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THE UTILIZATION OF AUTOMATION AND LEAN APPROACH TO IMPROVE EFFICIENCY AND PRODUCTIVITY

The Implementation of Automated Sales Data Management and Reporting System. Case Company X

International Business
2020

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ABSTRACT

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Automation and digital transformation have become a topic that several companies strive to adopt. In the competitive market, firms without a digital transformation effort could become incompetent. Automation and digital transformation are exceptional solutions to improve the efficiency, productivity and profitability of a business; thus, it is worth to invest in.

This dissertation paper aimed to utilize popular and low-cost office tools and Lean thinking to create the new Automated Sales Data Management and Reporting system(A/MS&A/RS) for the case company X. The biggest purpose of making this new system was to digitize the manual working method into a more automated process in order to achieve higher working performance efficiency and productivity.

In the theoretical framework, the correlation of automation and efficiency as well as productivity was discussed. Furthermore, Lean thinking including Lean principles, Value-added and Waste elimination concepts, and the literature about Lean models such as Kaizen continuous improvement and PDCA cycle were clarified as fundamental for implementing the empirical research.

The implementation of building A/MS&A/RS for case company X was the main theme of the empirical research. In order to successfully construct a new effective system for CX, both qualitative interviews and quantitative follow-up surveys were used parallelly throughout the research period.

The results of this dissertation paper could prove the practice of Lean approach and automation could help business to accomplish better efficiency and productivity result.

Keywords Lean, Automation, Efficiency, Productivity, PDCA

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List of Abbreviation:

A/MS&A/RS: Automated Sales Data Management and Reporting System

A/MS: Automated Sales Data Management System

A/RS: Automated Sales Data Reporting System

CX: Company X

CA: Client A

MS: Microsoft

VBA: Visual Basic for Application

KPI: Key Performance Indicator

TPS: Toyota Production System

PDCA: Plan – Do – Check – Act

4kk: Collection 4

4kk: Collection 6

1. INTRODUCTION

1.1 Background of the Study

Innovation and creativity have existed throughout the human existence. Innovation and creativity have always been playing an important role in making human life easier and more convenient. For example, human ancestors started to become innovative when they created fire from stone due to the demand of seeking for the sources of warmth, and methods to avoid predators or to cook food. Today, people start to penetrate the industry 4.0 which has innovation and creativity that has reached its highest level: everything we do has technology embedded. Thus, advanced technology has impacted significantly to people's life, especially in the working context. (Conway, 2018). Since the development of technology and automation expanded and was adopted by a large amount of businesses around the world, there have been several transformations from traditional business operation to digitalization and technological advances. Some of the popular technology tools are well-adopted could be everything from basic office tools such as Microsoft Office tools (MS Word, MS Excel, MS PowerPoint, OneDrive etc.), Google Tools (Google Docs, Google Sheets, Google Slide, Google Drive, etc.) to professional applications or Business Intelligence (BI) tools such as Enterprise Resource Planning (ERP), Enterprise Content Management (ECM), and other applications. These tools not only support and create a central network in many business operations, but they also participate in shifting a business into a new technological era.

The researcher determines to conduct a study making suggestions regarding utilizing some well-known technology tools to optimize the efficiency and productivity. The researcher aims to observe the actual influences of advanced technology tools on a SMEs efficiency and productivity, and on employees' working methods. Then the researcher executes her suggestions at as low cost as possible to test the potential of those tools towards the case company's flow efficiency and productivity. As the result, the researcher can make an impact to the case company's decision whether it would like to adopt more digital tools to replace its manual operation or not. As outcomes, the processes of digitalizing and automating the business performance could be proven as crucial and effective even just with simple office tools.

1.2 Thesis Objective and Research Area

This dissertation paper's biggest objective is to exploit the potential of some popular and low-cost technology tools such as MS Office tools and Google tools in supporting the performance of SMEs and startups to reach the highest efficiency and productivity at the lowest cost. The thesis topic was inspired by the researcher's internship period with Company X (CX) – a small-scaled market research and business support company. As the second biggest objective, by applying Lean thinking in terms of continuous improvement, the researcher aims to transform the company's (CX) data management and reporting system to become more efficient and manageable, which can improve productivity. By utilizing tools such as VBA, and Google tools (Google Sheets, Google App Script, Google Data Studio), the researcher constructs the Automated Sales Data Management and Reporting system (A/MS&A/RS). To automate manual processes, the researcher supports the business in saving time and workforce for more other professional tasks. Hence, the dissertation paper will be mainly about:

- Detailly discussing the implementation process of the researcher's suggestion for CX. The suggestion is to make the Automated Sales Data Management and Reporting system A/MS&A/RS by using low-cost and popular office tools.

- Proving the positive impact of utilizing advanced technology to replace manual working methods in CX.

- Changing the stereotypes thinking of the case company (CX) about the using of technology and automation.

- Encouraging adopting technology and automation for other projects and departments in the later.

1.3 Structure of the thesis

Firstly, the research will start with an introduction and discussion about used tools' introduction. At the very beginning, the dissertation paper gives the audience a glimpse of what are the tools that would be used during the making process of A/MS&A/RS. The mentioned tools are:

- Microsoft Excel and VBA

- Google tools: Google Sheets, Google App Script, Google Slides, and Google Data Studio

Next, within the theoretical framework, the researcher mainly discusses the correlation between **automating processes** and **Lean thinking,** which can help the organization improving its **efficiency and productivity**. The methods of Kaizen continuous improvement and PDCA Cycle models are the main Lean approaches that participate significantly in every processes of the empirical research. The main purpose of applying accordant Lean principles into company case CX is to eliminate unnecessary wastes and to ensure the loop of continuous improvement progress. Thus, the company can become better day by day.

The empirical research is mainly about the innovation of Automated Sales Data Management and Reporting system (A/MS&A/RS). The researcher combines the qualitative methodology and the instruction of Kaizen continuous improvement cycle to create and execute an efficiency and productivity improvement plan. As the main theme, the researcher uses the qualitative approach to identify existing problem within the case company and its project that the researcher works with, and CX's demands in terms of automation transitioning. Next, after giving the suggestion to change, the researcher execute the plan of which to create the Automated Sales Data Management and Reporting system (A/MS&A/RS) for the case company. Throughout the empirical part, the researcher describes the process of making the system which strictly follow the cycle of PDCA and Kaizen continuous improvement. It also mentions that by transforming the project's working methods, which Lean principles has been used and which type of wastes has been eliminated in the empirical research. After the system is launched for using, the quantitative approach is carried to observe the progress of timing and accuracy improvement by using the new methods and in comparison, with the old methods.

In the conclusion part, there are discussions about the main findings, validity and reliability, the limitation of the thesis working period, and suggestions for further research.

Below is a figure which illustrates the structure of the primary research of the thesis:

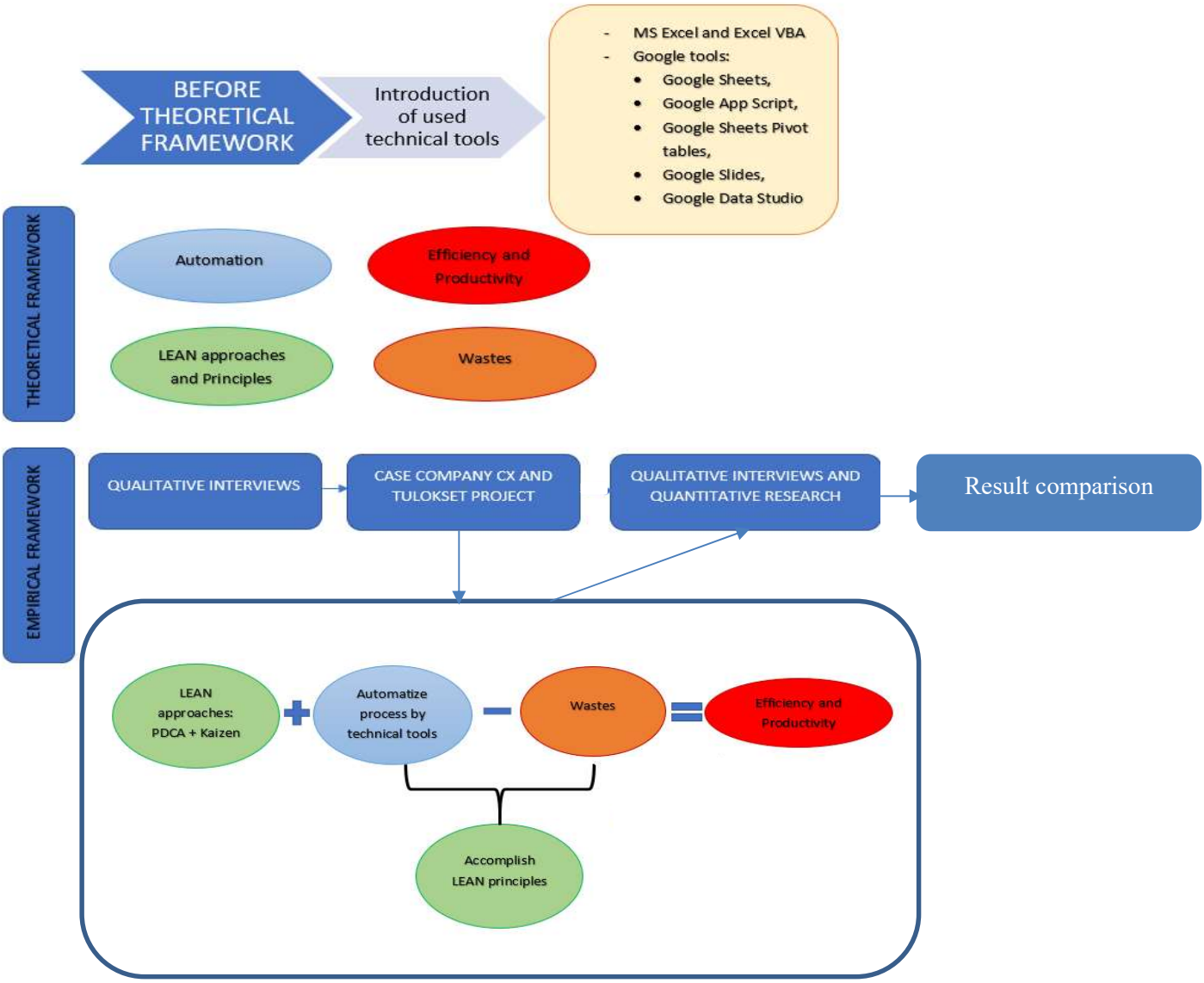


Figure 1 Research Structure

2. VBA AND GOOGLE TOOLS FOR THE AUTOMATED SALES DATA MANAGEMENT AND REPORTING SYSTEM

2.1. VBA for structuring the master database

VBA or **Visual Basic for Application** is a programming function that is included within MS Office tools and especially in MS Excel. The creation of VBA is based on the demand of optimizing the time that people spend on Excel by coding macros for functions which embedded into the specific Excel Sheet. (Corporate Finance Institution, 2020).

VBA is considered an effective solution for complex and tedious office tasks such as data processing in large scales, automating repetitive tasks, proofing mistakes, extracting and querying crucial data among a vast database, constructing and structuring data, executing but hiding visuality of calculated formulas, etc. (Ted Learning, 2020). One of the highlighted characteristics of VBA is that it is an "user-centric" programming language. It allows people to write user-defined functions for use in worksheets which adapt users' demand for their work. VBA also supports user in judging circumstances for decision-making process through its logic functions, such as If statements, and maintain the process loops until it proceeds all assigned works or until the user wants it to stop. (Automate Excel, 2020). The tool is seen as a potential supportive tool for people who strive to align Lean approach into their performance.

Indeed, the researcher has well-exploited the good side of VBA in the period of building the automated sales data management and reporting system. Firstly, the researcher uses MS Excel and VBA in counting total sold products by types of products automatically. Secondly, MS Excel and VBA are mostly used to extract crucial data, to migrate data into the system database and to format the data becoming structural for the new system's master database. However, since CX mainly uses the cloud system Google Drive (Google's Cloud system) instead of One Drive (Microsoft Office's Cloud system), thus, VBA helps only until the data is formatted and structured, but not to finalize the database. The researcher needs to transfer the structured data by VBA to the system's database on Google Sheets manually.

