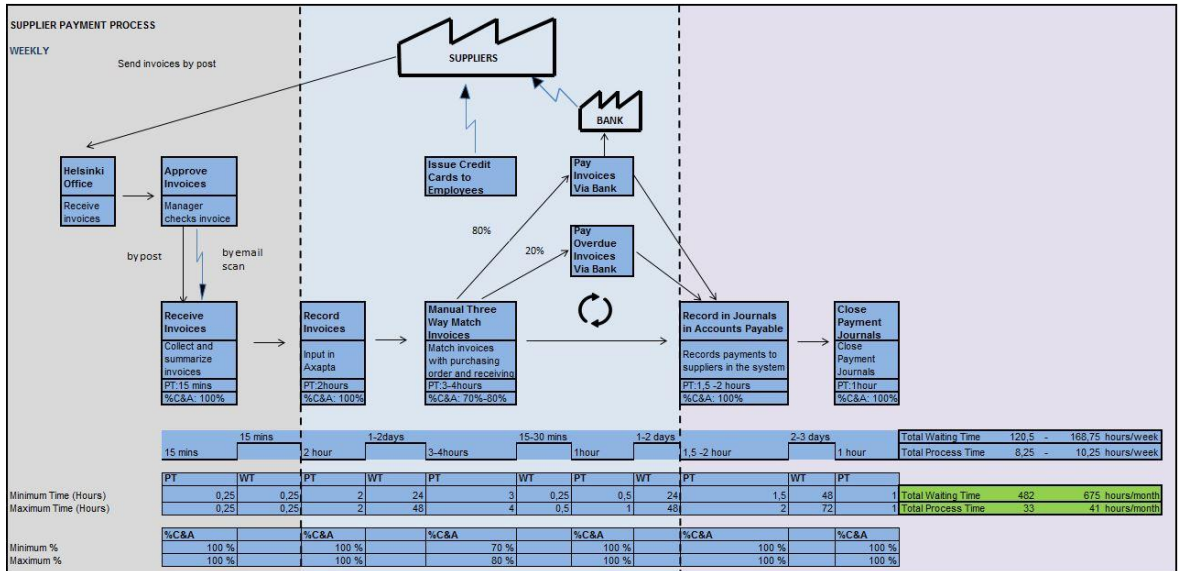
Figure 15. Current Phase – Accounts Payable

Figure 15 presents activities performed in Account Payable. Suppliers send invoices by post to Helsinki office. Helsinki manager verifies those invoices before they are sent to Tallinn office by fax, post on weekly basis. Once accountants receive invoices, they summarize and input in Accounts Payable module in Axapta. The inspection process involves three way matching invoices with purchase orders and receiving reports. This process, however, usually is performed as two way matching invoices between invoices and purchase orders. After the verification and inspection is processed, accountants prepare to pay invoices. Accountants have to independently log in net bank to pay the bills. The next step is to record in the system and close journal payments.

Box Score

Key Performance Metrics	Current State	
	Minumum Value	Maximum Value
Process Time (hours)	33	41
Waiting (hours)	482	675
Cycle Time (hours)	515	716
%Activity	6,41 %	5,73 %
%Waiting	93,59 %	94,27 %
%RFPY	70 %	80 %
Number of steps		8

Figure 16. Box Score of Accounts Payable – Current Phase

Figure 16 presents the box score of key performance metrics results in account payable module. Similar to Accounts Receivable, the proportion of process time to waiting time is very high.

4.1.4 General Ledger

Activities on General Ledger module are performed on monthly basis. Three activities from company X are mentioned in this workbook are recording customer invoices, recording expenses and paying employee salaries. Tax activity and others related are not mentioned.

Accountants record all customer invoices and expenses that they already recorded in Accounts Receivable and Accounts Payable again in General Ledger.
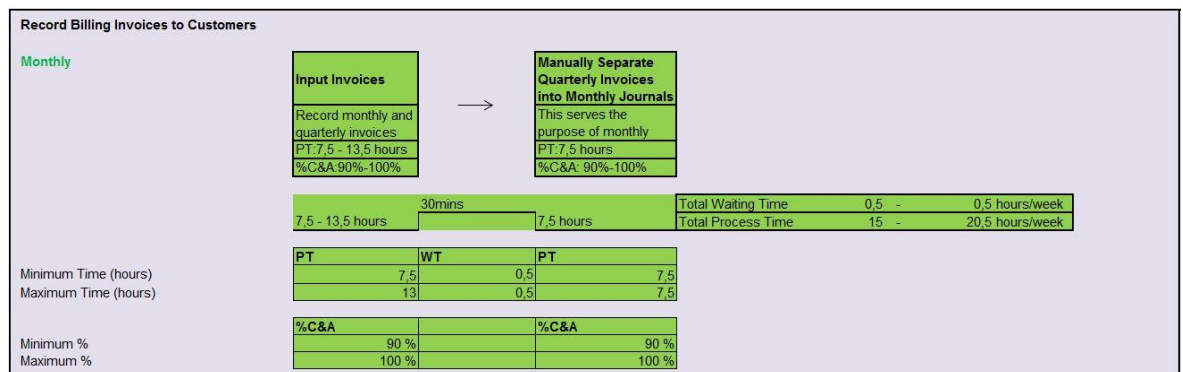
Figure 17. Current Phase – General Ledger – Record Billing Invoices to Customers

Figure 17 presents activities related to recording billing invoicing transactions in General Ledger including input invoices, manually separate quarterly invoices into monthly journals.
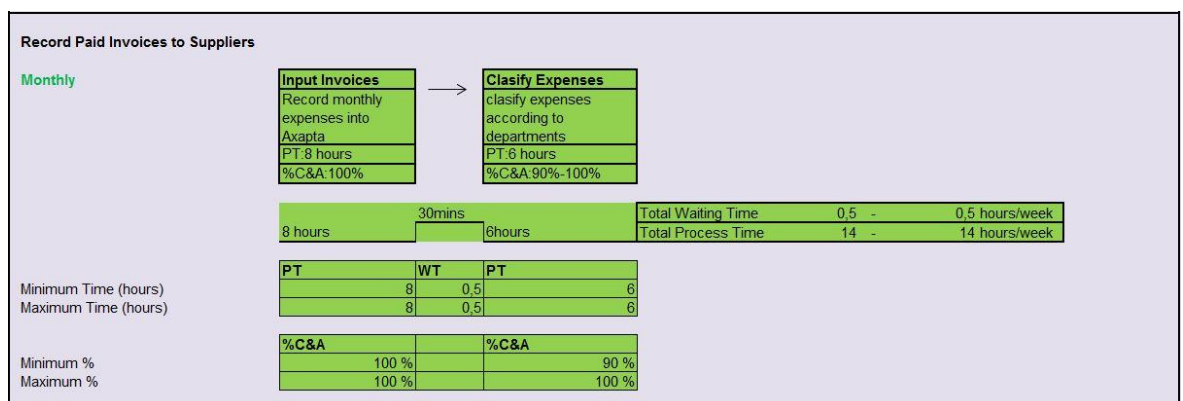
Figure 18. Current Phase – General Ledger – Record Paid Invoices to Suppliers

Figure 18 presents activities related to recording payments to suppliers transactions into General Ledger including input invoices, classify expenses according to each departments.
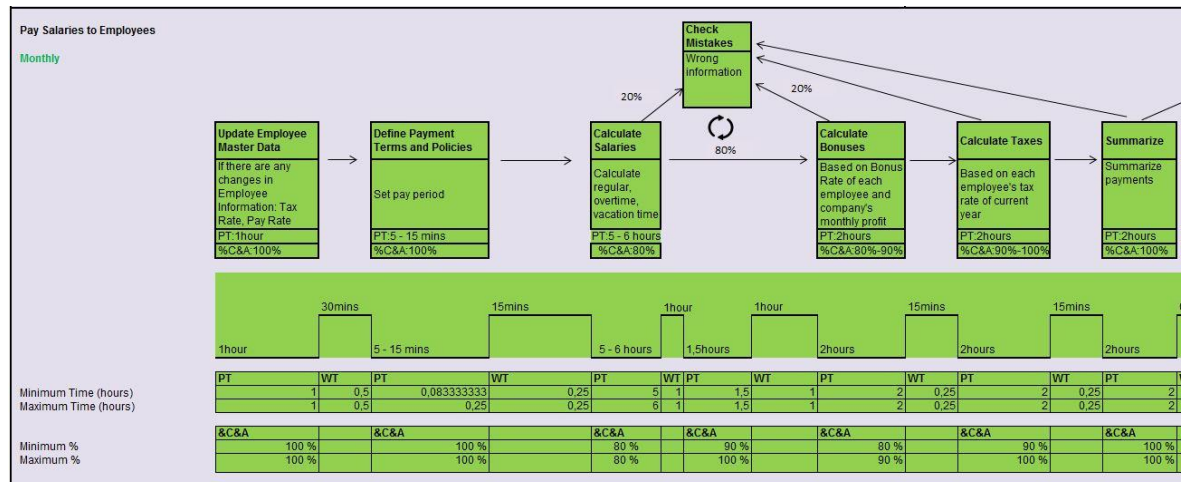
Figure 19. Current Phase – General Ledger – Pay Salaries to Employees – Part 1

Figure 19 presents payroll activities. Company X pays salaries to employees at the end of the month. Salaries of the previous month are paid next month. The first step in payroll process is to update employee master data if there are any changes. The second step is to define payment terms and policies. The next step is salaries; bonuses and taxes calculations as overtime, vacation are taken into account. Mistakes might occur in this step as employees might forget to report unregularly time or accountants might calculate wrong.
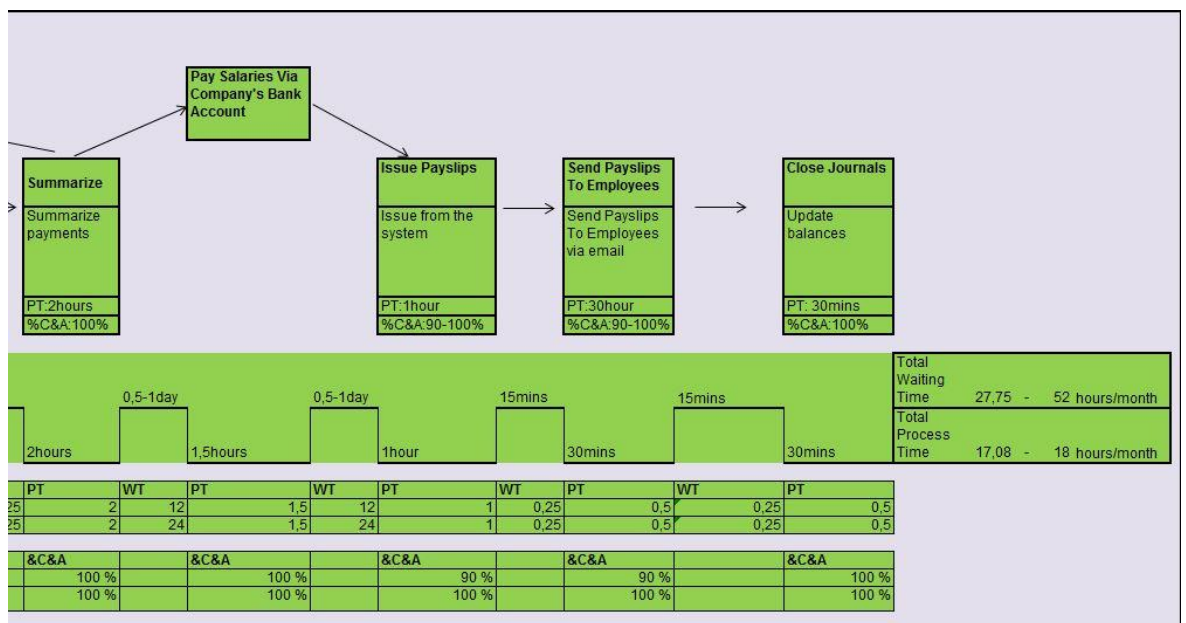
Figure 20. Current Phase – General Ledger – Pay Salaries to Employees – Part 2

Figure 20 presents remaining payroll activities. After salaries and other related amounts are calculated, accountants log in company's electronic bank to pay salaries to employees and issue pays lips. The final step is to close the journals and update to expense ledgers.

Box Score

Key Performance Metrics	Current State	
	Minumum Value	Maximum Value
Process Time (hours)	46,08	52,75
Waiting (hours)	28,75	52,75
Cycle Time (hours)	74,83	105,50
%Activity	61,58 %	50,00 %
%Waiting	38,42 %	50,00 %
%RFPY	31 %	72 %
Number of steps		16

Figure 21. Box Score of General Ledger – Current Phase

Figure 21 presents box score of the results of key performance metrics in General Ledger module. The process time is very long leads to long cycle time.

4.2 Problem Analysis Phase

This section performs a variety of lean analysis tools to give a detail look of problems faced by accounting department in aforementioned activities in section 4.1 of the case company.

4.2.1 Waste Analysis

Maskell & al. 1996 defines all financial transactions are subjected to being Waste. Waste is easily detected and visible once value stream mapping is drawn. After visualizing all the accounting activities and connecting each activity to each activity in the case company to create a current state of a value stream mapping, the author is able to identify 9 types of waste in 3 cycle stages of 3 highest volume of transaction accounting processes in case company which are: Accounts Receivable, Accounts Payable, and General Ledger. 3 cycle stages in Accounts Receivable are Pre-Invoicing, Invoicing and After-Invoicing. 3 cycle stages in Account Payable are Pre-Invoice-Payment, Invoice Payment and After Invoice Payment.

Table 5. Waste analysis of the accounting processes in case company

Types of Waste	Stages	Accounts Receivable	Accounts Payable	General Ledger
Transport	**Pre-**	Print and fetch invoic-	Receive invoices	

	Invoicing	es from printer.	by post/fetch invoices from Helsinki office.	
	Invoicing			
	After-Invoicing	Send invoices by post to customers.		
Inventory	**Pre-Invoicing**	Billable hours waiting to be reviewed and approved by different levels of managers on weekly basic. Approved billable hours on weekly basic are stored and cumulated until the last week of the month to be processed and inputted in Axapta for billing process.	Invoices coming to Helsinki office wait averagely from 1 to 7 days to be sent to Accounting department in Tallinn.	Same inventory type of waste in Account Receivable and Account Payable
	Invoicing			
	After-Invoicing			
Motion	**Pre-Invoicing**	Collect billable hour timesheet from other departments. Categorize billable hours according to product lines. Email billable hour timesheet to product line managers for verification. Manually compare	Inspect invoices from suppliers. Process three - way matching suppliers' invoices, purchase order and receiving report.	Manually separate quarterly customer invoices into monthly invoice.

		amount of billable hours with customers' agreements to avoid over billing.		
	Invoicing	Enter a hundred of rows of billable hours manually to Account Receivable module in Axapta every month.	Enter invoices to Account Payable module in Axapta. Manually pay invoices on bank account: fill in invoice and reference numbers	Pay salaries and tax which is done separately from the system.
	After-Invoicing	Print invoices Stuff into envelopes Affixing postage Mail invoices to customers Check bank account if customers send payment. (this step is done many times because electronic banking is not integrated in the system): − Record customer payment to close paid invoice in Axapta. − Send overdue notice	Approve payments to close invoices in Axapta.	Record paid salaries and taxes in Axapta. Classify expenses into many different subledgers.
Waiting	**Pre-Invoicing**	Wait for inspection and approval from manag-	Wait for invoices to get approval	Same waiting in Ac-

35

		ers before input billable hours into Axapta	from manager. Wait to receive approved invoices from Helsinki office to process.	count Receivable and Account Payable
	Invoicing			
	After-Invoicing	Waiting for customer paying invoices to close journal or send overdue notice		Same waiting in Account Receivable
Over Production	**Pre-Invoicing**			
	Invoicing			
	After-Invoicing			Might produce reports that no longer necessary
Over Processing	**Pre-Invoicing**			
	Invoicing			
	After-Invoicing			Produce extremely detailed reports when a higher-level report would work
Defects	**Pre-Invoicing**	Wrong amount/type of billable hours Invoice wrong customers Wrong address	Wrong amount of invoices	bad data from database
	Invoicing	Wrong amount/type of billable hours		
	After-Invoicing			

Abundant Goods	Pre-Invoicing			
	Invoicing			
	After-Invoicing			Produce reports for company's purposes only.
Talents	Pre-Invoicing	Manual and double work	Manual and double work	Manual and double work
	Invoicing	Manual and double work	Manual and double work	Manual and double work
	After-Invoicing	Manual and double work	Manual and double work	Manual and double work

Table 5 shows that Waste are detected and identified equally among three accounting processes. Compare between value streams mapping from subsection 4.1.1 and waste analysis in table 5, most of waste are non-value added activities in case company's current accounting processes. Waste under Motion category contributes the largest amount of Waste while Transport, Inventory and Waiting contribute equally to the second largest amount of overall waste. These types of Waste in case company do not occur separately but relate closely or have root-cause relation to each other. The most visible linkage is between group of Transport, Inventory, Motion and Waiting. Once any unnecessary action occurs in those three previous types of Waste, it unavoidably leads to the occurrence of Waiting Waste. Likewise, Defects Waste always causes extra unnecessary actions in checking, speculation in Motion Waste. Lastly, Talents Waste is the result from the occurrence of all type of Waste. Overproduction, Over Processing and Abundant Goods are not detected in Account Receivable and Account Payable, it might be detected in General Ledger instead but these types of Waste are not considered as important for case company as mentioned above Waste Types.

Overall, current accounting processes of case company rely heavily on the manual control and multiple levels of management inspection and approval of billable hours and invoices to ensure their accuracy and consistent with customers' and suppliers' agreements. This is shown clearly as Waste occurs mostly in pre-invoicing out of three stages in each accounting process. Thus, this leads to higher cost of control, longer waiting and processing time, and higher probability of occurring errors especially when accountants have overloaded transactions needed to be processed.

4.2.2 Process Analysis

This subsection presents in numerical figures of the amount of Value – Added Time compared to Non Value – Added Time in the Cycle Time. Data is retrieved from Value Stream Mapping in subsection 4.1.1. The amounts of time spent in same activities in monthly invoicing process and quarterly invoicing processes are combined.

Value – Added Time is the amount of time that a process takes to transform a product/service into what customers would like to purchase (Cudney & al. 2014, 496.)

$$\%Value\text{-}Added\ Time \left(\frac{\sum Time\ spent\ in\ Value\text{-}Added\ Activities}{\sum time\ for\ entire\ process} \right) X\ 100\%$$

Table 6. Process Analysis

Processes	Value-Added Activities	Non Value-Added Activities	%Value-Added Time
Accounts Receivable	Input in accounting system (12,5-23hours) Create Invoices (10-12hours) Send Invoices (4hours) Close Payment Journal (4hours)	Collect Billable Hours (0,25 hour) Send Billable Hours to Product Line Managers to verify (0,25hour) Verify Billable Hours with Bosses (0,5 -1hour) Summarize Billable Hours (1,5 hours) Get PO Numbers Finalize Invoices (4,5-5,5hours) Resolve mismatch (4,5hours) Print Invoices (1 hour) Resend Invoices (1 hour) Manually Check Bank Account (0,5hour) Receive Payments(1-2 hours) Send overdue payment notices (0,5 hour) Confirm Payments(0,5 hour) Bank Reconciliation (5,5-6hours)	56%-61%

		Create and Post Matching Transactions (2,5-3,5hours)	
Accounts Payable	Record Invoices (2hours) Issue Credit Cards to Employees Pay Invoices Via Bank Record in Journals in Accounts Payable (1,5-2hours) Close Payment Journals (1hour)	Receive Invoices(0,25 hour) Manual Three Way Match Invoices (3-4hours) Pay Overdue Invoices Via Bank (1hour)	49%-51%
General Ledger	Input Customer Invoices (7,5 – 13,5 hours) Input Supplier Invoices (8 hours) Update Employee Master Data (1 hours) Define Payment Terms and Policies (0,25 hour) Calculate Salaries (5-6hours) Calculate Bonuses (2 hours) Calculate Taxes (2 hours) Pay Salaries Via Company's Bank Account (1,5 hours) Close Journals (0,5 hour)	Manually Separate Quarterly Invoices into Monthly Journals (7,5 hours) Classify Expenses (6 hours) Check Mistakes (1,5 hours) Summarize (2 hours) Issue pay slips (1 hour) Send pay slips To Employees (0,5 hour)	60%-65%
Whole Process	62,75 – 82,75 hours	46,75 - 51,25 hours	57%-62%

Table 6 shows that most Non Value – Added activities are found in Accounts Receivable module. The time proportion is quite equal between Value – Added and Non Value - Added activities in overall and in each process. The most time consuming activities are inputting information in the system.

4.2.3 Process Capacity Study

Process capacity is the study of the ability of a process to produce a specific product or deliver a specific service which is capable of meeting specifications set by producer or customer. In other word, Process capacity is conducted on the performance of individual product or service against set specifications. (Cudney & al. 2014, 48)

The author applies Process Capacity Study in this study of the performance of case company's current accounting process to evaluate its efficiency. According to Value Stream Mapping in subsection 4.11, Account Receivable is the most important part in company X as it is the most time-consuming and requires heavy inspection out of three processes.

Key performance metrics are applied as follows: Number of defects observed, Number of units inspected, Defects per unit (DPU), Defects per Opportunity (DPO), Number of defects observed on a unit, number of opportunity on a unit, Defects per million opportunities (DPMO)

$$DPU = \frac{\textit{Number of defects observed}}{\textit{Number of units inspected}}$$

$$DPO = \frac{\textit{Number of defects observed on a unit}}{\textit{Number of opportunity on units}}$$

$$DPMO = DPO \ X \ 1 \ 000 \ 000$$

Number of unit is the amount of lines that accountants have to prepare to put in invoices. The number of invoices is unqualified to be chosen as sample in the case of case company due to the fact that the time and effort spent on each invoice is not equal as some customers get more services than other and different services have different method of collecting billing hours, leading to different time spending on invoicing hour collection, investigation and analysis as well as the input of different amount of invoicing lines. Each invoicing line, however, is equally prepared and time-consuming, thus is qualified to be sample for this study.

Number of opportunities on a unit is the number of different parts contributing to each in-voicing line. There are 18 invoicing parts which are classified as followed: service type, name of service, billable type, service category, name of customer, name of person who performs the service, invoice description, date, week, month, amount of kilometers, price per travelling kilometer , km * price, amount of hours, hourly price, total pricing amount, extra information field 1, extra information field 2.

Number of defects observed on a unit is the average number of wrong parts in each in-voicing line. The author observed reporting billable-hours sheet in case company for 2 months from 15th February, 2016 to 4th April, 2016. The results are as follows:

TIME	UNITS	OPPORTUNITIES/UNIT	DEFECTS	DPU	DPO	DPMO
15th Feb - 19th Feb, 2016	56	18	15	0,267857143	0,01488	14881
22th Feb - 26th Feb, 2016	54	18	11	0,203703704	0,01132	11316,9
29th Feb - 4th Mar, 2016	51	18	8	0,156862745	0,00871	8714,6
7th Mar - 11th Mar, 2016	54	18	16	0,296296296	0,01646	16460,9
14th Mar - 18th Mar, 2016	58	18	9	0,155172414	0,00862	8620,69
21th Mar - 25th Mar, 2016	48	18	14	0,291666667	0,0162	16203,7
28th Mar - 1st Apr, 2016	57	18	17	0,298245614	0,01657	16569,2
4th Apr - 8th Apr, 2016	58	18	9	0,155172414	0,00862	8620,69

Figure 22. Process Capacity Analysis

Figure 22 shows that defects happened in every week and accounted for 20% to 30% of the total number of units, which leads to the DPMO figures vary from 8 000 to 16 000 de-fects per million opportunities.

4.3   Problems Prevention and Elimination Strategy Phase

This section presents strategies on how to tackle problems stated in section 4.2.

As mentioned in the previous sections, the heavily reliance on inspection and control in one hand helps case company to ensure proper authority and accuracy in financial data recording but in another hand it leads to higher control cost, many unnecessary proce-dures and extra works from accounting department and risks of being controlled as it is not particularly effective in detecting problems and errors that do occur. This inspection method involves the comparison of process output with a standard of some kind. When errors are found, they are corrected without any step to be done to determine the system-atic problem which underlies the cause of errors. As a result, the level of inspection is gradually increased to catch more errors while errors, at the same time, keep occurring with a relatively constant frequency until there is a change occurring in the process gener-ating those errors.

In the case of company X, errors frequently happen in the billable hour collection and verification (pre-invoicing state) and in invoice preparation (invoicing state) in Accounts Receivable activities. Subsection 4.2.3 provides a defect measurement study for these activities. In the billable hour collection and verification process, errors occur when employees mistakenly categorize billable hours for a specific project/service under wrong category or record incorrect price. If this error is suspected, rechecking customer's agreement is required and accountant/manager will fix it in billable sheet. Case company process billable hours on weekly basis, thus leads to this type of error occurs every week. In the invoice preparation process, if error occurs, for example, mismatch in invoiced amount, accountants have to check contract's term and all billable time sheet again to identify the error, then fix it.

Figure 23. Change in the paradigm related to control in Lean Accounting.