2.2. Google Sheets and Google App Script for making transaction entry tool and automated reporting templates

When MS Excel is a product of Microsoft, **Google Sheets** is an Excel-common feature and web-based product that is belonged to Google. It is needed to mention that CX has been using cloud storage, files sharing and collaboration system with Google Drive since CX was established. Google Sheets and other Google tools are preferred by individual users, SMEs and startup companies thanks to its functional, simple user-interface, and especially, it is free-of-charge for several tools. With Google Sheets, people can manipulate data with almost similar spreadsheet functions that are in MS Excel. (Bursak, 2020). Google Sheets is a powerful tool which can boost real-time collaboration, data processing and visualizing as users' demands. (Google Workspaces Developers, 2020).

Due to the characteristic of the case company, for instance, most of crucial staffs and freelancers are working remotely; thus, Google sheets and Google tools are the most suitable and low-cost working tools and cloud system for CX. As the collaboration result between the researcher and the company, the A/MS&A/RS is built by using mainly Google Sheets.

Google App Script – a development programming platform that is integrated in not only Google Sheets, but also in other Google tools. (Google Workspaces Developers, 2020). The programming language of Google App Script is modern JavaScript. Not just as a tool to create add-ons, Google App Script can do more than that. Similar with VBA, Google App Script aims to make the user experience with Google tools at the highest optimization level. It allows the user to customize the visualization by adding functions, menus, sidebars, etc. Android Add-ons, chatbot, and macros functions can also be made with Google App Script. (Google Workspaces Developers, 2020).

Google App Script played an important role in the making the sales entry form and note entry form for the A/MS&A/RS. In specific, the researcher used Google App Script to create command buttons for the transaction entry forms which were "Save" button and "Reset" button. Needed script lines were integrated into the command buttons in order to automatically manipulate the transaction entries, for instance, to formulate and to structure the entry data, and to record the transaction entries into the system's master database, which would support significantly in generating automated reports in the A/MS&A/RS in the later.

Before the automated sales dashboards are made, the researcher uses the Google Sheets in generating the semi-automated reporting templates for the monthly sales and weekly sales report. The researcher designs the instruction of what kind of data need to be extracted and pre-defined accordant charts and calculated data tables for the reports. Whenever the data within the table is changed, the charts will be accordantly updated, which can give the audience the most up-to-date sales results. The charts and needed data tables will be transferred into Google Slides as final version before it could be submitted to the upper management board. The view of semi-automated reporting templates can be found in Appendix 5 at the end of the thesis.

2.3. Google Sheets Pivot table, Google Slides, and Google Data Studio for supporting and making automated reporting system

Google Sheets Pivot tables, Google Slides, and Google Data Studio are tools that mainly participate in the automated reporting system, A/RS part of the A/MS&A/RS. After the database are completely constructed and the transactions entry tool are made and launched, the researcher utilizes some functions within Google Sheets, and some other Google tools such as Google Slides and Google Data Studio and strives to create a reporting system that is as much automatic as possible.

Google Sheets Pivot tables: Pivot table is one of basic, but effective data analysis tools. It is a common tool that is integrated inside MS Excel and Google tools such as Google Sheets, Google Data Studio or Google Analytics, for examples. Pivot tables allows users to easier manipulate the large set of data, for example, to extract the most crucial number in the big database as users' demands. (Thomas, 2020). With Google Sheets Pivot tables, user can summarize data, reorganize data into users' visual demand, find patterns within the large set of data, or implement counting and calculations. Furthermore, Pivot tables is extraordinary helpful since it can refresh and update automatically by itself whenever the users add, delete, or move data within the chosen data source of the Pivot tables. For example, if the user makes a total row sum for his/ her Pivot table, whenever the users add more row in the data source, the pivot table will be updated and the total row sum will be added the amount of new entered row simultaneously.

In order to get the most accurate Pivot table and use this function effectively, there are some requirements for preparing the data source that the users should consider. The researcher takes these requirements into account during the period of building and constructing the master database for the system. The database needs to be well-prepared and fulfill conditions:

- The database must have titles for the columns as fields' names: When the users create the Pivot table, it will take the top row of the column as the fields titles; thus, blank first row of the chosen data source may cause error. It is ideal, if the title of each column is unique. (Schiffner, 2016).
- The database must be structured maintained: It is important that the user distinguishes the right structured database versus the one structured database. One of the common rules is that usually, values that have same type and format are within the same column. All of the data with wrong structures must be converted into the correct format before the users generate needed Pivot tables. (Acampora, 2013)
- Within the database, each data needs to be matched with the pre-defined format of the column and each cell must only contains one data entry. Besides, there must not been any merged cells within the data table source. Plus, the user should avoid having empty cells (information) to have a complete record row. It is mentioned that the empty cells may affect the accuracy of applied calculation in some specific fields in the defined Pivot tables. (Lady Excel, 2020).

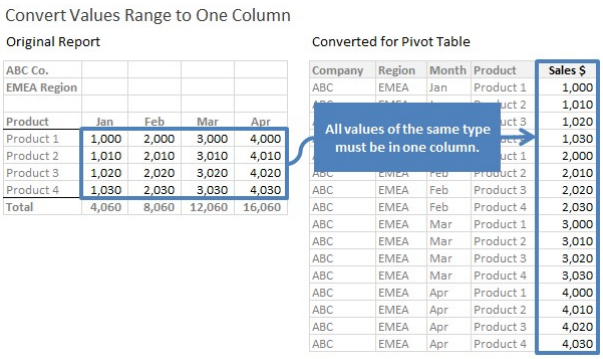
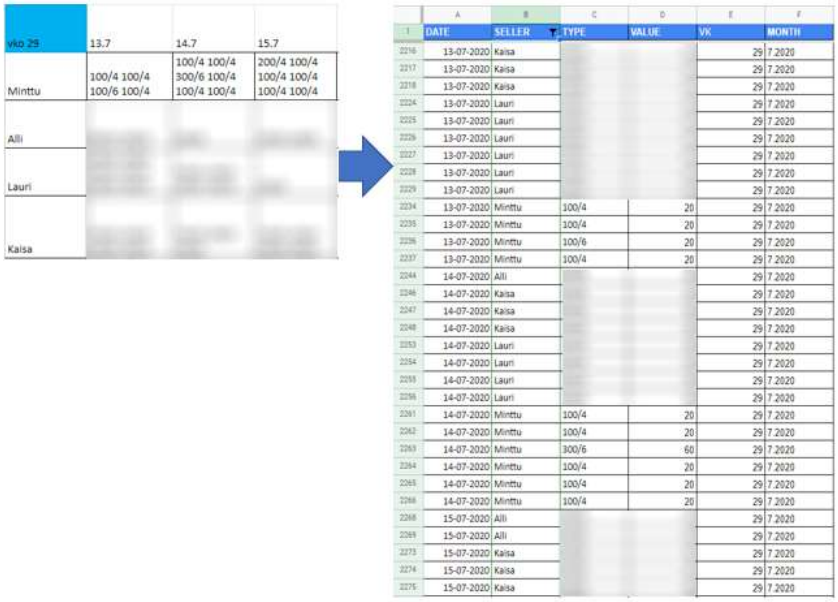


Figure 2 Example of how to convert wrong structured data table into structured data table



vkd 29	13.7	14.7	15.7
Minttu	100/4 100/4 100/6 100/4	100/4 100/4 300/6 100/4 100/4 100/4	200/4 100/4 100/4 100/4 100/4 100/4
Alli			
Lauri			
Kaisa			

	A	B	C	D	E	F
1	DATE	SELLER	TYPE	VALUE	VK	MONTH
2216	13-07-2020	Kaisa			29	7.2020
2217	13-07-2020	Kaisa			29	7.2020
2218	13-07-2020	Kaisa			29	7.2020
2224	13-07-2020	Lauri			29	7.2020
2225	13-07-2020	Lauri			29	7.2020
2226	13-07-2020	Lauri			29	7.2020
2227	13-07-2020	Lauri			29	7.2020
2228	13-07-2020	Lauri			29	7.2020
2229	13-07-2020	Lauri			29	7.2020
2234	13-07-2020	Minttu	100/4	20	29	7.2020
2235	13-07-2020	Minttu	100/4	20	29	7.2020
2236	13-07-2020	Minttu	100/6	20	29	7.2020
2237	13-07-2020	Minttu	100/4	20	29	7.2020
2244	14-07-2020	Alli			29	7.2020
2246	14-07-2020	Kaisa			29	7.2020
2247	14-07-2020	Kaisa			29	7.2020
2248	14-07-2020	Kaisa			29	7.2020
2253	14-07-2020	Lauri			29	7.2020
2254	14-07-2020	Lauri			29	7.2020
2255	14-07-2020	Lauri			29	7.2020
2256	14-07-2020	Lauri			29	7.2020
2261	14-07-2020	Minttu	100/4	20	29	7.2020
2262	14-07-2020	Minttu	100/4	20	29	7.2020
2263	14-07-2020	Minttu	300/6	60	29	7.2020
2264	14-07-2020	Minttu	100/4	20	29	7.2020
2265	14-07-2020	Minttu	100/4	20	29	7.2020
2268	14-07-2020	Minttu	100/4	20	29	7.2020
2268	15-07-2020	Alli			29	7.2020
2269	15-07-2020	Alli			29	7.2020
2273	15-07-2020	Kaisa			29	7.2020
2274	15-07-2020	Kaisa			29	7.2020
2275	15-07-2020	Kaisa			29	7.2020

Figure 3 The researcher practices converting wrong data tables into the master database for A/MS&A/RS

With Pivot table function, the researcher creates different kinds of Pivot tables from the master database of A/MS&A/RS. The sales data is summarized, drilled down and represented the sales situation from different perspective. For example, under here, one Pivot table is made to show the sales situation in pieces and in value of each seller in each week of the month (July).

TOTAL SALES/ VK/ AGENT					
DATE - Year-Month	*VK*		*SELLER*	TOTAL PCS	TOTAL VALUE
⊞ 2020-Jan Total					
⊞ 2020-Feb Total					
⊞ 2020-Mar Total					
⊞ 2020-Apr Total					
⊞ 2020-May Total					
⊞ 2020-Jun Total					
⊟ 2020-Jul	⊟	27	Alli	6	220
			Kaisa	15	380
			Laura	11	300
			Lauri	6	200
			Manu	3	60
			Satu	6	220
	27 Total			47	1380
	⊟	28	Alli		
			Kaisa		
			Laura		
			Lauri		
			Manu		
			Satu		
	28 Total				

Figure 4 Generated Pivot Table for representing Individual Sales Performance by week

Google Slides: Google Slides is a presentation tools that similar with MS PowerPoints. The users can use Google Slides in order to make visual presentations. Similar with other web-based Google office tools, Google Slides allows collaboration between users which

is suited well with the characteristics of CX and its partners. Hence, Google Slides has been a visual report tool used by CX and its employees. The researcher combines the Google Sheets and Google Slides in creating the monthly and weekly report templates for A/MS&A/RS. Google Slides' s templates are seen as the final report version for weekly and monthly sales situation before the automated sales dashboards are made.

Google Data Studio: In the later stage of constructing A/MS&A/RS period, the researcher creates automated sales dashboards with Google Data Studio. This is one of the most highlighted results of automated transformation for the working method of CX. Google Data Studio is a data visualization tool. The users use Google Data Studio to create KPI dashboards and visualize numbers into interactive figures such as data tables, charts, filters or even texts and images. As the mechanism, the Google Data Studio can be connected with the variety of data sources that are chosen by user and allow user to make fields' calculation and represent the results into figures according to users' different purposes. In this case, the automated sales dashboards are synced with the A/MS&A/RS. Thus, it is refreshed and updated automatically whenever there is any change in the sources of data. The practice of making automated sales dashboard in A/RS would be showed in Appendix 6.