Maskell & al. (1996, 103) introduces a new lean perspective on internal accounting control which shifts from traditional control through inspection to lean control through prevention as shown in figure 23. According to lean philosophy, all transactions are classified as waste, thus, tracking and inspecting high volume of transactions is considered wasteful. Lean seeks for the way to eliminate the existence of those transactions even before the actual accounting flows start instead as it identifies particular process features that drive errors more probable, then re-structures that process to minimize that probability.

The shift to this type of control can help case company avoid such above mentioned problems occurring in accounting department. In this section, the author presents Root-Cause Analysis as one of the most efficient control through prevention tools to prevent and eliminate types of waste occurring in the control through inspection method of case company.

4.3.1 Root-Cause Analysis

In order to control through prevention, the first step is to analyze the roots underling the problems to prevent them at the very first stage. In this subsection, author utilize root-cause fishbone diagram to address the roots behind problems that company X facing in subsection 4.2.1, 4.2.2 and 4.2.3.
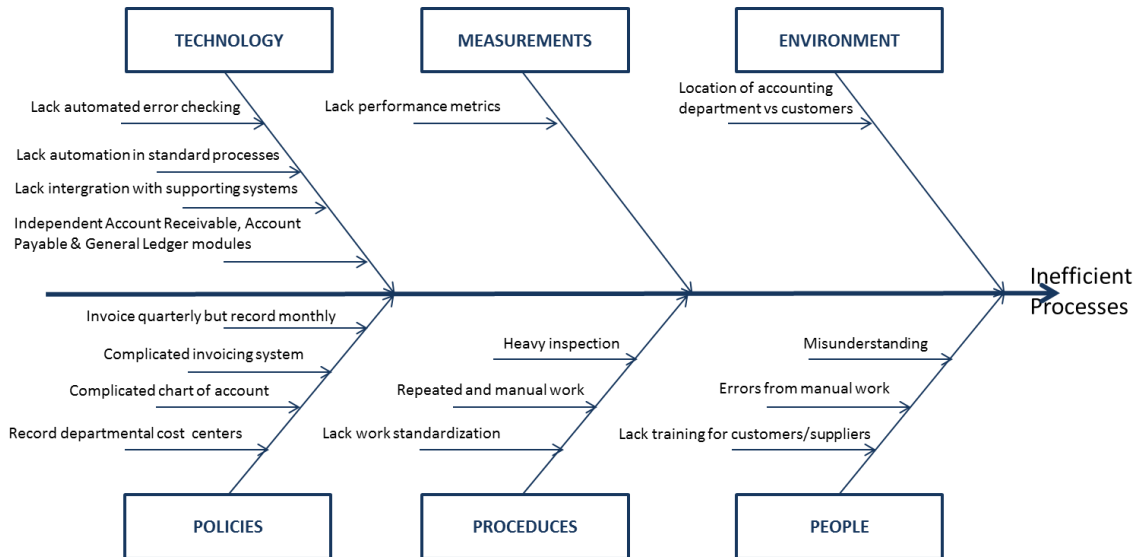
Figure 24. Fishbone diagram of root – cause analysis in company X

Figure 24 presents roots underlying problems faced by accounting department of company X. Roots related to technology and policies account for most of the problems and also lead to the roots in other matters.

Old and outdated accounting software leads to wasteful time and effort consuming, lengthy overall cycle time. Firstly, the lack of automation in error checking processes leads to heavy inspection from different management levels to compensate for the steady accuracy nature of automation. In Account Receivable process, Billable hour recording and tracking is processed 100% manually from employee level to management level, lead to heavy inspection in proceeding steps. In Account Payable process, Three Way Matching Invoice is also processed manually by accountants. Secondly, recurring processes which happen every financial period are not automated, thus accountants have to perform unnecessary repeated tasks such as: send recurring invoices, send payment to recurring invoices, send overdue invoices. Thirdly, some procedures require double or triple works and unnecessary large amount of manual work because they are not integrated or not enable in the current accounting system. E-invoicing and electronic banking are not implemented so that accountants have to do these related activities: send invoices to cus-

tomers by post, check bank account, and update account receivable balance in Axapta separately. Similarity, accountants receive invoices from suppliers by post, pay via bank, check and update account payable balance in Axapta separately. Fourthly, account receivable, account payable and general ledger modules are implemented independently leads to same financial transactions also have to be inputted independently in those three modules as updating General Ledger accounts are the latest process among three processes. As the result, Waste detected in Account Receivable and Account Payable occurs again in General Ledger process.

Company X is currently maintaining invoicing procedures and policies which do not match with the simple operation of the current accounting system in two matters: the first matter is current system itself posts many disadvantages, as aforementioned in previous paragraph, to support two complicated invoicing methods, the second matter is company X bills regular customers on quarterly basis but records on monthly basis while the General Ledger module does not enable the automatic recording recurring balance accounts, which leads to accountants, at the beginning of each quarter, have to manually divide the quarterly invoice amount into monthly revenue, then record in the system for the first month, keep track of the invoice amount for another two months in excel file to record in general ledger later when the second and third month comes. Besides, for the purpose of producing report and budget comparison, case company is currently maintaining a complicated chart of account with the record of many cost centers on department level leads to unnecessary processing time from accountants.

There are not any standard performance metrics applied to measure the effectiveness of activities performed, leading to the un-synchronizing procedures. Thus, when a problem occurs, it is difficult to access and identify the root behind the problem and to apply the right method to fix that problem.

While accounting department is located in Tallinn office while all the transactions with customers are performed in Helsinki office, it creates unavoidable Waste such as transportation, miscommunication, delay etc. Eventually, this disadvantage might cause already existing Waste worse.

The lack of trainings to customers and suppliers also contributes to the root behind problems caused by people. Suppliers have different ways of sending invoices as customers have different ways of receiving invoices and different payment periods.

All the aforementioned roots lead to the roots occurring in procedures as there are so much manual, double and repeated work, heavy inspection and lacking work standardization.

After root-cause problems are identified, the elimination of root-cause variability should be addressed to bring the whole process under control.

4.4 Improvement Phase – Streamline accounting processes

This section presents idea on how to eliminate problems[9] by using various Lean methodologies to tackle roots[10] underlying those problems.

A successful implementation of Lean philosophy and principles approach in optimizing accounting processes is measured by minimizing process inefficiencies while maximizing process efficiencies. This can be achieved by linking key Lean performances factors and metrics to the three crucial dimensions of any process optimization as follows: speed, accuracy and efficiency and at the same time, streamline all accounting processes.

$$\textit{Lean accounting process optimization} = \sum_{n=1}^{n} S^n \; + \; \sum_{n=1}^{n} A^n \; + \; \sum_{n=1}^{n} E^n$$

The straightforward equation measures the effect of various lean methodologies which are utilized in this workbook to improve case company's accounting processes as well as the dependencies of each improvement effort to each other and the overall optimization of all process as a whole. Each parameter (P) in process optimization: Speed, Accuracy and Efficiency are expressed under S, A and E respectively in the equation with the joint benefit of the initiatives ranging from 1st to nth count. nth presents suggested Lean practices by the author applied in three processes Accounts Receivable (AR), Accounts Payable (AP), and General Ledger (GL) to achieve the optimum of each process optimization dimension, thus improve the whole process.

With the purpose of visualizing, evaluating and measuring results of improvements from aforementioned Lean practices, the performance metrics are applied. The performance

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[9] Mentioned in section 4.2
[10] mentioned in section 4.3

metrics are lean metrics applied in the Current Phase 4.1 and Analysis Phase 4.2 to make the results of future phase comparable to current phase.

Table 7 presents the process optimization matrix suggested by the author for company X. Various Lean Methodologies are applied in each accounting module and the performance metrics to measure the efficiency of the application of those tools and the aimed targets are suggested to achieve the optimum of process optimization.

Table 7. Process Optimization Matrix

P	Process Factors (initiatives 1st to nth)	Process	Sub-Section	Metrics	Target
S	One piece flow technique to reduce transaction volume.	AR,AP,GL	4.4.1	PT WT CT	Shorten PT, WT, CT
	Streamline processes: − Chart of accounts to reduce number of accounts and cost centers − AR, AP, GL to reduce double works	GL AR,AP,GL	4.4.1		
A	Mistake proofing in: − Time tracking system − Invoice data entry − Invoice matching − Payroll process	AR AR AP GL	4.4.3	DPMO %C&A %RFPY	Zero defects 99%-100% accurate
	Autonomation: − Bank reconciliation − Three-way matching − Create appropriate journal entries from imported batch of transactions	AR,AP,GL AP GL	4.4.5		
E	Integrate with supporting systems: − Time Tracking − Electronic Invoicing − Electronic Bank	AR AR AR,AP,GL	4.4.2	%Activity %Waiting %Value – Added Time	Reduce Waste Reduce Non Added – Value Activities

Automated processes: − Send overdue invoices − Send recurring invoices − Send payment for recurring invoices − Create recurring journals − Record deferred revenues	AR AR AP GL GL	4.4.4			Reduce Manual Processes Increase Automatic Processes
Training: − Accountants − Employees − Customers − Suppliers	AR,AP,GL	4.4.6			

A shorter cycle time, which results from shorter process and waiting time, provides accountants ability to free themselves from traditional bookkeeping activities to take charge in the control position of the improved processes to ensure the efficiency of the whole process. Company also benefits from it as financial information is processed faster; leading to financial result is available faster for faster decision making.

Accurate financial procedures and information with zero defects occurring 100% first time through provides a true and reliable situation of company business, thus lead to more appropriate decision making.

In order to reach fast and accurate process, the process must work efficiently with high proportion of time of value – added process. Process efficiency is the application of supporting systems that are appropriate to the need of the company. Training is also carried out to ensure right people for the right process.

4.4.1 Work Standardization

Work Standardization helps to eliminate unnecessary waste such as: transactions, invoices, and account maintenance, then create a continuous and efficient flow among all steps in the whole process.

Key customers and suppliers identification – One piece flow technique
This part concerns the reduction of Motion Waste occurring in Account Receivable and Account Payable.

According to case company's current value stream mapping, the most time-consuming activities are in the customer invoicing process and supplier invoicing speculation in both monthly and quarterly routine due to the high volume of transactions. On average, it takes from accountants 3-4 hours/month and 1-2 days/quarter to prepare customer invoices, as well as 3-4 hours/month to three way match supplier invoices. Identifying key customers and suppliers can help case company reduce significantly the batch size of transactions, thus reduce the number of units requiring inspection if defect is found, eventually speed up the concerned process. Besides, associated cost is also significantly reduced.

The first step is to reduce multiple suppliers for the same commodity. Case company pays to suppliers on monthly basic on office supplies, drinks, rent, insurance, electronic, water, phone and 3g bills, back-up and related services needed to maintain company's servers This step involves the analysis of suppliers' performance on quality of goods, term of delivery and customer service. Besides, related expenses are grouped under same categories, thus, case company can seek for suppliers who can deliver a large range of related products and services. Combining all the above factors, case company can identify unique suppliers for same commodity. These unique suppliers will be subjected to key suppliers identification in the below step.

Company can identify key customers and suppliers by using 80/20 Pareto rule. 80% of the revenue comes from 20% customers as well as 80% of the purchases comes from 20% suppliers. Accountants can identify these suppliers and customers via history reports to identify which suppliers have contributed to 80% of total expenses and which customers have contributed to 80% of company revenue in the past recent years. These 20% customers and 20% suppliers are identified as key customers and suppliers or certified partners.

The next step is to draft master purchase agreement with all key suppliers. Master purchase agreement includes specific terms and agreements on specific items/services, quantity and price of items/services, delivery frequency and terms in which when suppliers will be notified for the next delivery to avoid recurring invoices and processes on monthly basic over a long time period which is usually one year. This step would eliminate the need of creating purchase order and allow master purchase order to be included in supplier master file, thus, three way matching purchase order, invoice and receiving report can be reduced to two way matching.

Likewise, case company also can negotiate with key customers to become their certified suppliers and encourage key customers to use blanket purchase order to reduce the volume of purchase orders.

Regarding of 80% of the rest of customers and suppliers which usually make up the greatest amount of transactions, case company can negotiate to change monthly invoice basis to quarterly invoice basis.

As a result, by identifying key suppliers and customers, case company can not only improve cooperative relationship with their key partners, encourages suppliers to get payment faster thus reduce the process cycle time but also reduce significantly amount of paper works and transactions by shifting from a transaction intensive and procedurally complex process to one piece flow technique with minimum transactions and built-in controls. Built-in controls will be explained deeply in Mistake Proofing chapter.

Chart of Account Simplification – Value Stream in Account Structure

This part concerns the elimination of Waste which occurs in activities performed in General Ledger module.

Case company's current chart of account is lengthy and complicated with high volume of sub ledgers as all transactions in all accounts are maintained to ensure the balances of all accounts in financial statements are classified properly. Besides, case company also relies on reporting of actual costs versus budgeted amount of each department/office as a tool in accounting control process. This practice, on one hand, helps case company to easily review all the records at the year-end audit and easily track down cost associated to an individual apartment/office. On another hand, this, however, leads to more maintenance work needed to update a listing of the detailed records in all accounts as well as difficulties in report preparation, thus causes delays in closing the books. As a result, value stream does not exist in current account structure.