3. THEORETICAL FRAMEWORK

3.1. Automation

"While there is always a price for automation at some point, it does not mean that there will be less jobs, but rather means there will be new jobs, possibility in different areas, so employees would only need to acquire new skills," - CEO Nidal Bitar Information and Communications Technology Association of The Jordan Times

According to Groover, automation is the performance of technology in a process with the minimum of human involvement and assistance. (Groover, 2014). Automation occurs when any production process become significantly automated. There are three common types of automation such as automation as the manufacturing mechanization (type 1), automation as processes mechanization (type 2), and automation as the utilization of computers into repetitive paperwork (type 3). While automation type 1 and 2 can be seen clearly through the human replacement by physical robots or machinery in production, the third type of automation are considered as when humans use the advancement of technology in order to complete repetitive tasks faster, easier and more accuracy. (Silverman, 1966, p.1). This means that when automation in type 1 and 2 could perform given tasks independently, the third automation type is mostly to support people in their task performance. Throughout this dissertation paper, the impact and the implementation of the third type of automation into the case company CX will be mainly discussed.

"The fear of technological unemployment has not materialized in the past and likely will not in the foreseeable future because the jobs lost to automation will be matched by the new jobs created by the growth-boosting effect of technological advancement"- (Papanyan, 2017).

Automation has been applied significantly in several different business fields. Especially in the 21st century, the demand for automation is increasing magnificently. The European Commission claimed a foresight that currently 50% of jobs worldwide can be shifted into the automation era in the near future. To adapt with the workforce market's demand, the majority of the labor force will be required by the market that they need to develop more in their technology, IT, and programming skills. Thus, physical and manual skills' de-

mand will be reduced. (European Commission). The advancement of automation has generated an enormous impact on the job market as some existing jobs have been lost or new jobs have appeared. Depending on circumstances, to become automated can be judged as a threat or an opportunity. (Manyika, Lund, Chui, Bughin, Woetzel, Batra, Ko & Sanghvi 2017).

However, humans cannot deny the convenience and effective supports of automation into their working life. The world is changing and its transition into the advanced technology and automation era is unavoidable. Instead of arguing about the threats or opportunities that automation can generate, it is better to design a plan to utilize the advantages and the best sides of automation, and to avoid as much as possible downsides of autometion. For instance, while people worry about shifting to automation can lead to the dominance of machinery and algorithm in the workforce and they may lose their jobs, it would be more effective to allow the adoption of automation to deal with simple, time-wasting, and repetitive tasks. On the other hand, the workforce can have a chance to free their working capacity and energy, and to invest them in more professional tasks that cannot be replaced by machinery and automation. In the larger image, the business can see automation as a solution to improve its general productivity and efficiency. The fact is that throughout the history, automation participated significantly in businesses that followed Lean approaches to make working processes more efficient and to eliminate sources of waste within the organization's operation. This is how automation contributes to the companies throughout their journey toward Lean. Hence, humans should consider automation as supportive tools that can make their work performance better. The Toyota Production System could be one of the best examples of this statement. Toyota and its Toyota Production System (TPS) was known for the success of adopting Lean and automation since the 90s. Until today, Toyota and its TPS secures it competitive position within the automobile manufacturing industry by balancing the human effort and the contribution of automated machinery. (Amyx, 2017). Toyota's factory workers acknowledge two important facts: firstly, humans always have unique, and unreplaceable capabilities; and secondly, automation and robots are their tools and power to make their jobs easier. (Amyx, 2017). One of Toyota's factories in George Town, Kentucky has its excellent factory workers, who designed multi-armed robots to help them in lifting heavy assembled parts, such as gas tanks, in just one motion. This action brought numerous benefits for both organiza-

tions as reducing motion waste and boosting production more efficient. In the moral aspect, these robots participated in ensuring worker's safety, and working conditions. Furthermore, it innovated new opportunities for many line workers in shifting their work duties to become more professional. (Rothfeder, 2017).

3.2. Efficiency and Productivity

Productivity and efficiency are two different philosophies, but they are related to each other. When productivity is mostly about labor performance results, efficiency is more about quality-focused in making the working process better, more efficient, and less waste. (Sharon, 2018, p.7). This part discusses the definitions of productivity and efficiency, their relationship and their impact on each other.

There are several results when people search for efficiency's definition. Here would be cited the most common efficiency definitions. In a general definition, efficiency represents the quality and ability of completing a task successfully without wasting unnecessary resources. (Collins Dictionary, 2020). Or, it shows how well the organization converted the least input to achieve the same or more standard level of output (Banton, 2020). Depending on the circumstance, efficiency can become different beliefs and approaches. For example, operational efficiency measures how well the organization earns profit over the invested operating cost (Caroline, 2020), while production efficiency is how the organization maximizes the utilization of resource capacity to create a cost-efficiency production chain. (Chappelow, 2019). According to Modig and Åhlström, there are two forms of efficiency: resource efficiency and flow efficiency. Resource efficiency is the most common efficiency concept, representing the effort of optimizing input resources to achieve the highest amount of output. One example of using the resource efficiency approach is that business usually divides one task or one project into smaller pieces of jobs and assigns resources on each small task. Flow efficiency is quite a new efficiency phenomenon while it focuses more on product and services production processes. During the work units producing process, flow efficiency happens when there is an effort to eliminate waste sources to make the process effective and satisfy the final demand as fast as possible. (Modig & Åhlström, 2012, p.9-13).

When it comes to productivity, one of the most common definitions of productivity is labor productivity. Labor productivity determines the measurement of labor performance

results, i.e., total outputs per worker per hour, and it is among the main productivity concepts that several businesses strive to improve. As a result, the improvement of labor performance means more outputs are produced during a shorter time, which leads to an increase in profitability. (Steindel & Stiroh, 2001, p.14-18). Productivity can be a production efficiency measurement tool. It is believed in business and production concepts that the more improvement in business productivity, the more growth in terms of finance and sustainability aspects that the company can achieve. (Sharon, 2018, p.7).

In the OECD study in 2001, the productivity can be measured by evaluating the output's amount over the input resource's amount for each specific task. Productivity is improved if the input resources are decreasing more magnificently than the output result. Or, the increase of output results over the same amount of input can be judged as productivity improvement. Thus, to reduce the invested resources including labor, timing, expenses, and efforts on specific tasks while maintaining at least the same amount or more of the task's output is a business productivity goal if it wishes to become an efficient firm. (OECD, 2001). By investing effort to improve productivity, every party's operation can be beneficial intangibly and tangibly. For example, productivity participates in improving human beings, which is a work-life balance among the employees. Besides, productivity can contribute to long-term economic development by optimizing the resources for achieving better outputs. Furthermore, productivity can generate more profit from making more products and services while maintaining the same amount of resources or even reducing the input resources. (Sharon, 2018, p.7-8).

To reflect on the case company CX, CX has its characteristic of working with different tasks and different projects with several clients in the same period. The researcher's primary purpose is to improve the flow efficiency within one project's implementation methods and processes to reduce labor capacity and time usage for the other tasks. From this, the saved labor capacity and time usage can be invested in producing more work units in other tasks and projects that requires human involvement. As a result, the improvement of flow efficiency can lead to the progress of resource efficiency and the labor productivity.

3.3. Lean approach

3.3.1. Lean manufacturing and Lean thinking

Lean methodology started to become popular since it was adopted by Toyota and was integrated into the Toyota Production System (TPS) in the 1950s. However, there were arguments that Lean's philosophy was actually founded by Henry Ford and was first used in Ford Motor Company. (Levinson, 2002). Lean is also known as JIT or Just-in-Time. According to Toyota's vision and philosophy, Lean was first applied to the Toyota Production System to respond to the customer demand in ordering vehicles in the quickest and ensure efficiency as much as possible. (Toyota, 2020).

Many people think about Lean as a manufacturing or production methodology. However, Lean thinking can be adopted in different sectors and other situations in life. Especially, Lean thinking can be transferred into managerial aspects. The primary purposes are to embrace downtime to witness the problems and strive to solve stated problems; hence, the organization can constantly improve its performance better day by day. (Balle, Jones, Chaize & Fiume, 2017, p. xiii). By applying Lean thinking, the organization could maximize its efficiency by optimizing the continuous workflow and performances and reducing the wastes or factors that do not create any value for the organization and the customer. (Terry, 2020). At the same point, John Nicholas defined and summarized Lean as a management practices when the company or organization maintains the continuous improvement by continuously identifying and eliminating waste sources during the operation time. (Nicholas, 2010, p.3).

To maintain Lean effectively and achieve positive results, people need to ensure the uninterrupted flow of continuous improvement. John Nicholas claimed that maintaining continuous improvement is considered essential to ensure the company's survival and success. Continuous improvement's main purpose is to exceed the customers' expectations by boosting the production process faster, cheaper, and more agile and creating better products and services. The way to do it is not through touching the services and products directly but to keep the loop of examining and improving elements within the production process such as material and their necessary intrinsic process. (Nicholas, 2010, p.21).

Depending on each organization or company, continuous improvement can be designed, deployed, and executed in different ways. Although there may be a variable of Lean approaches, they lead the organization to one purpose: to achieve the set of goals that could make the business's operation today better than yesterday.

3.3.2. **Lean Principles**

Lean is innovated to deliver two main concepts: respecting people and eliminating waste from processes through a continuous improvement approach. (Kapanowski, 2019, p. 14). According to John Nicholas's study, Lean approach consists of seven main principles, which are **Simplification, Cleanliness and organization, Visibility, Cycle timing, Agility, Measurement,** and **Variability reduction**

In terms of **simplification**, wastes can be reduced by making the working process more uncomplicated than it was before. Simplification is done correctly and ideally if the active process's output is similar even though there has been less complicated input. As a suggestion, the tasks' working methods transformation can be seen as simplified if the business can reduce working hours or labors. At the same time, it still maintains the exact amount and quality of the tasks' outputs. The simplification approach can be made as product, process, or procedure simplification. (Nicholas, 2011, p.66-67)

Next, **cleanliness and organization** are mentioned mostly in facilities or the environment aspect. Dirty factories, cluttered warehouses, unorganized files in working devices, or uncleaned working desks regarding the working atmosphere's cleanliness can lead to poor functional performance, low-quality results, and the increase of wasted time or motions rather than real-time working. In Lean approach, to improve cleanliness and organization, there should be some necessary actions such as total cleaning the working environment and educating employees' mindset to maintain cleanliness and organization. It is beneficial to perform tasks and to work in a clean and tidy working environment. It not only brings effective results to work, but it also contributes to mistake-proofing techniques easier, leading to speedy problem-solving actions in the later on. The cleanliness and organization can be transformed and maintained by following the Five S criteria, which referred to one of the Japanese's Just-In-Time techniques. It is recommended to have a Five S evaluation to evaluate the current working environment to know what needs to be

done to make the working atmosphere becoming cleanliness. Five S according to Japanese and its translation stands for:

- Seiri = Sort: to sort out needed tools and discarding unnecessary tools.

- Seition = Set in order: to set needed tools in a logical order of usage.

- Seiso = Shine: to clean up the facilities, tools, and working environment to explicit the problem.

- Seiketsu = Standardize: to institutionalize the working process or step by step procedure to finish a specific task.

- Shitsuke = Sustain or Self-discipline: to establish a self-discipline mindset among the responsible workforce in keeping the cleanliness and organization of the working environment.

(Nicholas, 2011, p.69-72).

Thirdly, **visibility** reflects the ability to visualize and transcribe the workflow as what had been done in the past, what needs to be done in the present, and what will need to be done in the future. When the workers receive the redirect, redefine and displayed information about the work and the task, they will acknowledge each of their own obligations towards the job; for example, who is in charge of task A, who will take care of task B, or when is the deadline for the task delivery. Visibility is not only crucial in manufacturing such as having a visible layout factory, but it is also vital to include in the managerial perspective. (Nicholas, 2011, p.73-75).