To tackle this matter, accountants can periodically review balances of all accounts and merge small balance accounts into larger accounts. Before eliminating small balance accounts, however, all the reports generated from General Ledger should be reviewed to ensure the deleted accounts are not any report recipient or are stored for some special purpose; otherwise, the report will not be complete. The periodical elimination of small amount of small balance accounts does not impact the comparability of accounts in any one year to any great degree, (Bragg 2013, 340). Major conversion in Chart of Account, however, should be undertaken at the very beginning of company's reporting period to avoid the problem that it is more difficult to create historical reports to compare with account balances in the previous periods. This requires minimal work, reduces clutter in balance sheet and does not interfere with the proper recording of information.

The next step is to create a value stream in account structure as case company can reduce cost centers. The first step is to identify key value streams in case company. The second step is rather than to collect and categorize all kind of cost elements associated with different departments, Helsinki and Tallinn offices, costs can be collected and grouped for each value stream. The third step is to identify cost centers for each value stream. Each value stream can have very few cost centers. Cost related to labor is collected by the sum of wages and bonus associated with working in specific value stream. All other costs are assigned to administration and overhead category.

Streamline Accounts Receivable, Accounts Payable and General Ledger

As mentioned in section 4.1 and 4.2, current accounting system does not support streamline for its modules as accountants have to input same information in different modules. Interfacing Accounts Receivable and Accounts Payable with General Ledger enables data flow automatic among processes under the approval of accountants. Accountants firstly choose batch of postings presenting accounting transactions performed in Accounts Receivable and Accounts Payable to be updated in Chart of Accounts in General Ledger. Once the transfer of those posting batches is enabled, they will be automatically imported to and created corresponding journal entries and posted to the appropriate accounts in General Ledger. Accountants can determine which transactions are imported to General Ledger by specify General Ledger date range, which, in turn, the system will import only transactions executed within that date range. This practice saves time from accountants as well as avoids the risk of mismatch data because of inputting many times.

4.4.2 Supporting systems integration

This subsection introduces electronic systems that can be integrated in the accounting system to shorten cycle time and reduce human effort.

Time keeping system

This system allows employees to record and report their billable hours on daily or weekly basis. Employees can make a list of tasks they need to perform during the week beforehand and mark them done once they have finished those tasks. There are list of functionalities for employees to manage their task list. For example, finished task but can modify later or finished task and send right away to managers' account in the system. Managers then collect those billable hours and modify then send straight to accounting system for accountants. The system also has automated reminders as it automatically send reminder to employees whose timesheet has not yet been entered in the system.

In order to the accounting system can read the data transmitted from Time keeping system, the data format from two systems should be the same.

E-invoicing system

The traditional invoicing process is extraordinarily wasteful in term of human effort and time that go into creating and issuing an invoice. Regarding paper invoices, they might be lost due to mistakes or changes in the address of customers. There are also delays at the receiving company especially large corporation as mailroom has to sort out through the mails firstly and then deliver internally, leads to long time payment. Regarding electronic invoices, this requires the collections of customers' email from each customer. This address is then attached to an electronic invoice that is generated and issued to customer via internet. Allow immediate payments or prompt response from customers regarding any mistake.

E-invoicing, however, posts several problems. Customers change email address or erase invoices by mistake without reviewing them. In order to avoid such unexpected issues, accountants can analyze on which customers pay electronic invoices reliably and who does not to decide on who should be issued electronic invoices. The system also can re-issue same invoices, if needed, on weekly or second weekly basis automatically in case customers do not receive the invoices. The reissuance, however, posts a risk of multiple payments for customers. To avoid this, reissue invoices should be in the different format and title should be addressed as reminder invoices.

Electronic Bank Integration

This part concerns the interface and streamline of electronic banking with all three modules in accounting system as accounting system is able to connect to bank account, import bank statements and automatically enter transactions into bookkeeping records.

4.4.3 Mistake Proofing

This methodology can be applied in activities that required speculation in company X to prevent mistakes caused by humans such as billable time sheet verification, invoicing process in Accounts Receivable and three way matching supplier invoices in Accounts Payable. On the other hand, the system does not always perform correctly. Thus, case company can combine the technique with self – checking to ensure 100% accuracy in all speculation activities. In order to implement successfully this combination, accountants have to understand installed mistake proofing systems, how they work as well as their functionalities.

Automatic error checking during entering time keeping system

This part concerns the elimination of errors occurring in time keeping system as employees input by themselves.

Errors during this data-entry stage can lead to more inspection and checking work from accountants when they are preparing invoices. The computerized data-checking application integrated in the time keeping system should have protocols for input fields. These input fields should be the same, in the same format and have the same allowed number of digits with information needed in a customer invoice so that accountants do not need to modify data again once they have received billable hour reports, generated by the time keeping system by employees, sent to invoicing module; they just need to copy and paste into invoicing creation instead. These fields include: service type, product, product category, name of customer, name of person who performs the service, invoice description, week, month, amount of kilometers, price per travelling kilometer , km * price, amount of hours, hourly price, total pricing amount.

Automatic error checking during entering invoice data entry

This part concerns the elimination errors occurring in invoicing preparation in Account Receivable.

Errors during data-entry stage of creating invoice can result in a variety of downstream problems. Incorrect customer billing address, quantity of services, service description and price are typical errors. This can leads to a problem that customers might not pay the invoice. As a result, accountants have to work extra in the non-payment process and negotiate extra payment. The application of a computerized data-checking method can help to prevent as many data-entry problems in advance as much as possible.

Computerized data-checking application should have all the data-checking protocols for all the fields that needed to be included in the invoices such as: Zip Code, Prices, Payment Term and Product Description. These protocols should be able to be customized according to company's preferred invoice style. Besides, some sort of standards should be applied to these protocols to avoid mistakes. For example, Zip Code field should be programed to get data from a list of cities so that either city or zip code is inputted, the other will automatically appear. Also, only 5 digits - input is allowed to enter in Zip Code field to avoid unusual length. Similarity, Price, Product Description and Product Number fields should be also linked to some sort of database so that either one of these fields are entered, the rest will be entered automatically. The system should also obtain a valid entry

that compulsorily requires input to authorize the invoice; otherwise, the invoice cannot be processed.

Automatic error checking during three-way-matching process

This process is applied in the automatic matching in Accounts Payable to avoid mistakes. Purchase documents including purchase order, invoice and receiving report are imported into the system under the same format. Then the system will automatically check the information inside those documents to ensure they are matched.

Automatic error checking during payroll process

This process is applied in the automatic checking when calculating salaries to employees in General Ledger. The system will automatically fetch data from employee master data and compare with information accountants entered in planned pay slips to ensure data about pay rate, tax rate is correct.

4.4.4 Automation

This subsection concerns the automation of recurring processes over the same financial periods. By automating repeated activities, it ensures the processes are performed automatically on the frequent basis set by accountants.

Automatic sending of recurring invoices to customers in Accounts Receivable

This functionality can be applied in the Quarterly Invoicing Process in Accounts Receivable due to the nature of the process as it is the preparation of recurring invoices for regular service for regular customers.

Automatic sending of payment for recurring invoices to suppliers in Accounts Payable

This chapter concerns the time reduction in dealing with recurring invoices that have same amount arriving at regular intervals during a long time period. This type of invoice occurs mostly in quarterly invoicing process in case company.

In order to reduce the same work for accountants, these invoices can be streamlined by creating a payment schedule for them in accounting system to overpass the approval process and issue automatically payment with a pre-specified amount on a pre-specified date. These repetitive payments schedule should be reviewed as well as payment amount and payment date should be modified if needed to avoid over or under payments if contract terms change in the future. Besides, termination date should also be included in

these schedules to avoid extra payments. Company is liable to make these payments, thus company can be subject to penalties if these payments are not paid.

Automatic sending of overdue invoice notices to customers in Accounts Receivable

This functionality is applied in after invoicing stage in Accounts Receivable. As the accounting system is integrated with electronic banking, the system can check the automatic generate overdue reminders.

Automatic creating of recurring journals in General Ledger

This functionality applies in the case that accountants have to record recurring journal entries over similar financial periods.

Automatic processing of deferred revenues in General Ledger

This functionality applies in the case that accountants record quarterly sales invoices on monthly basis in General Ledger. At the beginning, deferred revenue for a quarter is recorded on credit side of unearned revenue in Liability and debit side of customer's account receivable (in the case that company has not received payment until that time) or cash account (in the case that company received payment). The next step is to set the timeframe, the recognized revenue for each period in the timeframe and the recognition date. In the case of company X, timeframe is 3 months of 1 quarter, the value of recognized revenue is equal for each month. After revenue recognition is enabled, on the set recognition date of the next month, the system automatically generates appropriate journal entries to recognize revenue as follows:

Accounts	*Debit*	*Credit*
Unearned Revenue.	*………………1 third of quarter sales*	*………………………………*
Revenue	*…………………………………….....*	*……1 third of quarter sales*

And this process will repeat automatically for the next 2 months until all unearned revenues are recognized.

4.4.5 Autonomation

This subsection concerns the control over processes that need automation but also inspection. Autonomation enables the processes to be performed and able to detect defects automatically but under speculation of accountants to ensure the absolute accuracy.

Automatic three-way matching in Account Payable

Three-way matching invoices is the most time-consuming activity in Account Payable process as accountants have to manually match supplier's invoice, purchase order and receiving report. This process can be automated once all the three needed documents are inputted in the system. By the introduction of key and certified suppliers in subsection 3.4.1, company X can negotiate with suppliers so that they can send directly to Tallinn office via email instead of sending to Helsinki office. Then accountants can input all the documents in the system. Once all the needed documents are in the system, the automatic matching process starts. Matched invoices are finalized for approval and prepare for payment. With unmatched invoices, the system will automatically send email notification to suppliers to request the information clarity.

Automatic bank reconciliation

This method enables the bank balance reconciliation process automatically by compared the uploaded electronic bank statement and the un-reconciled balance of accounts in the system by applying matching rule. The electronic bank statement is uploaded automatically from electronic bank account if it is streamlined and integrated with accounting system or uploaded manually by accountants. In order for this process to perform successfully, the perquisite requirement is that the uploaded and imported bank statements have to be in the right format so that the system can read and compare data. During the reconciliation, the system will inform abnormal activities, for example, no matching is found or there are more than one matching is found. Regarding the first case, the system allows accountants to find match manually. Regarding the second case, the system will list all possible matching transactions on the screen and accountant can choose which is the correct matching.

Automatic creating corresponding journal entries in General Ledger from transactions imported from Accounts Receivable and Accounts Payable

Batch of transactions after imported from Accounts Receivable and Accounts Payable are, under the authorization of accountants, created in General Ledger under appropriate journal entries.

4.4.6   Training

Training is needed for employees in general and for accounting department in specific once the new system is implemented to maintain a continuous work flow. Employees are trained to use the Time Keeping System on how to input data correctly without creating any mistakes as well as how to send the hour report via the system. Accountants are trained on how to control the automatic steps to ensure a 100% accurate flow of data.

Training is also necessary for customers and suppliers especially when dealing with e-invoicing and e-payment. Customers should be instructed to check emails for invoices rather than mails by post. Suppliers should be instructed to send invoices directly to accounting apartment via electronic form in the right format so that accountants can import into system rather than inputting manually.

4.5   Control Phase

This section concerns on the matters of how to control the future accounting process.

Continuous Improvement

Continuous improvement is necessary to keep the case company on track and keep up with the new changes in the accounting activities.

Comply with International Accounting Standards Board

Lean accounting fully complied with International Accounting Standards Board as it does not change the way accounting information are recorded (Lean Accounting Summit, 2016).

Lean accounting also fully complied with International Management Accounting Standards (Institute of Management Accountants, 2016)

4.6   Value Mapping Stream – Future Phase

This chapter concerns the proposed future phase of an effective accounting system for company X based on the improvements suggested in section 4.4.

The target of %C&A is 100% so in the future value stream map, all activities are assumed to reach 100% C&A.

Accounts Receivable

This part presents the future state of Accounts Receivable activities in company X.

Monthly Billable Invoicing

Figure 25. Future Phase – Accounts Receivable – Billable Invoicing – Pre-Invoicing Stage

Figure 25 presents activities performed in the Pre-Invoicing Stage of Billable Invoicing of future Accounts Receivable. Employees record billable hours via Time Keeping System. Mistake-proofing function integrated in the Time Keeping System prevents the incorrect input. At the end of the weekdays, employees will press the "Send" button in Time Keeping System to send weekly cumulative billable hours directly to new accounting system. Accountants receive and verify those billable hours directly from Account Receivable module. Accountants can generate pdf file to send to bosses to verify.