Cycle timing is the fourth Lean principle. Cycle timing is the gap time laps that happened between the operational activities. To maintain Lean performance, the business aims to strengthen the regularity and the steadiness of the workplace patterns. The company can avoid uncertainty in terms of being out of track and increasing the learning and knowledge exchange for the future improvement plan of specific work tasks, projects, or production chain. (Nicholas, 2011, p. 75 & 85).

As the fifth Lean principle, **Agility** is mentioned. Agility reflects the ability to adapt to changes in competitive situations. Being agile equals with being able to observe the uncertainty of the market and customer demand, and to have on-time decisions and quick actions toward the change. (Nicholas, 2011, p. 76).

Next, **measurement** is an essential Lean principle to evaluate and judge the situation from received data and any business process output. In fact, measurement is significantly applied and appears in several stages of the continuous improvement cycle and performance. To make measurements during manufacturing or management process, there could be necessary decisions made, and people can be aware of the current situation's status and take appropriate actions toward it. The measurement principle can be combined with visibility in management, which can bring positive results in evaluation, controlling, or reporting systems. Manufacturing schedule, working timeline, or performance assessment are an excellent example of applying measurement and visibility principles. (Nicholas 2011, p. 77-78 & p.85).

Finally, **variation reduction** represents the avoidance of variability during the working or manufacturing process. By testing different hypotheses, people receive variations. Variations are also the differences that are not accordant to the goal or different with results that people wish to receive from any plan's or task's implementation. According to Lean thinking, the less possibility that a business gets unwanted results or variations, the more efficient and sustainable it is. After applying continuous improvement on a specific task, the company can make the ideal working procedures institutionalized as people have the standard in their task performance. (Nicholas, 2011, p. 79-80 & p.85).

3.3.3. **Kaizen Continuous Improvement**

One of the most popular Lean approaches is Kaizen. The example of a basic continuous improvement process is visualized in this six-step Kaizen continuous improvement cycle:

Figure 5 Kaizen Continuous Improvement cycle (Source: Kanban Zone)

According to the above figure, the Kaizen continuous cycle starts to identify and analyze the problems to create problem-solving plans. Next, the plan would be tested, and the output results would be analyzed. If the plan's solutions contribute positively, the plan would be standardized, and the continuous improvement process could start another cycle.

Kaizen is a Japanese philosophy which made of two different words which are Kai and Zen. According to Japanese literature's definition, first, Kai stands for reform or change, and second, Zen is defined as virtuous and goodness. In combination and reflection with the Japanese-style management method, Kaizen is understood as a situation transition method for better or continuous improvement. (Macpherson, Lockhart, Kavan, & Iaquitnto, 2015, p.4). Kaizen's main characteristic is a constant or never-ending approach that aims to improve efficiency and quality. Companies, who follow the Kaizen model, understand the encouragement of collaboration to create incremental improvement together. Daily, if a small change is applied, the result of improvement can be seen majorly over time. (Singh & Singh, 2015, p.75-76). To operate Kaizen activity within a business, the collaboration between "the means to operate" is required. "The means to operate" means tools and methods, and enterprise human resources. During the collaboration, if the traits of tangible factors (tools and methods) and intangible characteristics (personnel's skills, proactive and innovation mindset) received continuous improvement, it would generate better results in achieving the higher and better level of Kaizen activity within the business's operation. (Macpherson, Lockhart, Kavan, & Iaquitnto, 2015, p.6).

In making an improvement plan for the efficiency and productivity of CX's operation, the continuous improvement process is mostly about identifying challenges and defect factors that prevent the company from developing further than current status. From that, there will be an appropriate plan for cutting down the waste, improving the quality of task-performance, and optimizing personnel resource utilization.

3.4. Value-added, human involvement and waste concepts

Henry Ford, the founder of Ford Motor Company, was one of the pioneers who innovated and applied Lean manufacturing to the operation and manufacturing. During World War I and II, Henry Ford significantly invested his effort into Ford Motor Company to reduce manufacturing cost, increase efficiency, and ensure employee welfare, such as cutting working hours and increasing hours wage. Thanks to Henry Ford, the workforce started to have work-life balance when the Ford Motor Company experienced reduced personnel turnover rate and production efficiency improvement. The main reason that contributed to Henry Ford's success was his ability to recognize waste. (Levinson, 2014). As an essential condition of any organization that pursues Lean thinking, people within the organization at any level are required to have waste recognition and waste elimination mindset at all times. (Kapanowski, 2019, p. 15). Whenever there is the manufacturing production process, there are tangible or intangible value-added parts; and wastes. Henry Ford claimed that everything is waste if it does not create value. (Henry Ford, 1920). There are three aspects that any organization who demands to become Lean should consider: value-added features should be focused, people's involvement should be considered, and waste should be reduced and eliminated as priorities.

3.4.1. Value-added focus

Value-added features happen during the production time that add value to the final products and services. There are **value-added activities, nonvalue-added but necessary activities, and nonvalue-added and unnecessary activities** during the production or business operation flow. The business should only focus on value-added activities and necessary nonvalue-added activities by having an appropriate improvement strategy, while the company strives to reduce unnecessary nonvalue-added steps. (Nicholas, 2011, p-58).

To do that, the company must have the ability to distinguish the unnecessary procedures, among others. When **value-added** steps contribute value directly to the production output, **nonvalue-added** activities are acted on behalf of supportive procedures for production outputs. The procedure of identifying whether if the specific nonvalue-added activity is needed or not is quite challenging sometimes. Activities belong to the organization's support activities, such as accounting, management, inspection, administration, after-sales services, or purchasing; for example, they are evaluated as nonvalue-added procedures. As mentioned, it is hard to distinguish which nonvalue-added activities are, whether necessary or unnecessary. As a recommendation, there are two way to reduce as less as possible unnecessary nonvalue-added procedures which are to involve people and to eliminate sources of obvious wastes.

3.4.2. **Human involvement**

Human resources play a crucial part in the motivation to eliminate waste and unnecessary nonvalue-added activities. Whenever a task is assigned to a responsible person, the task-responsible person can have the most experienced in the specific task than anyone else. They are constantly learning the task during the task-studying and- working period. As the result, they will have the ability to distinguish which process within the tasks are unnecessary and can be cut down. The comp. Thus, the business encouragement toward adopting Lean thinking and continuous improvement is significantly essential. (Nicholas, 2011, p-58)

3.4.3. **Waste elimination**

There are seven types of wastes that companies should strive to eliminate in order to pursue Lean successfully:

Overproduction:

This type of waste appears when the business operates manufacturing or production process for larger quantities of products rather than actual demand. (Souza, 2012, p.25). Overproduction is a common issue that several companies are facing. There could be a proactive action when the companies want to build up inventories. To reflect with the Lean principles, it is wasteful if the company maintains overproducing. (Nicholas, 2011, p.63).

Transportation:

During the products and service production, items are prescribed to be moved from one place to another; for example, from the factory to the office. (Souza, 2012, p.25). No value feature can add up to the products and services throughout the moving period. On the other hand, it demands equipment and the engaged workforce for the procedure that does not make any value for the final products and services. Hence, it is considered as waste. (Nicholas, 2011, p.63).

Inventory:

One of the unique characteristics that help people distinguish Lean operational business or traditional operational business is its inventory. By strictly following Lean approach, Toyota Production System called inventory as wasteful evil. (Flynn, 1992). Inventory is items not being sold yet and being held in stock. During the time items are kept within the warehouse, there is no value-added, while the longer items are held, the more time and money are wasted for this process. Keeping inventory means that the business applies the Just-in-Case practices instead of Just-in-Time. (Nicholas, 2011, p.62).

Waiting Time:

This type of waste occurs when employees are obliged to have gap time between the production process before moving to the next stage or continuing the process. The reason for this gap time is to wait for some implemented actions from other parties. For example, the employees are waiting for the arrival of some items as part of manufacturing, access approval from management level, or confirmation for some vital information. (Souza, 2012, p.26).

It is common to see the transformation from waiting time waste to the overproduction wastes in businesses. While the business strives to reduce the waiting time, it tends to make its employees or machines busy most of the time, producing products and services that are not for sales. (Nicholas, 2011, p.63).

Motion Waste:

This type of waste is similar to waste from transportation; however, it is focused more on the physical movement of workforce and human aspect. (Souza, 2012, p.26). Working

and being in motion is different. Lean approach defines working as actions that create value, while motions are movements that do not generate any value-added; hence, they are waste. Motion waste occurs when the employees are in unnecessary motions instead of working. On the other hand, the employees are usually unaware that they are actually in unnecessary movements. (Nicholas, 2011, p.64).

As a goal, motion waste should be reduced as much as possible. Some ordinary motion wastes are "searching, selecting, picking up, transporting, loading, repositioning, and unloading". (Nicholas, 2011, p.64). Work performance is measured by work content measurement. Lean's organizations tend to maximize the work content by reducing wasteful motions and increasing real-time working.

Processing Waste:

Any task has its own working process to lead to completion. However, there can be unnecessary steps during the working process that are considered as processing waste. (Souza, 2012, p.27). Organizations, who adopt Lean approach, often strive to cut down unnecessary steps and transform the inefficient working process to a more functional, efficient, and productive performance. Technology and automation encounter to upgrade the working process are one of the popular methods to eliminate the processing waste. (Nicholas, 2011, p.63 - 64).

Defects:

Defects are wastes regarding quality issues of products and services. Defects come from product depreciation or even from the production process. (Souza, 2012, p.27). Defects lead to the processes of fixing or reworking, which results in expenses for labor, warranty, reparation, and customer services. Not only that, defects can negatively affect the company's reputation and cause problems regarding attracting potential customers; or to ruin the customer's loyalty towards the brand. (Nicholas, 2011, p.64).

Seven types of wastes are visualized under the figure 6. As a summary, seven types of waste can be characterized into three main categories: waste from People aspect, waste from Quantity aspects, and waste from Quality aspects. By striving to reduce wastes in a continuous movement, the companies participate in transforming itself into Lean organizations.

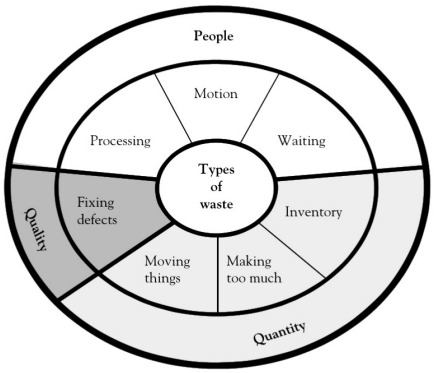


Figure 6 7 types of Waste (Source: Souza G. L., 2012)

The researcher defines the most common sources of waste within CX's operation and the given project: Processing waste, Motion waste, Defects, and Waiting Time. In the empirical part, the researcher will deeper analyse about CX and the given project's implementation process wastes and propose the suggestion for the project's transformation to reduce the wastes as much as possible.

3.5. PDCA Cycle as one version of Kaizen and Lean approaches

The Kaizen continuous improvement cycle characteristics are found similar to the concept of the PDCA Cycle model. PDCA is a practical, well-established and four-step approach to support the continuous improvement process. PDCA is shortened for Plan-Do-Check-Act. It is the uninterrupted and clockwise cycle of performing perceiving and thinking, which is started with the planning step. It is kept repeating rolling to other steps with non-destination. (Nicholas, 2011, p.29). PDCA cycle is known as the Shewhart cycle or Deming cycle since A. W. Shewhart and W. Edwards Deming. They were people who developed and popularized the utilization of the PDCA cycle. (Nicholas, 2011, p.28-29).