Figure 26. Future Phase – Accounts Receivable – Billable Invoicing – Invoicing and After Invoicing Stages

Figure 26 presents activities performed in the Invoicing and Post Invoicing stages of Billable Invoicing in the future Accounts Receivable. At the end of the month, accountants will prepare invoices from cumulative billable hours sent from Time Keeping System over 4

weeks of the month. Inspection is not as heavy as it is used to be thanking to the double error proofing checking when employees input data in the Time Keeping System and when accountants create invoice data entry. The next step is to send invoices. This step will be processed electronically as accountants just need to press a button to confirm sending invoices and it will automatically send to customers' emails. There is another option that the invoices will be automatically sent to customers once it has been created.

The interference with Electronic Banking will help accountants keep track of payments as it will send notification to accounting system once it has received payments from customers and, at the same time, it will send bank statement to accounting system to prepare for bank reconciliation. This interference also helps to automatically send overdue notices to customers as the system will check the invoice date and bank statement if the payment is received within the payment period of time stated in the invoice. Bank reconciliation will be automatically processed to compare bank statements imported from Electronic Banking and posted transactions in Accounts Receivable module. Then the system will generate the list of matching and un-matching transactions for accountants to confirm. After journal payments are closed, the system will automatically update the batch of those entries to General Ledger; create corresponding journal entries and post to debit/credit balances of appropriate accounts in chart of account.

Quarterly Invoicing

This process is similar to monthly billable invoicing process.
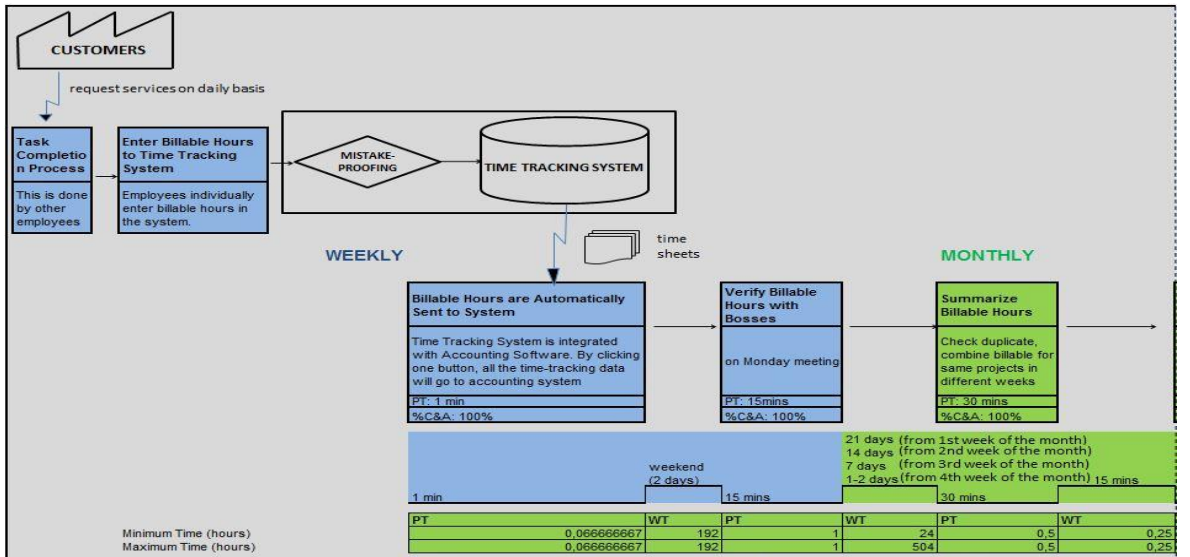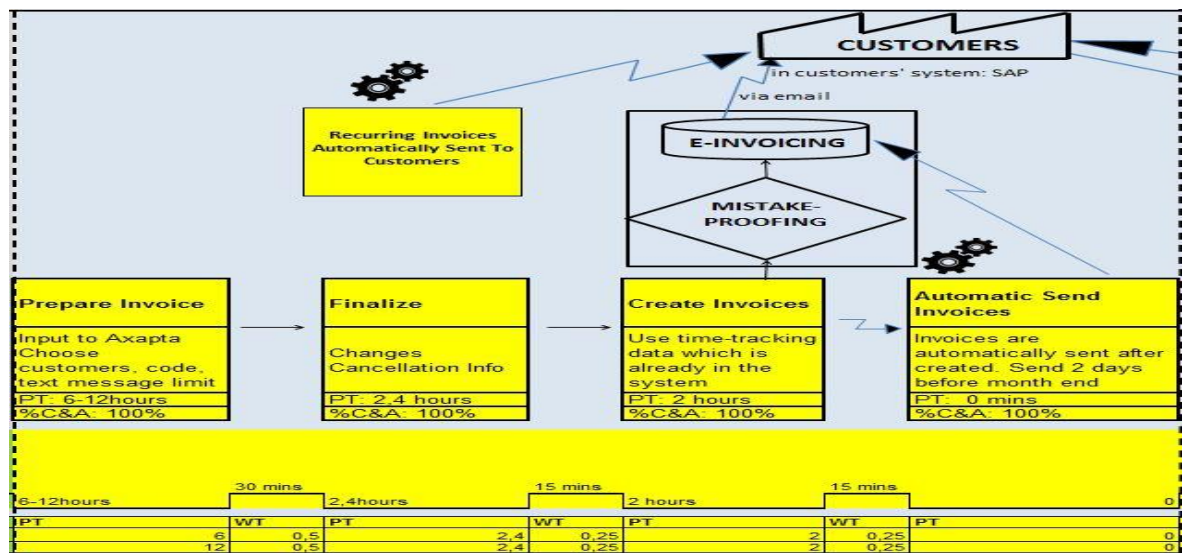

Figure 27. Future Phase – Accounts Receivable – Quarter Invoicing – Invoicing Stage

Figure 27 presents activities which will be performed in Invoicing stage of quarterly invoicing in future Accounts Receivable. The inputting data invoice entry will be less time-consuming than that in the old system as accountants do not need to prepare invoices for

key customers anymore thanks to the application of blanket purchase order. In this process, recurring invoices will be also sent automatically to customers so that accountants do not need to perform them anymore.
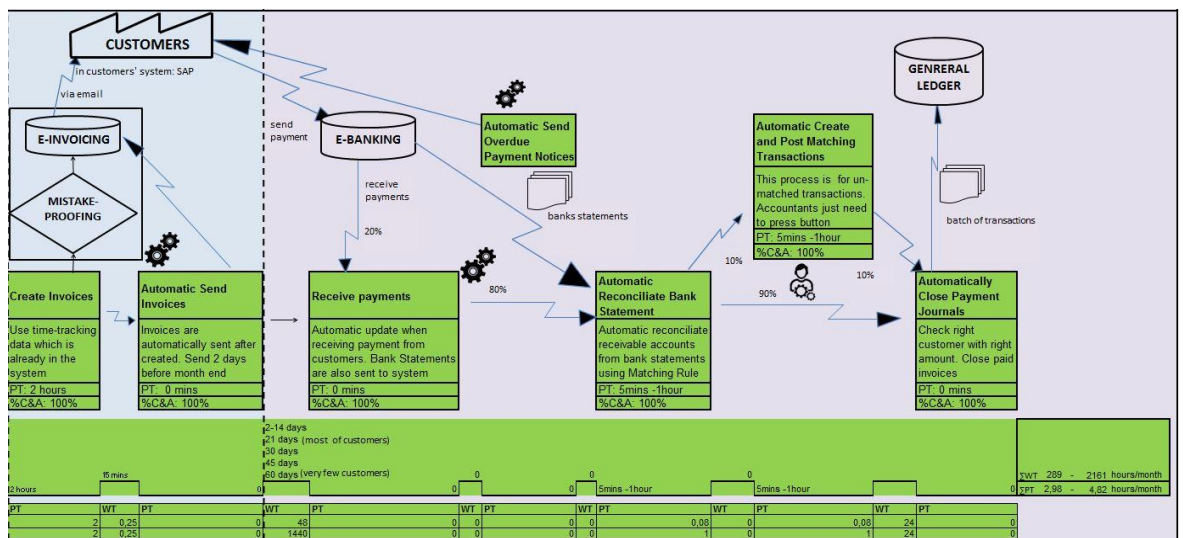

Figure 28. Future Phase – Accounts Receivable – Quarter Invoicing – After Invoicing Stage

Figure 28 presents activities performed in the Post invoicing stage of Quarterly Invoicing in future Accounts Receivable. This stage is basically the same with its counterpart stage in billable invoicing.

Key Performance Metrics	Current State		Priojected Future State	
	Minumum Value	Maximum Value	Minimum Value	Maximum Value
Process Time (hours)	36,33	46,67	6,5	10,95
Waiting (hours)	414,58	2754,58	403,9	2649
Cycle Time (hours)	450,9166667	2801,25	410,4	2659,95
%Activity	8,1 %	1,7 %	1,6 %	0,4 %
%Waiting	91,9 %	98,3 %	98,4 %	99,6 %
%RFPY	75 %	80 %	100 %	100 %
Number of steps		34		20

Figure 29. Future Phase – Box Score of Accounts Receivable

Figure 29 presents key performance metrics of Accounts Receivable in both current and future phase. The projected future phase reduces significantly process time thanks to the application of automated processes. Some processes are set to performed automatically leads to waiting time is reduced as well. Number of steps is also reduced from 34 steps to 20 steps for the whole process.

Accounts Payable

This process will have less volume of transactions as accountants no longer have to process all the invoices that come from all suppliers. Accountants just need to process un regularly invoices instead thanks to the use of blanket purchase order with key suppliers.
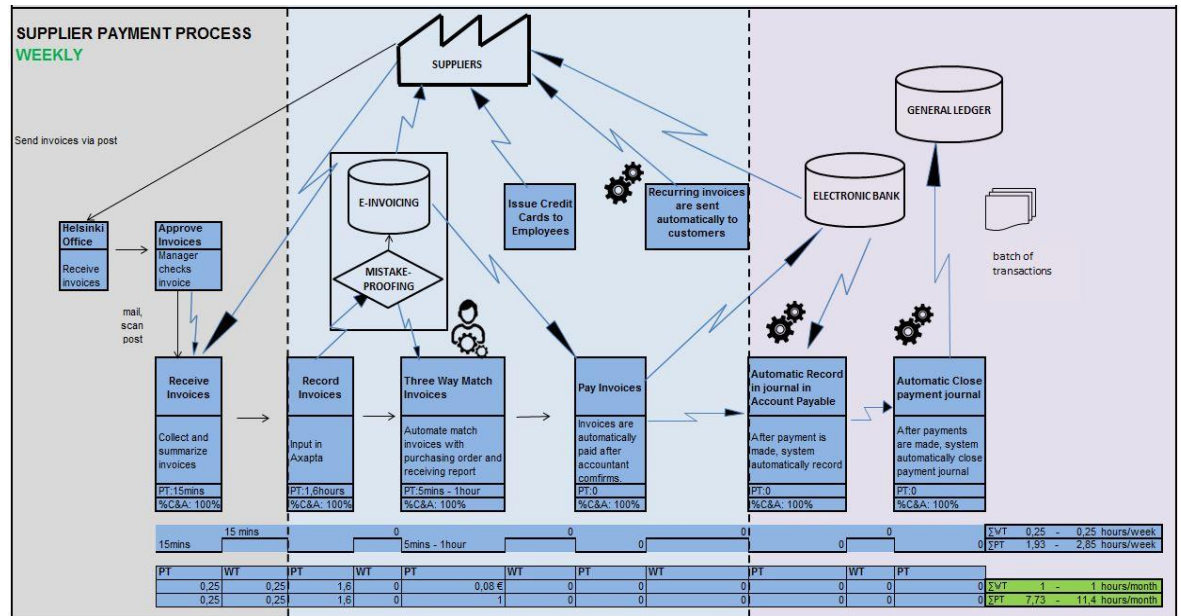
Figure 30. Future Phase – Accounts Payable

Figure 30 presents activities in the future Accounts Payable. Suppliers will send invoices directly to Tallinn office. Accountants collect all invoices to prepare for three-way-matching process which will be processed automatically under mistake – proofing function integrated and the control of accountants to ensure the accuracy. Processed invoices will be automatically paid to customers via Electronic Banking interfaced with Accounts Payable module. Once the payments are made, Electronic Banking will send bank statement to accounting system to prepare for bank reconciliation and close payment journals. This process is also performed by the system under the monitoring of accountants. Once the payment entries are closed, the system will automatically purge these transactions to General Ledger and create corresponding journal entries there.

Key Performance Metrics	Current State		Priojected Future State	
	Minumum Value	Maximum Value	Minumum Value	Maximum Value
Process Time (hours)	33	41	1	1
Waiting (hours)	482	675	7,73	11,4
Cycle Time (hours)	515	716	8,73	12,4
%Activity	6,41 %	5,73 %	11,45 %	8,06 %
%Waiting	93,59 %	94,27 %	88,55 %	91,94 %
%RFPY	70 %	80 %	100 %	100 %
Number of steps		8		8

Figure 31. Future Phase – Box Score of Accounts Payable

Figure 31 presents the key performance metrics results of both current and future phase of Accounts Payable. The process time and waiting time are significantly reduced.

General Ledger
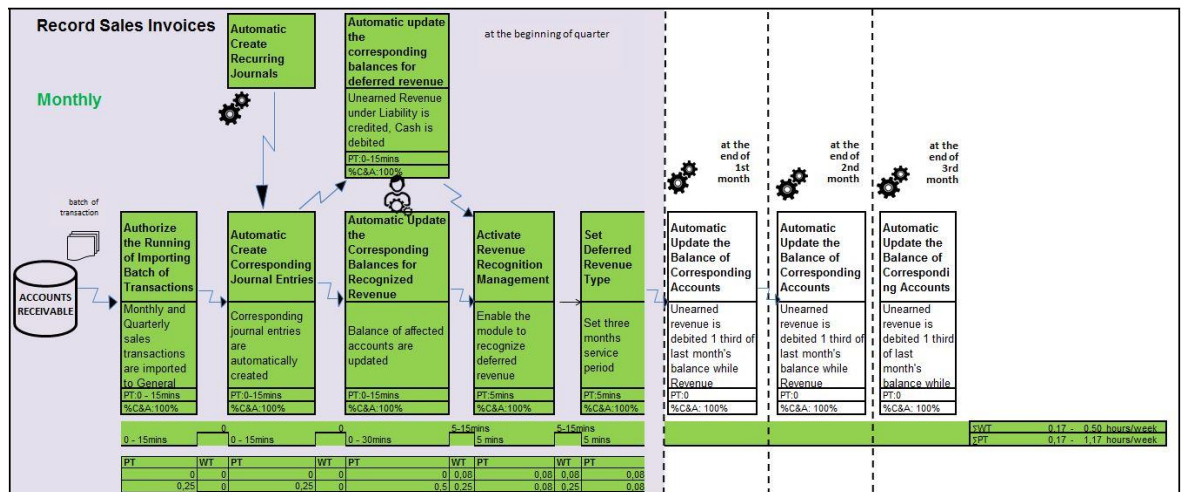
Figure 32. Future Phase – General Ledger – Record Sales Invoices

Figure 32 presents recording sales invoices activities in future General Ledger. Account-ants do not need to input manually transactions anymore as they will be automatically updated from Accounts Receivable under the authorization of accountants. Then the sys-tem automatically creates corresponding journal entries for those transactions. Deferred revenue will be automatically treated on the set period of time.
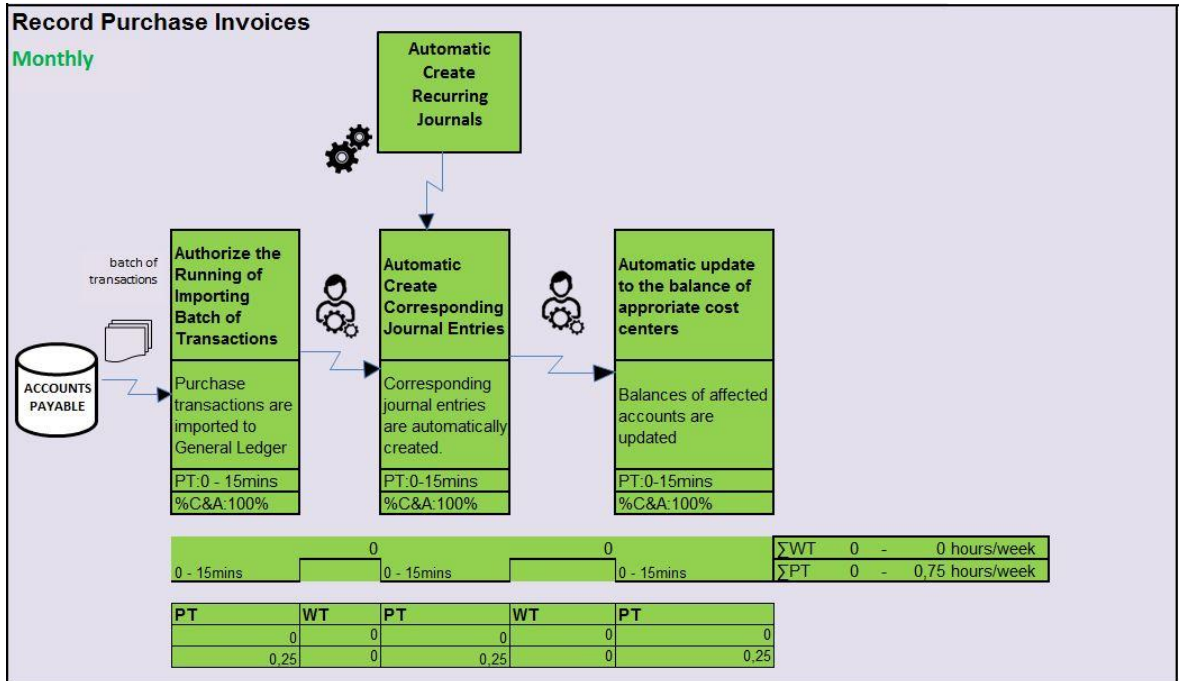
Figure 33. Future Phase – General Ledger – Record Purchase Invoices

Figure 33 presents recording payments to suppliers in future General Ledger. Batch of transactions are authorized to be imported from Accounts Payable to General Ledger and the system automatically create appropriate journal entries for those transactions. Accountants can check if those postings are corrects and then authorize the updating to appropriate account balances.
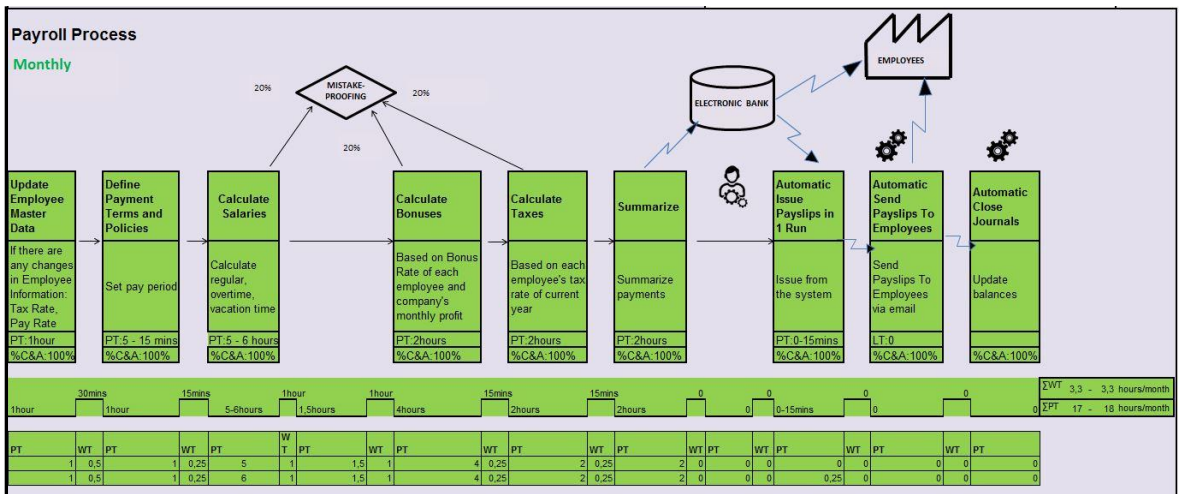
Figure 34. Future Phase – General Ledger – Payroll Process

Figure 34 presents payroll activities in the future General Ledger. Accountants update employee master data if there are any changes in the payment term with employees. Then accountants define payment terms and policies, calculate bonuses, taxes. Mistake-proofing system is integrated to ensure the correct of the data. After all the calculations

are processed, the system automatically authorizes payments to employees via interfered electronic banking system. Pay slips are automatically issued and sent to employees via email. Payroll journals are closed as appropriate accounts balances are updated.

Key Performance Metrics	Current State		Priojected Future State	
	Minumum Value	Maximum Value	Minimum Value	Maximum Value
Process Time (hours)	46,08	52,75	17,17	19,92
Waiting (hours)	28,75	52,75	3,47	3,8
Cycle Time (hours)	74,83	105,50	20,64	23,72
%Activity	61,58 %	50,00 %	83,19 %	83,98 %
%Waiting	38,42 %	50,00 %	16,81 %	16,02 %
%RFPY	31 %	72 %	100 %	100 %
Number of steps		16		23

Figure 35. Future Phase – Box Score of General Ledger

Figure 35 presents key performance metrics of the future General Ledger. Process time and waiting time are significantly reduced.

4.6.1 Result

This subsection summarizes results in section 4.6

Table 8. Process Optimization Result

Parameter	Metrics	Target	Anticipated Results		
			Accounts Re-ceivable	Accounts Pay-able	General Ledger
Speed	PT	Shorten PT	Reduce 29,8 – 35,7 hours	Reduce 32 – 40 hours	Reduce 45,4 – 49,3 hours
	WT	Shorten WT	10,7-105,6 hours	474,3 – 663,6 hours	25,3 – 49 hours
	CT	Shorten CT	40,5 - 141,3 hours	506,2 – 703,6 hours	71 – 98,3 hours
Accuracy	DPMO	Zero defects	Zero defects	Zero defects	Zero defects
	%C&A, %RFPY	99%-100% accurate	100%	100%	100%
Efficiency	%Activity %Wait-	Reduce Waste	Eliminate manual steps, increase automatic steps		

	ing				
	%Value – Added Time	Reduce Non Value- Added Activities	Reduce 21,5 – 23 hours	Reduce 3.3- 4 hours	Reduce 14, 8 – 15 hours

Table 8 presents anticipated results in the future state of accounting system. All the targets are reached. Overall, Process Time, Waiting Time, Cycle Time and time spending on Non Value-Added Activities are significantly reduced. All processes are estimated to reach 100% complete and accurate with zero defects detected.

5 Accounting Software Recommendation

This chapter suggests Accounting Software what the author found satisfying both the criteria set by the Improvement Phase as well as the expectation of company X.

5.1 Enterprise Resource Planning

Enterprise Resource Planning (ERP) is a broad set of integrated activities to support companies manage their business in the way that it facilitates the flow of data across the departments of company as well as with suppliers' system by providing standardized environment and common operational database supporting communication. (Hall 2011, 490)

Company X can adopt ERP system which integrated Time Keeping module, invoicing module that interact with suppliers' system as well as electronic banking.

5.2 Cloud-Based Accounting

Cloud- Based software is an online platform where users can access anywhere, anytime and on any device as long as there is internet connection available (Xero, 2016). Cloud-Based Accounting software helps companies to reduce cost of on premise installation while work more efficiently as it is updated frequently and integrated with a wide range of add-on services such as electronic banking, electronic invoicing and suppliers' system as well as scalable as it allows as many users as needed. (Visma, 2016.)

5.3 Accounting software recommendation

Visma Netvisor is developed by Visma Solutions Ltd, a subsidiary of Nordic Visma Group. The software has been developed for over 10 years and is one of the pioneering in Finnish cloud – based accounting technology. (Visma, 2016.)

Procountor, Governmental Accounting Standards Board Accounting, is cloud-based comprehensive electronic financial management software developed by Procountor Oy, a Finnish provider of cloud-based accounting software to Nordic market (Procountor, 2016).

Xero is cloud – based accounting solution developed by Xero, New Zealand from 2006 and it has over 600 000 subscribers all over the world (Xero, 2016).

Table 9 presents desired functionalities, mentioned in previous chapters, for the future system that are available in the recommended software.