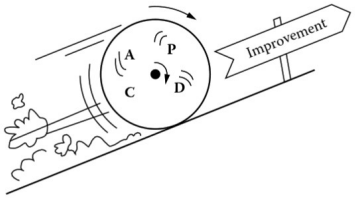


Figure 7 PDCA Cycle (Source: Nicholas, J., 2010)

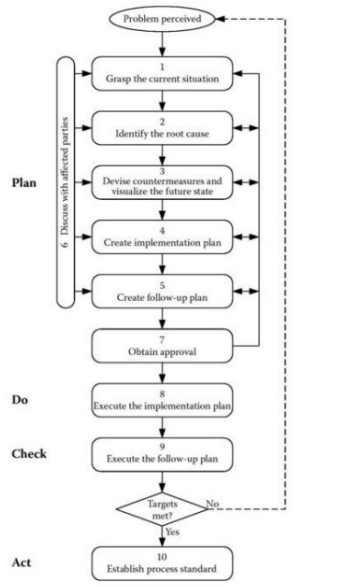


Figure 8 Example of a detailed PDCA cycle approach (Source: Durward. & Art., 2008)

The PDCA cycle can be extended as the above figure 8. People can have different ways to practice the PDCA cycle since there is no concreted and detailed PDCA theory that every business must follow. Depending on the situation and business type, the PDCA cycle can be applied differently such as some sub-steps can be added or deducted. However, it is still included essential steps within an uninterrupted cycle such as to make the implementation plan to solve problems within the current situation (Plan – P), to execute the plan (Do – D), to check if the plan is going well, and/or the result is goal-matched (Check – A), to standardize the approved process, and to start another cycle again on the same issue or on another issue (Plan – P)

a. Plan step:

According to John Nicholas, this step is necessary in order to create a preliminary plan to improve, for examples, a working process or quality of products/services. Within the step, there are four smaller steps:

- Collecting the necessary data to understand the current situation: One of the most potential data that can be exploited is dissatisfaction, which are outcomes of existing problems. Current employees or customers with lousy experiences are recognized as good data sources that the researcher can approach. (Nicholas, J.,2010, p.29). By grasping the current situation from the beginning, the problem could be clearly identified from the cause. It was insisted that there should be a summary illustrated diagram or figure for the current situation. Thus, the problem could be visualized and measured. (Durward & Art, 2008, p.63).
- Defining the problems: From the collected data, the researcher can address the problems and its cause. (Nicholas, 2011, p.29). The root cause can be investigated by utilizing the Five Why questions approach. By asking five essential whys questions, the identified problem from several aspects could be revealed, which can lead to a quick grasp of what needs to be included in the plan to solve the problem. (Durward & Art, 2008, p.65)
- Determining the goals: The improvement of goals or countermeasures must be stated. Depending on the problem type and improvement demand, the goal can be adjusted. The more visionary goal, the more an unambiguous plan can be made to achieve it. (Nicholas, 2011, p.29), (Durward & Art, 2008, p.66-67). The defined goals can be identified better by using Four Deep Questions approach that TPS has been using.
- Finalizing the plan: Upon the defined problems and the stated goal, the researcher can make the accordant and appropriate plan to solve the problems and achieve the objective. (Nicholas, 2011, p.29).

b. Do Step:

Once the plan is specified, the implementation stage can be begun. As can be seen, it is crucial to establish a detailed step by step plan. So that, the plan can be easier to carry out and to be monitored. During the plan implementation, flexibility and adjustment for the plan can be practiced depending on the circumstances. (Nicholas, 2011, p.29).

During the implementation, in case there is any change happened in comparison with the original plan, it should be discussed again within the team and supervisor and received the approval from higher authority before it can be gone through. The change could be due to problems that occurred during the output's verification, or, from any other reasons during the implementation period. By making consultations about the adjustment before it can be approved, effective communication towards the issue can be boosted. In this step, there should be a substantial involvement from experienced people such as an expert in the field to judge the adjustment and to give the best advice on the adjustment. (Durward & Art, 2008, p.71)

c. Check Step:

Even though the plan is well-prepared, it does not totally ensure that the researcher could achieve the stated goal. The "Check" step is essential to assess the plan execution's performance and result. This can be seen as an analysis and evaluation step for the plan implementation. The "Check" step is considered as supporting the "Do" process. During the "Do" process, every received outcome and side effects from executing the "Plan" should be recorded as a result of an experiment. Subsequently, the beginning plan can be modified as a hypothesis of experiment versions to test different hypothesis's output. The process should be repeated until the results are matched with the stated goal. (Nicholas, 2010, p.30). According to the study of Durward K. Sobek II and Art Smalley's study, the "Check" step is the implementation of a "follow-up plan" to measure and verify the implementation process as well as the plan's output.

d. Act Step:

As mentioned, despite the thoroughly prepared plan, problems or limitations can appear during the implementation period. The "Check" step acts as a decision-making gate with authority to approve the continuous implementation or redirect the plan to the adjustment phase. In other words, the "Act" step is the consequences that come from the "Do" and "Check" step. There would be three scenarios for the encounter of the "Act" step. In the first scenario, if the execution of the determined plan worked positively and successfully, the plan would be retained, institutionalized, and standardized for other similar problems. In contrast, if the plan implementation hit errors or caused the fault, the investigation towards the cause of errors would be made; thus, leading to the plan's adjustment. There is

another scenario as the execution was successfully but could only operate within a restricted and rigid method; the beginning plan could have retouches for improvement or expansion. Depending on the implementation and performances' evaluation, appropriate action is given. Unless the result from the implementation is judged as success and most optimized, the loop of "Do", "Check", "Act" should be maintained to create the most applicable plan which can deliver the most goal-matched output.

Below is the visualization of PDCA theory that is summarized into a flowchart:

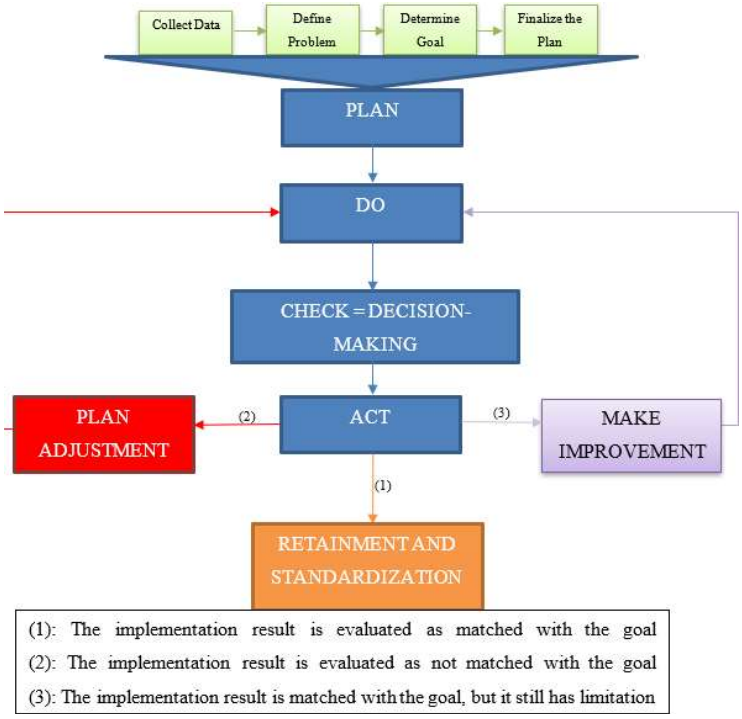


Figure 9 PDCA Cycle by Nicholas

Here should be noticed that, even when the goal is achieved from the PDCA cycle practices, it is not the final destination of the PDCA cycle or Lean transition process. As one of the most important characteristics of Lean thinking is continuous improvement, the company should keep maintaining the non-stop and clockwise movement of PDCA throughout the business's operation to make sure the company can become better through the periods.

The combination between Kaizen continuous improvement cycle and PDCA cycle is applied as the primary tool for the researcher during the thesis working period. The interview questions design, the self-observation and take note process, and the transformation of the tasks' and project's implementation are implemented by applying the instructions of Kaizen continuous improvement cycle and PDCA cycle.

4. EMPIRICAL ANALYSIS

Together with theoretical research, the empirical research process contributes an important role in the reliability of research results and as an application of theory analysis into practice. In this part, the suggestion of suitable and possible used empirical research methodologies for business students' final thesis in general, especially for this thesis topic: “The implementation of automated sale data management and reporting system: Case company X”, in specific, is introduced.

4.1. Research methodologies

The empirical research methodology consists of two research methodologies, which are quantitative and qualitative. There will be examinations for definitions and mean of use for each method. From that, the researcher can evaluate which methodology can be a possible method for this thesis topic.

4.1.1. Qualitative methodology

According to White and Rayner, a qualitative methodology is a form of research that can predominate applied economics and business research. “It is a descriptive, non-numerical way to collect and interpret the information” (White & Rayner, 2014). In specific, qualitative research's primary purposes are to describe, explain, and interpret collected data. Qualitative is a useful model that allows the researcher to create more involvement in the target respondent’s experience. (Creswell, 2003).

The qualitative methodology is usually performed through interviews between the researcher and interviewees as direct form. Semi-structured interview questions are generated, which can bring up new ideas for researchers during the interview time. As a result, the researcher can have an opportunity to dig deep into the respondent's experience, behaviors, and reasons for insight thoughts and reactions. As an indirect form, observation techniques can be mentioned.

4.1.2. Quantitative methodology

Quantitative research is used when the investigation or the research needs to quantify data. It can be used to gather responses for questions that include variables within the

research. Usually, quantitative research starts with a problem statement and includes a hypothesis, a literature review, and a quantitative data analysis. (William, 2007).

Quantitative research according to Creswell as "employ strategies of inquiry such as experimental and surveys and collect data on predetermined instruments that yield statistical data" (Creswell, 2003). The results or collected data are typically numeric and quantified using mathematical models from analytical programs for data analysis performance. Quantitative research includes tested hypotheses, whether it is rejected or accepted (White & Rayner, 2014). Quantitative methods are standard for collecting primary data collection. In this type, the researcher creates structured questionnaires and aims to receive many answers from respondents. It can be seen as an effective method when the researcher wishes to analyze the frequency and quantity characteristic through questions in the forms "how many…?", "how often…?", "how long…"; or questions with alternatives.

4.1.3. **Chosen method(s)**

After reflecting on the thesis topic, there will be a combination of quantitative and qualitative methods. The thesis research process is divided into three phases: the pre-research phase, the A/MS&A/RS system testing phase, and after the A/MS&A/RS phase. With the pre-research phase, the qualitative method is chosen. With the system testing phase, the quantitative method will be used. After the testing phase is finished, the qualitative method will be used again.

The combination of quantitative and qualitative methods can be generated and be called a mixed methodology. Shorten, A. & Smith, J. stated that mixed methodology could carry promising strengths of both qualitative and quantitative that lead the researcher to "explore diverse perspectives and uncover relationships that exist between the intricate layers of multifaceted research questions". The quantitative and qualitative methods can both positively support each other, which can import beneficial results to the research topic.

A mixed-method can be a favorable solution for topics or questions that neither quantitative nor qualitative methods could answer alone. (Shorten & Smith, 2017). The qualitative method contributes to the research period by pointing out the challenges and the demands of CX regarding the given task. On the other hand, the quantitative method plays an important role to test the provided system in terms of time and result quality as well as

proving the improvement of productivity and efficiency in both task execution and business operation by using the given tool.

4.1.4. Data Collection

When researching and collecting data, there are two types of data being used: secondary data and primary data. Secondary materials, which are mostly used in the theoretical framework, are information that has been published. This type of data can be found in published articles, academic textbooks, company annual reports, or press releases. The secondary data is rated as less expensive and easier to find than primary data. Thus, the secondary materials are under the demand of being used by several people for different purposes. (White & Rayner, 2014, p.108).

On the other hand, primary materials are collected data by the researcher to analyze the specialized issue. One of the main characteristics of primary materials is more up to date than secondary data. People mainly seek to use primary data due to their research and analysis demand. Thus, the primary data is often expensive or difficult to collect. (White & Rayner, 2014, p.108).

Primary data collection method

To implement this research, the primary data is collected from three different phases: pre-research phase as before the A/MS&A/RS is made, A/MS&A/RS system testing phase, and after A/MS&A/RS is launched. With the pre-research phases, there are two personal interviews and a self-observation approach. When it comes to the system testing phase, 132 quantitative surveys (66 samples per system) are collected. Lastly, with the after A/MS&A/RS phase, 3 last personal interviews are implemented.

At the beginning of the research, two personal interviews are implemented as the pre-research stage. The interviews' primary purpose is to point out the challenge and the problem that the company's personnel faces with the task. Besides, the researcher supports the primary data collection by her self-observation toward the TULOKSET Project and CX's operation situation. Self-observation has been always happening since the researcher was attending as a trainee of the company. In the pre-research phase's interview, the company's personnel will list their demands and preferences on the improvement and

transformation of the TULOKSET Project. The current situation of project implementation regarding time consumption and human resources utilization for the project's tasks are also discussed. The company's sales data from January 2020 until June 2020 are given by the company to be included in the new master database of the project transformation process.

The interviews can be conducted as structured interviews, unstructured interviews, and semi-structured interviews. While a structured interview means an interview with only prescribed and selected questions beforehand, the unstructured interview is considered as a discussion to build up the topic during the interview time. (White & Rayner, 2014, p.52). The semi-structured interview is chosen as the interview type for both pre-research and testing phases in this research. A semi-structured interview is the combination of a structured interview and an unstructured interview. There would be prescribed questions that were prepared beforehand. During the interview, the relevant follow-up questions would be added to develop the topic into different perspectives and situations. (White & Rayner, 2014, p.52).

As mentioned above, task-responsible personnel are people who have the most experienced in the specific task/project than anyone else. Thus, the interviewees in this researcher are carefully chosen. The respondents are currently working at CX at the senior and mid-senior levels. They are working directly on the project. The brief profiles of interviewees are listed below:

- Ms. K. K. – CEO of CX and Project Manager of CA

Ms. K. is the founder as well as CEO of CX – a small-sized market research and business support company. She is currently directly managing with the TULOKSET Project of CA, including sales data, data processing, and sales agent management. Ms. K. designed the sales management system, which was mostly based on manual activities. In the interview, she gave a detailed description of the tasks, the relationship between CX and CA operation, the rights and responsibilities of each party on the project, and the limitation of the given resources. Ms. K. also noticed her demands on the development criteria of the project as well as suggesting features that she would need to have in the new A/MS&A/RS. At the end of the thesis working process, Ms. K. will be interview again to

give her experience about the TULOKSET Project's outputs coming from the A/MS&A/RS.

- Ms. A. F. – Former Project Assistant of CX

Ms. A. worked at CX as a Project Assistant, and she was mainly working with projects from CA – CX's client. During her working time as Project Assistant, her responsibilities were to support Ms. K. in managing the sales data entry, to count and calculate the daily sales, and to update the daily sales into monthly basis sales tables. Her daily duty included informing how many pieces had been sold and the accordant sales value to Ms. K. Ms. A. gave out challenges and problems during the working time from her experience in doing the task manually.

- Self-observation:

The researcher participates in the project as a part of the traineeship program. In the beginning, the researcher contributed as a Project Assistant trainee to support Ms. A. from the middle of April to the end of May. From May to September, the researcher involves in the project as a Project Assistant Trainee and thesis worker. During the working time, the researcher has her observation and evaluation on the daily tasks in specific and on the TULOKSET Project in general. The idea of transforming the project implementation methods are suggested in May 2020. The researcher has the right to utilize the data as well as internal information supporting the study process. The researcher has the responsibility to innovate the methods that can help CX implement and manage the tasks within the TULOKSET Project more efficiently. The description of the working process and the process's outputs become the main reporting part in the empirical part of the dissertation.

After collecting the needed data, there are a data analysis process, sales data manipulating and processing, and system building periods. After the new system, which is A/MS&A/RS, is launched, three months for system testing are provided. During the testing phase, the quantitative surveys are designed as a follow-up sheet for supervising time consumption and quality of the outputs. The quantitative surveys are implemented separated for the user of the old manual system and user of the A/MS&A/RS.

At the end of the testing phase, there are three last interviews. One is with Ms. K., and two with the new Project Assistant and Project Assistant Trainee of CX, who will continue supporting Ms. K. in this TULOKSET Project.

- Ms. H. H. – Current Project Assistant of CX

Ms. H. is working on the project during the A/MS&A/RS testing phase; she performs the project tasks mainly with the A/MS&A/RS. On the other hand, she supported the researcher on recording time consumption and errors by implementing the project's daily tasks in the new system (A/MS&A/RS). In the interview, Ms. H. commented on the pros and cons of using the tool on the task. She suggested more features which can be improved.

- Mr. T. A. – Current Project Assistant Trainee of CX

Mr. T. is working on the project during the A/MS&A/RS testing phase; he performs the project tasks mainly with the old manual system. He supported the researcher on recording time consumption and errors by implementing the project's daily tasks in the old manual system. In the interview, Mr. T. expressed his thought mostly about the inconvenience of implementing the sales counting and calculating manually.

4.1.5. **Questionnaires design**

As mentioned, the interviews are mainly implemented before and after the Automated Sales Data Management and Reporting System (A/MS&A/RS) is made. Before the system is designed, the interviews' outputs are mainly to support the plan step of the PDCA cycle to prepare crucial information for the A/MS&A/RS making process, such as:

- To understand the nature of both company CX and its client – CA
- To figure out the problems among the tasks and the projects
- To understand the demand of CX and CA toward the tasks and the result
- To plan for the countermeasures for implementation to improve flow efficiency, resource efficiency, and labor productivity.

During the testing period of three months using the new system, there are also two types of short quantitative follow-up questionnaires that the Project Assistant (Ms. H.) and Pro-

ject Assistant trainee (Mr. T.) need to fill in every day. The quantitative surveys are operated by Google Sheets spreadsheets. The purpose of these quantitative surveys is to compare the performance in terms of time consumption, the accuracy of the result, and error reporting between working with TULOKSET Project with the new system (A/MS&A/RS) and with the old manual system. Besides, by filling into the survey tables, the researcher can also follow the improvement of labor productivity.

After the Automated Sales Data Management and Reporting System (A/MS&A/RS) is launched for approximately three months, the interviews are made to observe the user experience in terms of timing aspect and data accuracy aspect.

All questions in qualitative and quantitative research are inspired strongly from the theoretical framework, especially from Lean principles, waste concept, productivity, and efficiency measurement, and follow the literature about the PDCA model. The questionnaires for the qualitative interviews before and after the A/MS&A/RS is launched can be found in Appendix 1. The quantitative Follow-up surveys questionnaires for each type of system can be also found in Appendix 2.

4.2. Improve CX's productivity and efficiency by A/MS&ARS

4.2.1. Company X (CX) introduction

The company introduction is the summary of the interview question: "Can you give an introduction about CX?" with Ms. K. and Ms. A. from the pre-research phase. As the outcome, the researcher wishes to understand more about the background of the company, i.e. vision, mission, business activities, and its provided products and services. By getting to know more about business activities, the researcher can perceive the actual demand of CX with the project transformation that they want the researcher to work on. In the PDCA cycle, these interviews results would be transferred to the Plan step, while with Kaizen continuous cycle, these interviews results support the researcher in identifying the problem.

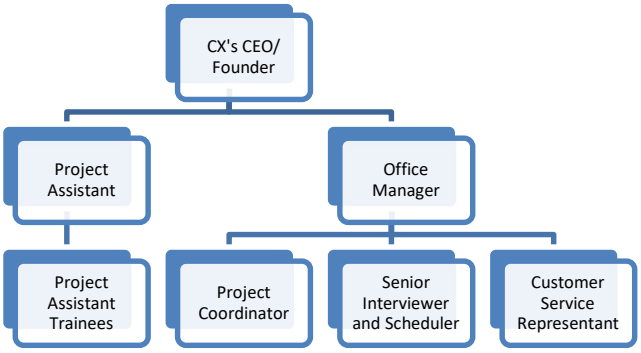


Figure 10 CX's Operation Struture

Company X (CX) is a Finnish-owned small-scale company which has a head-quarter located in Tallinn, Estonia. The company has 15 experienced years as a market research and business support company. In terms of provided products and services, CX is operated as a market research and business support company. The company is specialized in international contact center projects, research and data collection services, business support services, and content services. Currently, the company has its operated office in Finland, Estonia, and Spain. By 2020, the company has successfully delivered 156 projects within 15 years, consisted of 14 key personnel and 217 freelancers who are working remotely around Europe. In figure 10, there is the company operation structure.

In terms of research and data collection services, CX provides qualitative and quantitative market research and data collection in different languages. The company involves in its clients' business, which is larger-scale market research companies by signing a subcontract. As a part of the provided services, the company offers a full cycle of doing market research. The market research tasks are included as subtasks in business supports services that the company offers.

With business support services, the company guarantees to become a partner with its clients. CX aims to participate in clients' business projects and tailor-made task implementation methods to help its clients improve their productivity and cost-effectiveness. In the company services' portfolio, CX stated that the company "tailor-made reasonable rates services depending on clients' needs, goals and size." (CX, 2020). By using CX's business support services, the clients can have outsourced assistants for time-consuming, repetitive, and daily manual administration tasks. Thus, the clients can achieve better productivity and the ability to focus on their core business only. Time and resources can be saved for clients' companies for other higher skills requirement tasks.

With this characteristic, CX has experienced in working with multiple different clients and projects. Until today, CX has been working with approximately 20 clients from several different sectors. The company is dealing with a large scale of data process and different types of data processing and administration tasks.

By CX's characteristic, it is no doubt that CX is one typical example of striving to utilize resource efficiency and being result-oriented than flow efficiency and process-oriented. CX employees are expected to complete several orders (blog writing, database collecting, telesales, etc.), and to work with several clients as much as possible within their daily working days.

4.2.2. CA as CX's client and Task description

This part is the result of the question: "Can you describe the relationship between CA and CX and what specific project that CX is in charge of giving support to CA?". The target interviewee for this question was Ms. K. Ms. K. is CEO of CX, and simultaneously, one of CA's office Project Manager. Thus, she has the field knowledge as well as the ability to explain the relationship between CA and CX. As the outcome, the researcher can study more about the project, such as the actual working flow, and why CX insists on improving the efficiency of this collaborative project between CA and CX.

Introduction about CA:

One of the business support projects is to support its partner – Client A (CA) in the project that has been named: TULOKSET Project. "*CX supports organizing international sales, managing, and analyzing sales data. CX is also responsible for supervising sales agents and evaluating the personnel performance for CA.*". CA is known as a popular gaming corporation in Northern Europe. In total, there are seven sales subsidiaries within six countries, and each of the offices will focus mostly on their own geographic segmentation.

Bellow here is the relationship between CA and CX, as well as the CA project personnel structure:

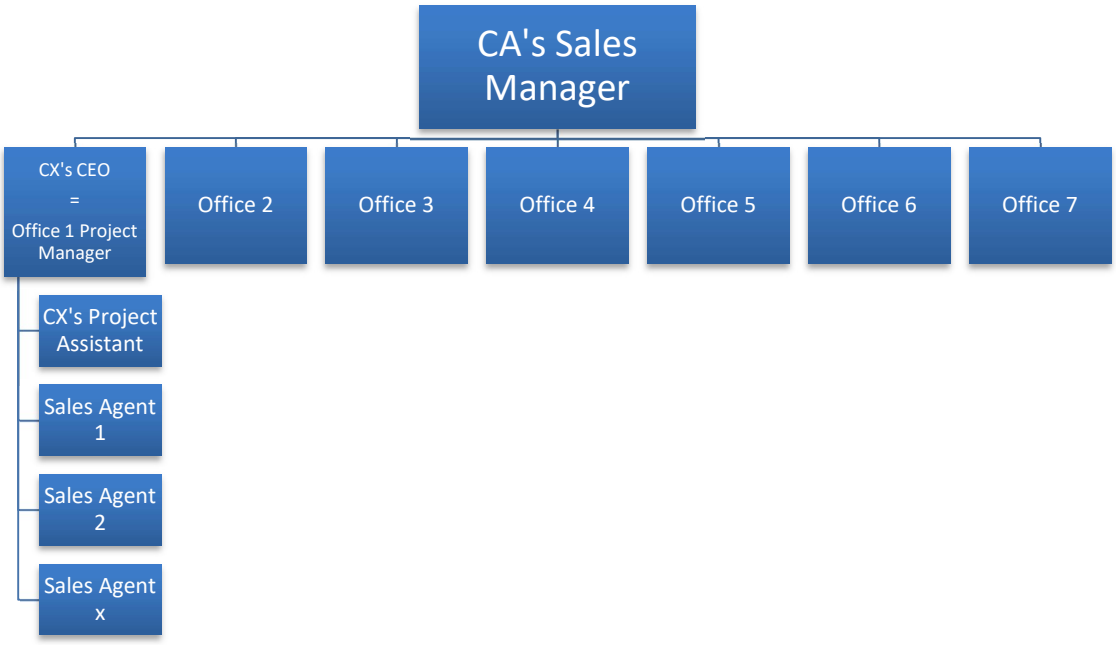


Figure 11 CA's Office Structure

The sales activities of office 1 are under CX management, which means CX has the authority to recruit and monitor sales agents, provide working tools and facilities to the agents, manage sales records, and analyze and report sales results. The sales management is independent between the offices in different offices in different countries, which mean that each office will have its own business support agency, and each of them will have different sales management methods, tools, and facilities.