Table 9. Recommended Accounting Software

Modules	Functions	Systems		
		Visma Netvisor	Pro-countor	Xero
AR	Automated error checking during invoice data entry	✓	✓	✓
	Automatic send invoices	✓	✓	✓
	Automated recurring invoices	✓	✓	✓
	Automated send overdue invoices	✓	✓	✓
	Payment Notification	✓	✓	✓
AP	Automatic receive invoices	✓	✓	✓
	Automated error checking during matching process	✓	✓	✓
	Automated payment for recurring invoices	✓	✓	✓
	Automated three-way matching in	✓	✓	✓
GL	Automated create recurring journals	✓	unknown	✓
	Automated update deferred revenue	unknown	unknown	✓
	Payroll	✓	✓	✓
	Automated bank reconciliation	✓	✓	✓
	Streamline Accounts Receivable, Accounts Payable and General Ledger	✓	✓	✓
	Time keeping system	✓	✓	✓
	E-invoicing system	✓	✓	✓
	Electronic Bank Integration	✓	✓	✓
	Support Multi-languages	✓	✓	✓

6   Conclusion

Previous chapters go through various topics to deliver the answers for this research problem in order to fulfill the research's objective on a research on an effective accounting system for a small – sized Nordic IT company. Chapter 1 gives an introduction to the objective of the research and draw out investigative questions that this research needs to find answers to fulfill the objective. Chapter 2 set the theoretical framework with Lean Manufacturing and Waste, Lean Thinking – Lean Enterprise and Lean Accounting as a background for the research. Chapter 3 sets the methodology to conduct this research as qualitative grounded theory method which aims to localize and customize existing theories and practices to the need of case company. Chapter 4 gives a complete look at the problem – solving methodology including 6 phases as follows: current phase of the current system, problem – analysis phase of the current system, problem prevention and elimination strategy phase, improvement phase and future phase of the future system. Chapter 5 suggests accounting software customized to the need of company X.

This chapter concludes the results and summarizes the answers for each investigative question to solve the research problems. Data validation and reliability methods are also presented to strengthen the trustworthy of this workbook. Then research limitation and further research as well as self-assessment and learnings are also mentioned in this chapter.

6.1   Lean Philosophy and its application in the design of accounting system

This section answers to IQ1: Why should companies apply Lean Philosophy in the design of accounting system? In order to give a deep and rich understanding of Lean Philosophy, the author presents Lean concepts from its origin to its expansion to Accounting area. The core value of Lean Manufacturing is to eliminate Waste. Lean Thinking captures the essence of Lean Manufacturing and goes beyond Production to other aspects of business to create a value stream flow across entire organization to deliver customer value.

Lean accounting maximizes profits by identifying financial impacts of Lean improvements, provide better way of understanding costs for better decision-making, reduce costs and capital by eliminate Waste, free up talents to work on more strategic tasks, motivate long-term Lean improvements by Lean performance measurements, and focus business around customer value.

6.2 Problems and underlying roots in accounting system under the scope of Lean Philosophy

This section answer to IQ2: What are the problems and their underlying roots in accounting system faced by case company under the scope of Lean Philosophy? The author applies value stream mapping methodology in order to make the problems manifest. From the results of value stream mapping, several studies are conducted. Waste analysis is to detect Waste; value - added and non – value added activities analysis to evaluate and assess time consuming in each activity and compare them between value – added and non-value-added activities; and process capacity study to assess the defect rate. The result of the first study is that all typed of Waste are identified in all three stages of three accounting module in which Waste in Motion contributes the highest proportion and Pre-Invoicing stage has the highest volume of Waste. This can conclude the first problems of the case company as follows: high level of manual control and multiple levels of management inspection and approval leading to lengthy processing and waiting time. The result of the second study is that the time consuming is quite equally between value – added and non-value-added activities. Non-value-added activities are found mostly in the Accounts Receivable module. The most time consuming activities is entering data entry. The result of the third study points out defect-related problems that defects happen every week in two month with the rate of 20%-30% of the total amounts of sample units.

The strategy to eliminate those problems is to eliminate the roots underlying those problems rather than eliminate those problems themselves in order to prevent problem occurrence in the latter time.

Root – Cause fishbone diagram is applied to identify the underlying roots of those aforementioned problems. 6 types of roots as follows: technology, policies, measurements, procedures, environment and people.

6.3 The application of Lean Principles and Methodologies in the future system

This section answer to IQ3: How Lean Principles and Methodologies can be applied to improve accounting processes in case company? The author links key lean performances factors and metrics to the three crucial dimensions of any process optimization which are Speed, Accuracy and Efficiency. To achieve Speed, one piece flow technique and process streamline are applied to reduce process, waiting and cycle time. One piece flow technique aims to reduce the batch of transactions by introducing certified suppliers and customers with purchase order blanket. Process streamline aims to create a smooth data flow among Accounts Receivable, Accounts Payable and General Ledger, simple chart of

accounts with value stream cost centers to close the book quicker and more efficiently. To achieve Accuracy, Mistake – Proofing and Autonomation are applied to reach 100% of Complete and Accurate as well as 100% of First Time Pass Yield with zero defects. Mistake – Proofing is applied in the processes that have high defect rate, high level of repeated inspection activities as follows: Time Checking System, Invoice Data Entry, Three-Way Invoice Matching, and Payroll. Autonomation is applied in the processes that need automation and human control at the same time such as: Bank Reconciliation, Three – Way Invoice Matching, and Automatic Journal Entries Creation from Imported Batch of Transactions. To achieve Efficiency, processes automation, supporting system integration and training are applied to reduce Waste, Non-Value-Added activities. Automation is applied in the processes that need to be automated on a frequent basis without human inspection such as Recurring Invoice Sending, Overdue Invoice Sending, Payment for Recurring Invoice Sending, Automatic Recurring Journals Creation, and Deferral Revenue Updating. Integrated and interfered supporting systems are Time Tracking, Electronic Invoicing, and Electronic Bank. Accountants, employees, customers and suppliers are trained to be able to use the new system.

6.4   Suggested Accounting Software

This section answer to IQ4: Which is the suitable accounting software for case company? Three accounting software is suggested as follows: Visma Netvisor, Procountor, and Xero. These three software meet requirements set by company X as well in the improvement section.

6.5   Data validation and reliability

Validity and reliability are key aspects of all researches as they ensure the data is clean, accurate which is collected from accredited, trustworthy and valid sources. Validity and reliability, in particular, vital in qualitative research where there is a high potent of biased researcher's subjectivity on data interpretation. Brink (1993, 35) categorizes major sources of errors concerning qualitative research which are: the researcher, the subject participating in the project, the situation or social context, and the method of data collection and context. Risks concerning data validity are mentioned in section 1. Triangulation is the critical method the author utilizes to avoid such risks. This method refers to the use of variable accredited sources of data and different theoretical perspectives in the analysis of the research to firstly prevent author's personal bias and secondarily fill the deficiency inherent in single-theory and single-research method Brink (1993, 37).

The search for disconfirming evidence is another method that author also utilizes to validate the reliability of data information.

6.6 Research limitations and further research

The research has been conducted primarily during the current phase of the accounting system, thus there are limitations to go deeper in the control and improvement phases of the future system which are primarily based on the theoretical estimation of the author.

6.7 Self – assessment and learnings

The author has gained significant knowledge throughout the research conduct process in both theoretical and practical perspectives. Regarding theoretical aspect, the author have had an opportunity to explore all theories and methodologies related to Lean, the origin of Lean and especially the transformation from Lean manufacturing to Lean Accounting and Lean Enterprise. From the understanding of Lean theories, the author was able to apply Lean methodologies to tackle real problems in a real life case company. Regarding practical perspective, the author has been given a chance to learn, to observe how accounting processes are performed in real life business, thus able to compare with what the author had learned from university. These knowledges are valuable and useful for the author in future academic and career path.

The author submitted the final thesis plan in November, 2015 and started working on it since then and completed in May, 2016. The empirical data collection period was from November, 2015 to March, 2016. At the beginning of the research, the author found it hard to focus as she had to do her full time work placement at the same time. Besides, the author sometimes lost direction because of overwhelming flows of data. Thanks to the first consulting meeting with her advisor, the author was able to be back on track as she was advised with direction she should take and focus on. At the middle of January, the final research framework was approved by her thesis advisor. With the grateful help and support from her Advisor, Company X in general and Accounting Department in specific, the author was able to control the whole process and managed to finish the research in May, 2016.

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Appendices

Appendix 1. First Interview with accounting department

INTERVIEW INFORMATION

Interviewer: Huong Do   **Location:** Tallinn Office

Interviewees: Two accountants of company X   **Date:** 20th October, 2015

INTERVIEW QUESTIONS AND RESULTS

Part 1. Current Accounting System

Section A. Background

What is the current accounting system? Is it cloud-based or on premise?

Microsoft Dynamics AX Axapta. It is on premise software

How much does the system cost? What are the initial cost and yearly maintenance cost?

It costed 30 000 euros at the beginning for installation, maintenance cost used to be 6000 euros /year but now it is around 2000 euros/year.

How long have been the company using the current system?

20 years.

Section B. Functionalities

What are the modules available in the system?

The three most useable modules are Accounts Receivable, Accounts Payable and General Ledger.

What are the main routine activities you have to perform in each module?

Accounts Receivable module is used to prepare invoices. Accounts Payable module is used to record suppliers invoices. General Ledger is to record all the revenues, expenses, employee salaries, taxes, budgets and prepare reports.

Section C. Performance

How does the current accounting system work in general?

The processing time is so slow. Sometimes it does not work correctly if it is in full screen. It might crash sometimes as well so I have to log out and log in again the system many times to get it work normally. There are too much manual works because the system does

not support those tasks.

What are the most disadvantages you found in the overall?

The three modules are not interfered so that I have to record what I already did in Accounts Receivable and Accounts Payable again in General Ledger at the end of the month.

What are the disadvantages you found in Accounts Receivable module?

In accounts receivable, I have to input manually all the billable hours into the system. After invoices are created, I have to print out and send to some customers via post as the system does not have electronic invoicing enabled.

What are the disadvantages you found in Accounts Payable module?

In Accounts Payable, I have to input purchase invoices manually into the system as it cannot receive electronically invoices sent from suppliers. Then I have to match those invoices with receiving reports manually to ensure the accuracy. Then I pay those invoices separately on net bank which is not integrated in the system.

What are the disadvantages you found in General Ledger?

In General Ledger, I have to manual divide quarterly invoice amount into monthly amount and keep track of the rest in an excel file to input the next months within the quarter.

Part 2. Future Accounting System

Section A. Background

Do you have any background preference for the future system?

I prefer software developed by a Finnish company but other suggestions are welcomed.

Section B. Functionalities

What are the desired functionalities you would like the future accounting system possesses?

It should be able to integrate with electronic invoicing, electronic banking, automatically update recurring journal entries. It also supports English and Finnish.

Section C. Performance

How should the system perform in the future?

It should be fast, easy to update and backup data.

INTERVIEW INFORMATION

Interviewer: Huong Do   **Location:** Helsinki Office

Interviewees: Two accountants of company X   **Date:** 20th October, 2015

INTERVIEW QUESTIONS AND RESULTS

What are the main activities in the Accounts Receivable? How long does it takes for you to perform a task and how long does it usually take among two tasks?

There are two invoicing types: billable hours invoicing and quarterly invoicing.

I collected billable hours sent by employees on every Friday afternoon. Then I group billable hours related to same product lines and send to product line managers via email to check again if the product category, price/hour, billable type are correct. Then they sent the modified files to me on Monday Morning before the Monday meeting. Then you already knew that bosses will verify those hours again during the meeting. I will prepare the invoices for them in the last week of the month. I collect all the reported and inspected hours from week 1ˢᵗ to week 4ᵗʰ and input them in Axapta. It usually takes 5-8 hours to input 50-60 reported lines per month. In this step, I have to modify the invoice description again to fit in the input field and that is one of the main reasons why it takes a lot of time. Then I have to check if there are any projects that have different period of billable times, for example, if it was processed in many weeks, or performed by different people. Another thing needed to be checked is that I have to double check with customers' contracts to make sure we do not overbill them and also calculate how many billable hours left we are allowed to bill them for future plan. The finalization takes 1, 5 hours. During this invoice preparation, mistakes also take place about 20-30%. It takes around 15 or 30 minutes among sub steps. After making sure all the data is correct, I create invoices in the system and it takes around 4 hours. Most of customers I have to print out invoices and send by post to Helsinki. Some customers I can send via emails. Some I have to go to their electronic system, log in and fill in the invoice number. This sending step takes 2 hours and I usually do it 2 days before the month ends. Sometimes, I have to resend invoices because of some reasons, customers they do not get the invoices and send emails asking for them. Most customers send payments after 30 days, some even send earlier around 2-14 days, or 21 days later. Just very few customers pay after 60 days. I usually checked the bank account after 15 days of the sending invoice day. If I see customer's payment, I will record in our system. After I receive most of the payments, I will do bank reconciliation

and close the payment entries. Bank reconciliation usually takes 2 hours with 1 more hour of matching invoices. Closing payment entries takes about 1 hour. It takes around 15 to 30 minutes among those steps if I do them in the same day; otherwise I will do it the day after.

The quarterly invoicing process is every quarter. This process has the same tasks with billable hour invoicing but it takes longer time to do because of there are more invoices to do. It takes 1 or 2 days to prepare the invoices, 3-4 hours to finalize and like billable hour invoicing, there are also some issues I need to look at customers' contract to check or discuss with bosses and it takes around 3 or 4 hours depending on the month. Then it takes me 6 hours to create invoices, 30 minutes to print, 2 hours send invoices, 30 mins to resend invoices if needed. Bank reconciliation is about 4 hours, I have to match invoices for about 1, 5 more hours and then close payments in about 3 hours. It takes around 15 to 30 minutes among those steps.