Product categories:

Currently, CX assists one of CA's subsidiary or sales offices in Office 1. Office 1 provides six different products; the information can be found in the table below:

Product Code	Product Price
100/4	20€
100/6	20€
200/4	40€
200/6	40€
300/4	60€
300/6	60€

Table 1 Product categories and prices

The products are divided into two collections (kk): 4kk (100/4, 200/4, 300/4) and 6kk (100/6, 200/6, 300/6). The purpose of dividing the products into collections is that CX and CA aim to boost sales for products from 6kk more than 4kk. CA has a rewarding system as a commission bonus payment to sales agents besides the fixed salary to those who exceed a certain amount of selling products from 6kk and products from 4kk. To be detailed, the sales agents have a basic salary as €1400, if within one sales month, the sales agents exceed €4000 by selling just 4kk products, they can receive a 35% commission. If within one sales month, the sales agents exceed €2545.45 by selling just 6kk products, they can receive a 55% commission. The clarification about the commission is important since the researcher is responsible to create tools to manage the commission situation which are integrated inside the A/MS&A/RS.

TULOKSET Project's working process and method:

As a part of the project assistant internship and thesis worker period, CX has given the order to the researcher to make the tasks within TULOKSET Project more comfortable to work with.

As a general evaluation, the TULOKSET Project and its working process are considered as **nonvalue-added but necessary activities**. The TULOKSET Project does not add any value to the final output products that CA is selling. However, it is an important sales management activity and cannot be deducted, since it acted as a measurement tool to measure sales performance, revenue, and profitability of CA. The TULOKSET Project was divided into daily tasks. At this moment, weekly tasks and monthly tasks have not been applied yet. Later after the A/MS&A/RS is made, the TULOKSET Project is divided into daily tasks, weekly tasks, and monthly tasks. The project's resource, tool, and system were deployed from the main shared Google Sheets file named: "Tulokset viikko ja kuukausitasolla" (Results weekly and monthly). The sheet's access rights would be granted by the CX's project manager and CA's sales manager. The Google Sheets "Tulokset viikko ja kuukausitasolla" was designed and provided by CX. Key personnel, who have the right to access the Google Sheets "Tulokset viikko ja kuukausitasolla", include:

- CA's Sales Manager: Supervise sales situation on a daily, weekly, and monthly basis

- CA's Project Manager = CX's CEO: Make sales entry daily and manage sales agents, do report to CA's sales manager and sellers, manage the sellers the commission situation
- CX's Project Assistant and Project Assistant Trainee: Count the sales, calculate sales value, update sales result on daily basis, do weekly and monthly sales situation report
- Sales agents: Track their sales activities reporting, fix entry errors if needed

Here was the process flow of the sales data entry steps:

Figure 12 TULOKSET Project's working process

As an evaluation, the process flow before A/MS&A/RS was complicated with an extraordinary amount of people involved as well as several unnecessary transit points. The tasks need to be gone through many stages before it could be completed. In the manufacturing context, if there are more transit points within the production process, there will be more wastes such as transportation wastes, waiting time wastes, and motion wastes could appear. When it comes to the project process flow, it was measured similarly; as there were motion wastes, processing wastes, and waiting for time wastes and other problem can exist within the process flow.

4.2.3. PDCA – Plan: Planning procedure for transforming TULOKSET Project's implementation process and method

Figure 13 Planning procedure

Identify the problem:

Instead of living with an inefficient project with defects and errors that happened during the project's stages, the investigation on figuring out defects and errors can be done. Once the problems are identified and solved, employee satisfaction and motivation can be developed. Besides, the employee attitude towards problems and the project's difficulties can also be changed as they might acknowledge problems as crucial material that could trigger improvement. In the end, the culture of continuous improvement can be built. (Balle, Jones, Chaize & Fiume, 2017, p. xii). To reflect on the CX case, during the working and researching time, there are 8 problems that the researcher and together with CX's personnel witnessed. Those problems can be divided into two groups:

Group 1: Problems related to managerial aspects and culture aspects

- The sales reporting methods are not as centralized as business-cross and subsidiary-cross.
- The sales agents are working under temporary and short-term contracts. The working environment is remote.
- In terms of language, the primary communication language between CX and CA is Finnish. This means the sales data system and the reports for monthly sales and weekly sales are in Finnish. On the other hand, CX's project assistants are mostly of international nationalities and are lacking Finnish skills. Language becomes a barrier and factor that can affect labor productivity.

Group 2: Problems related to the project implementation methods aspect

- The sales entry methods do not have any rule-based systems; the data are recognized as unorganized and confuse people who are doing data analysis and sales reporting.
- People who are working on behalf of CX on this task are working under short-term contracts. "*The working period as Project Assistant trainees usually varies from 3 to 6 months.*". Thus, until July 2020, each project-responsible personnel will have their own techniques for managing and reporting sales data. There has not been a project orientation for new roll-in workers. The new project-responsible personnel need to spend a large amount of time to figure out their own working method. As a result, there are time-consuming and uncertainty in task implementation and delivery methods.

- "*The accuracy of manual counting has become prone to errors*"; thus, it is difficult and complicated to control.
- "*The error tracking and fixing were one of the most time-consuming actions*."
- In terms of making the accurate counting, making weekly and monthly reports, and keeping the original of the "Tulokset viikko ja kuukausitasolla" sheet, there is an acknowledgment that project support trainees need to make a copy of sales data tables into their own devices. Thus, security, data protection, and data validation can be violated.

When the problems belong to Group 1, the researcher mostly cannot influence since they are coming from the business culture, collaboration agreement, management, and leadership perspective from the upper management board of both CX and CA. On the other hand, when the problems are in group 2, they are related to the inefficient, inconsistent, and non-systematic working method, and can be enhanced. The main solution is to create a new, more efficient, more consistent, and systematic working method. Thus, throughout the empirical analysis, the researcher aims to mostly solve problems that belong to group 2 - Problems related to the project implementation methods aspect.

Root-Cause Analysis:

By applying Lean thinking, it is essential to recognize the problems from a daily working experience basis. After that, creating appropriate solutions such as metrics, working frame, or methods should be prioritized. The right solutions can be built up step by step and come from the organization's contribution. (Balle, Jones, Chaize & Fiume, 2017, p. xi). The researcher could summary the answers, 5 witnessed problems from group 2 into the Five Why approach to understanding the main Root Cause of those problems:

Five Why questions:	**Root-cause identification**
Why would CA employ CX?	- CX provides inexpensive services - CA needs several consulting companies to manage its sales activities in each office
Why would it take large time spent on the tasks within the project?	-There is no advanced tool to be used for counting

	- Counting and calculation are done 100% manually
Why would it need several people involved in the task implementation, management and reporting?	- Manual counting and calculating could cause error or mistake, resources are used to mistake proofing from several perspective. - Resource efficiency is used as divided project into small tasks that require several people to involve
Why there are frequently have problem with quality of the result?	-Manual work and high employment turnover rate are the main theme
Why would not CA or CX improve in a more effective management system? (ERP, SAP)	- CA would like to have the project done with as low cost as possible. - Budget issue lead to the requirement of having system that utilize popular and low-cost office tools

Table 2 Root-cause Analysis

Goal identification and preliminary suggestions to achieve the goal:

After identifying the problems and its root cause, the researcher utilized Toyota Process System's Four Deep Questions approach to set the goals and the plan to achieve the goals. The goals can be determined from the Four Deep Questions approach:

Toyota's Four Deep Questions:	**CX's Four Deep Questions:**	**Main goals:**
a. How do we satisfy customer better?	a. How do we satisfy CA by CX's performance?	Satisfy CA
b. How do we made work easier?	b. How do we simplify the workflow?	Cut down the workflow
c. How do we reduce total cost?	c. How do we reduce total labor cost and labor usage for the project?	Reduce labor/ time usage => reduce total cost

d. How do we learn faster together?	d. How do we make the tasks, the project and the tool become simple and accessible by the workforce?	Make the tasks and the project more assessible

Table 3 Determine goals with Toyota's 4 Deep Questions Method

Improvement criteria lists that can directly address Four Deep Questions have been made through the qualitative interview with all chosen respondents who will take care of the tasks afterward:

a. How do we satisfy CA by CX's performance?

To satisfy CA, the CX Project's Client, the most important factor is quality in accuracy sales results. By deploying CX as one of CA's business supporters, CA is a more result-oriented mindset than a process-oriented mindset. To exceed CA's expectation, counting the calculating must be fast and accurate. The suggestion plan for achieving this goal is:

- There should be an improvement in terms of efficiency and productivity (decrease labor involvement and time-consuming and increase accuracy and quality of the result.

b. How do we simplify the workflow?

As we can see in figure 12, the project went through several stages before it could be finished. The main ambition is to apply the **simplification** of Lean principles to cut down **unnecessary motion and processing wastes**. Manual counting and calculation must be shifted into a more automated action. Suggestion plan for achieving this goal is:

- There should be a tool which can be a form to make sales entry
- The tool should be able to cut down unnecessary steps and transform the current workflow into:

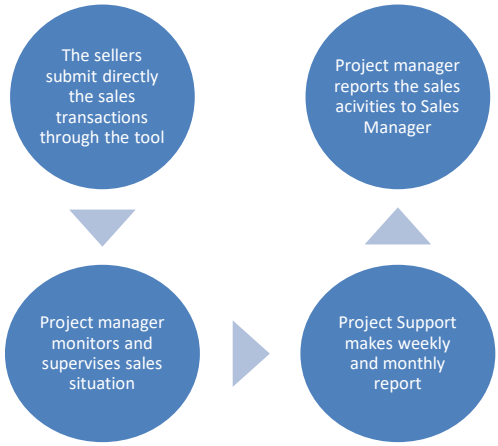


Figure 14 Desired simplified TULOKSET Project's working process

c. How do we reduce total labor cost and labor usage for the project?

From the five why approach, the researchers address one of the main wasteful problems is the involvement of many personnel into doing the counting and calculating manually or verifying the accuracy of the entries and counting. This over-usage of labor leads to the increase of labor cost that CX pays its project-related personnel (time spent for counting manually and constructing data for making reports), and CA pays its sellers (for extra hours in doing verifying entries). It can be seen clearly that by doing the counting and calculating manually, defects waste is appeared frequently as counting errors and mistakes. It leads to the demand for addressing and fixing mistakes and waiting time for the mistakes being addressed and fixed. By applying the **cleanliness and organization**, and **measurement** in Lean principles, the researcher made suggestions to evaluate the process of project implementation, and eliminate **Defects** and **Waiting Time** waste:

- There should be a master database with all sales data in structural order
- The data need to be organized as becoming more structured
- The database should be cleaned and in user-friendly status, which can support in easily querying needed data, addressing entry mistakes, and fixing the error.

d. How do we make the task, the project and the tool become simple and accessible by workforce?