What are the main activities in the Accounts Payable? How long does it takes for you to perform a task and how long does it usually take among two tasks?

After I receive invoices sent from Helsinki office, I will start check if is there any invoices that have close due date so I will process them first. But before paying, I have to match the invoices with the purchase orders to make sure it is correct. And it takes maybe 3 or 4 hours in total per week to do the matching. Then I will log into company's electronic bank account to do the payments and it might take 30 minutes to 1 hour. Then I will record all the payments in our system and close the journals. Each step takes 1 or 1, 5 hours to finish. The waiting time depends on my schedule of the week, maybe 1 or 2 days.

What are the main activities in the General Ledger? How long does it takes for you to perform a task and how long does it usually take among two tasks?

In Accounts Receivable and Accounts Payable, I create invoices and record invoices for each customer and supplier, but in General Ledger I have to classify everything. For example, I have to classify expenses into many different kinds of expense accounts. For quarterly invoices, I have record in monthly revenue. In General Ledger, I also pay employees' salaries, taxes, create reports. For paying employees' salaries, first I need to update employees' master data if is there any changes. Then I define payment term and policies, calculate salaries and it might take a day to do that. Then I will calculate bonuses and in order to do that I have to check company's profit for that month, employees' bonus rate etc. and it usually takes 3-4 hours. Then I calculate taxes which require checking again employees' tax rate. After everything is correct, I pay via net bank and issue pays slips via emails. Final step is to close journal.

Appendix 3. Current Phase – Accounts Receivable

Appendix 4. Future Phase – Accounts Receivable
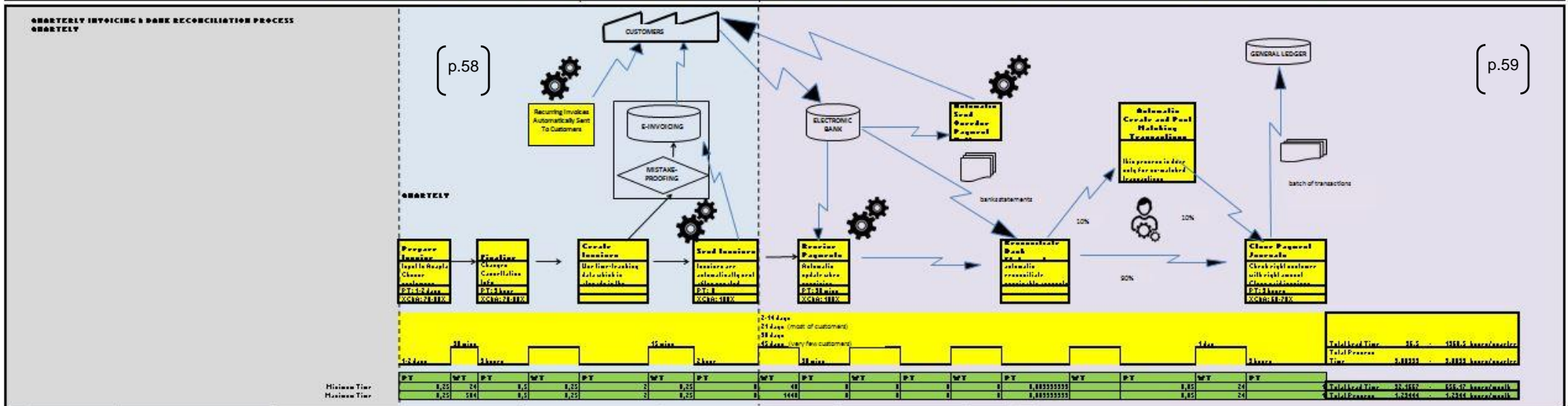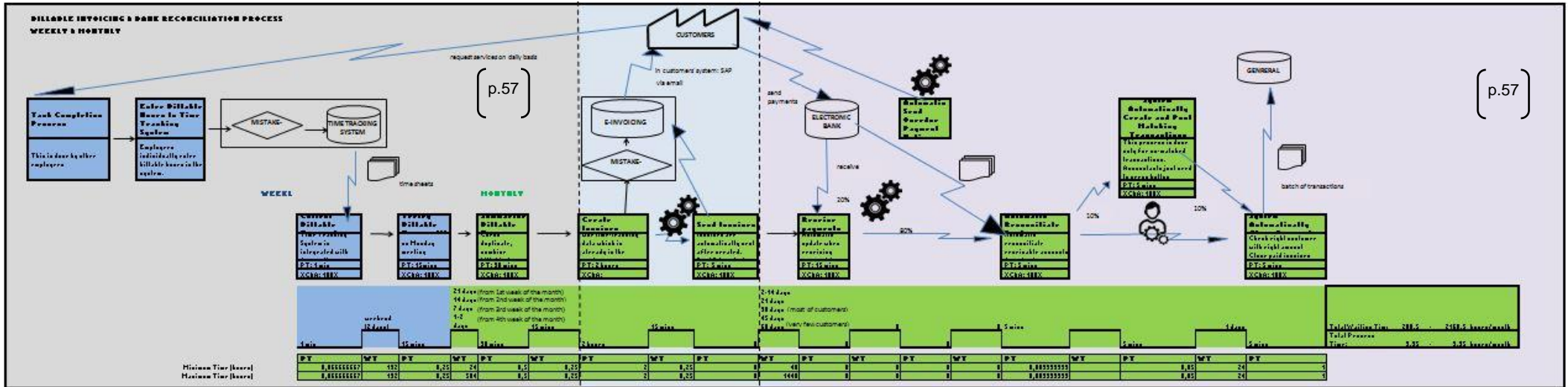
Appendix 5. Current Phase – Accounts Payable

SUPPLIER PAYMENT PROCESS

WEEKLY

p.30

Send invoices by post

SUPPLIERS

BANK

Helsinki Office
Receive invoices

Approve Invoices
Manager checks invoice

by post | by email scan

Issue Credit Cards to Employees

Pay Invoices Via Bank

80%

20%

Pay Overdue Invoices Via Bank

Receive Invoices
Collect and summarize invoices
PT:15 mins
%C&A: 100%

Record Invoices
Input in Axapta
PT:2hours
%C&A: 100%

Manual Three Way Match Invoices
Match invoices with purchasing order and receiving
PT:3-4hours
%C&A: 70%-80%

Record in Journals in Accounts Payable
Records payments to suppliers in the system
PT:1,5 -2 hours
%C&A: 100%

Close Payment Journals
Close Payment Journals
PT:1hour
%C&A: 100%

| | 15 mins | | 1-2days | | 15-30 mins | | 1-2 days | | 2-3 days | | Total Waiting Time | 120,5 - | 168,75 hours/week |
| 15 mins | | 2 hour | | 3-4hours | | 1hour | | 1,5 -2 hour | | 1 hour | | Total Process Time | 8,25 - | 10,25 hours/week |

	PT	WT	PT	WT	PT	WT	PT	WT	PT	WT	PT			
Minimum Time (Hours)	0,25	0,25	2	24	3	0,25	0,5	24	1,5	48	1	Total Waiting Time	482	675 hours/month
Maximum Time (Hours)	0,25	0,25	2	48	4	0,5	1	48	2	72	1	Total Process Time	33	41 hours/month

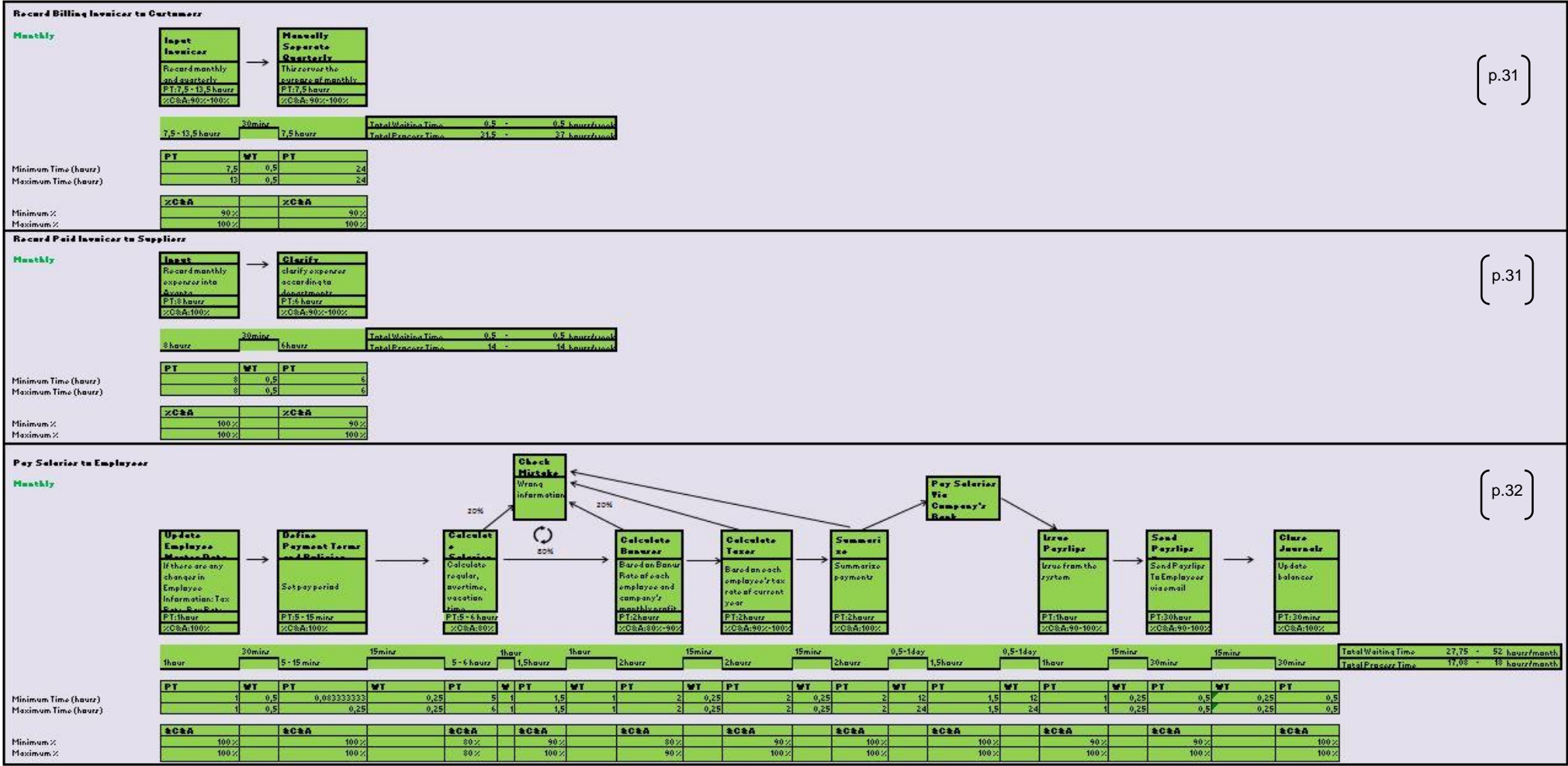|	%C&A		%C&A		%C&A		%C&A		%C&A		%C&A	
Minimum %	100 %		100 %		70 %		100 %		100 %		100 %	
Maximum %	100 %		100 %		80 %		100 %		100 %		100 %	

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Appendix 6. Future Phase – Accounts Payable

Appendix 7. Current Phase – General Ledger

Appendix 8. Future Phase – General Ledger

Appendix 9. Research Framework

Research Objective

Chapter 1

Research on a new Lean Accounting System for a small Nordic IT company

Research Methodologies

Chapter 2
Theoretical Framework
Lean Production (s. 2.1)
Lean Thinking – Lean Enterprise (s. 2.2)
Lean Accounting (s.2.3)

Chapter 3
Practical Framework
Qualitative Research (s. 3.1)
Interview, Observation, Data Collection (s. 3.2)
Data Analysis Method (s. 3.3)

Research Analysis and Result

IQ1: Why should companies apply Lean in the design of accounting system?

IQ2: What are the problems, underlying roots in accounting system under the scope of Lean Philosophy?
Chapter 4 (s. 4.1 & 4.2)

IQ3: How Lean Methodologies can be applied to improve accounting processes?
Chapter 4 (s. 4.4 & 4.5)

IQ4: Which is the suitable accounting software for case company?
Chapter 5

Problems (s. 4.1)

Value Stream Mapping

Waste Analysis

Process Analysis

Process Capacity Analysis

Prevention Strategy (s. 4.2)

Root-Cause Fishbone Diagram

One Piece Flow Technique

Streamline

Mistake Proofing

Autonomation

Supporting System

Automation

Training

Netvisor, Procountor, Xero

Recommendation

Futute State (s. 4.6)

Conclusion

Chapter 6

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