It is acknowledged that the workforce in both CX and CA usually has a short-term working period. The project assistant trainees are usually only under six months of contracts with CX. Thus, there is not long engagement between the task-responsible workforce

with the tool. Besides, sales agents occasionally have more people come to work, or people quit the job. In case the A/MS&A/RS is made, the plan for implementation needs some criteria, such as:

- The tool should be simple to use and accessible with the employment turnover situation of the company
- The sales data entry techniques will be rule-based
- Training systems in regard to the tool must be uncomplicated and agile to implement

4.2.4. **PDCA - Do, Check, Act: The implementation of creating A/MS&A/RS**

After understanding the background of the company, the project's situation, and the problem that the TULOKSET Project's personnel were facing at the moment, the accordant plan with countermeasure are made and moved to the implementation, the verification and the institutionalization steps (Do, Check, Act)

Under here is the summarized table shows the timeline of project transformation, the researcher will describe detailly each stage throughout the empirical research:

Stage	**Time**	**Main countermeasure:**	**Main evaluation for countermeasure:**
Stage 1:	May 2020	Counting and calculating the whole sales month (April) at once	Rejected => plan adjustment
Stage 2:	May 2020	Counting and calculating sales of May everyday	Rejected => plan adjustment
Stage 3:	June 2020	Counting and calculating sales daily in June with VBA Macro Countthings ()	Have limitation => make improvement
Stage 4:	Middle of June 2020	Using VBA Macro structure-things() in constructing the master database for A/MS&A/RS	Goal-matched => standardize

Stage 5:	End of June 2020	Using Google App Script to make the sales and note transaction entry tool for A/MS&A/RS	Goal-matched => standardize
Stage 6.1:	July 2020	Making semi-automated monthly and weekly performance reports with Google Sheets and Google Slides	Have limitation => make improvement
Stage 6.2:	July 2020	Making automated monthly and weekly performance reports with Google Data Studio	Goal-matched => standardize
Stage 7:	July 2020-September 2020	Testing A/MS&A/RS for result comparison	Goal-matched => standardize

Table 4 Researcher's Working Timeline

4.2.4.1. Do, Check, Act: VBA

Stage 1: Counting and calculating the whole sales month (April) at once:

Description:	**Countermeasure:**	**Follow-up evaluation:**
Researcher involves in manual counting and calculating sales with "Tulokset viikko ja kuukausitasolla". The counting and calculating for April were made on May 2020	Manual counting sales once a month	- Large time consumption for manually counting and calculating the sales, and verify result accuracy - Accuracy cannot be guaranteed => countermeasure is rejected

Table 5 Do, Check, Act: Stage 1's main points

At beginning of May 2020, CX gave an order to Ms. A. to do the monthly sales counting and calculating. The researcher participated as Task Support Trainee. The sales data management system was a Google Sheets file named "Tulokset viikko ja kuukausitasolla" (Results weekly and monthly). The file included several different sheets with each of them was each month. In each monthly sheet, there were spread tables represented each week of the month. In each table, the first column (Column A in the Google Sheets file) was the agents' name. Each cell was written a series of product codes as each seller's sold products in accordant date within a particular week. There were cells with different colors

marked as rules for noticing that the cells needed different counting techniques. However, there were not any notes to translate the meaning of the colors' rules. Within a cell, occasionally, there were notes (texts format) that went together with product codes (number format).

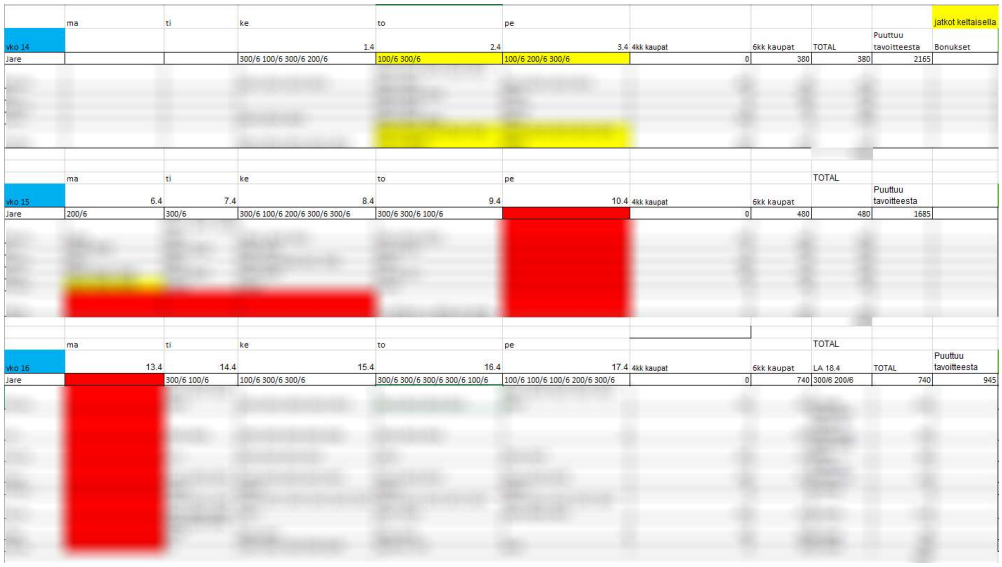


Figure 15 A part of Tulokset viikko ja kuukausitasolla sales management system: tables to count and calculate sales

At the end of each sheet, there were two tables for sales results: one was for counted pieces of sold products in April while the other table was for the respective calculated sales value. Two tables represented the amount of each product type that each seller made in pieces and value (Euros).

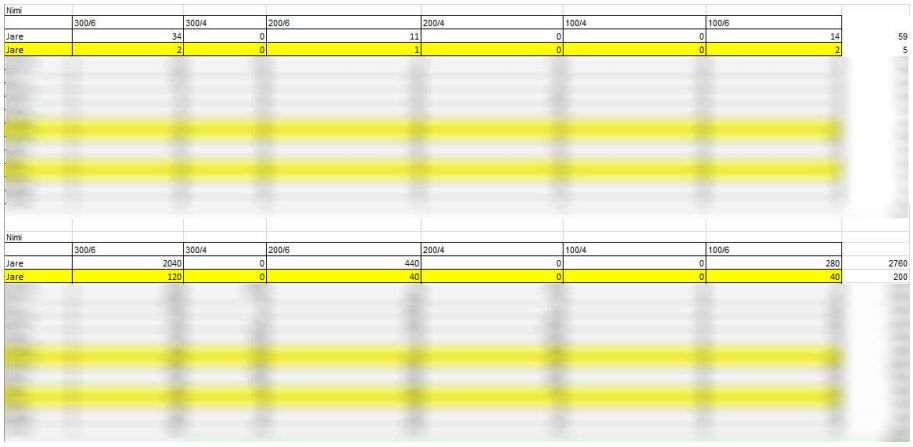


Figure 16 April's total sales result tables in pieces and in Euros per seller

To base on the weekly spread tables, the assignments were to count the total sales in different product types that each seller had sold and to calculate the sales value by multiplying the total pieces of each type with accordant product price. In this case, from tables in figure 15, the Project Assistant would usually count and calculate manually into result tables in figure 16.

Personnel	**Task**	**Time start**	**Time finish**	**Duration**
Nguyen (the researcher)	Counting and calculating sales	10:00:00	15:36:00	05:36:00
A.F.	Checking counting and calculation	17:00:00	21:00:00	04:00:00

Table 6 Time consumption in counting and calculate sales of April

In total, to update the sales data of April and verify the accuracy of the result, it took 9 hours and 36 minutes. During the counting time, the requirement was to keep the original "Tulokset viikko ja kuukausitasolla" file; the staff must make a copy of weekly data tables and only pasted the latest result into the Google Sheets file. Thus, several copies were made, which can cause a violation of the validation and security of data protection.

Stage 2: Counting and calculating sales of May everyday:

Description:	**Countermeasure:**	**Follow-up evaluation:**

The researcher tests to make counting and calculating on daily basis. The daily counting is updated into result tables of total sales in monthly basis. The purpose of the test is to observe the task's efficiency improvement in term of timing.	Manual counting once a day	- Total time spend on task is improved - Accuracy cannot be guaranteed => countermeasure is rejected

Table 7 Do, Check, Act Stage 2's main points

The issues such as excessive time consumption, unnecessary human resources utilization, and data security violations were derived and discussed with CX's CEO by the researcher. After April's monthly meeting, one suggestion arose that instead of updating the sales once per month, the sales should be counted and updated daily. Hence, the timing to verify the accuracy of the result can be reduced. The researcher took the responsibility of the work from this moment for making entry sales data daily. Below here is the time reporting for sales data entry in May:

Date	Start time	Finish time	Duration	Task:
1				Holiday
2				Weekend
3				Weekend
4	9:00:00	9:15:36	0:15:36	Prepare tables
5	9:00:00	9:02:32	0:02:32	Starting of week 19. Update for 4/5
6	9:00:00	9:03:00	0:03:00	Update for 5/5
7	9:00:00	9:03:10	0:03:10	Update for 6/5
8	9:00:00	9:03:12	0:03:12	Update for 7/5
9				Weekend
10				Weekend
11	9:00:00	9:46:40	0:46:40	Starting of week 20. Update for 8/5. Verify accuracy for week 19
12	9:00:00	9:03:40	0:03:40	Update for 11/5
13	9:00:00	9:04:20	0:04:20	Update for 12/5
14	9:00:00	9:03:50	0:03:50	Update for 13/5
15	9:00:00	9:04:50	0:04:50	Update for 14/5
16				Weekend
17				Weekend
18	9:00:00	9:30:26	0:30:26	Starting of week 21. Update for 15/5. Verify accuracy for week 20
19	9:00:00	9:04:52	0:04:52	Update for 18/5
20	9:00:00	9:03:10	0:03:10	Update for 19/5
21	9:00:00	9:03:40	0:03:40	Update for 20/5
22	9:00:00	9:03:12	0:03:12	Update for 21/6
23				Weekend
24				Weekend
25	9:00:00	10:00:26	1:00:26	Starting of week 22. Update for 22/5. Verify accuracy for week 21
26	9:00:00	9:04:20	0:04:20	Update for 25/5
27	9:00:00	9:04:15	0:04:15	Update for 26/5
28	9:00:00	9:04:24	0:04:24	Update for 27/5
29	9:00:00	9:04:20	0:04:20	Update for 28/5
30				Weekend
31				Weekend
1	9:00:00	10:46:26	1:46:26	Update for 29/5. Verify accuracy for week 22 and month
Total			**5:20:21**	
Average			**0:15:15**	

Table 8 Time consumption for manual counting and calculating sales on a daily basis

In total, it took approximately 5 hours, 20 minutes, and an average of 15.25 minutes per day to update the sales daily. As a result, the timing aspect is reduced to about 4 hours, 16 minutes. However, during working time in May, there was one issue arisen as the

pieces and value results tables were made for total sales monthly while the sales data were entered daily. The new updates on the sales added up in cells that have already had existing entries. The technique is to add a new number of sold pieces into the existing data. Almost every cell was needed to be retouched every day. It leads to the probability of harming the accuracy and validity of the result.

Stage 3: Counting and calculating sales of June everyday with VBA Macro Countthings():

Description:	**Countermeasure:**	**Follow-up evaluation:**
The researcher launches the VBA tool macro function countthings(). The tool is tested to count and calculate sales daily in June 2020.	Automated counting and calculating with macro VBA countthings() once a month	- The productivity and the efficiency are improved in both timing aspect and the accuracy of the result - It is not effective to use as main counting tool for long-term and does not support the reporting system. => countermeasure is adjusted

Table 9 Do, Check, Act Stage 3's main points

To ensure both the timing aspect and quality aspect, the VBA is utilized to make the sales counting and calculation process faster and more accurate. The idea is to transform the sales data from the spread tables into structural data. Thus, the VBA tool with a macro script for counting function was designed based on the idea of the researcher and the making support of external resources. The detailed script for VBA Macro countthings() can be found in Appendix 3.

The VBA tool's user can paste data tables that is/are wished to be counted into the prescribes sheet. After running VBA Macro countthings(), the tool will process the data table into a prescribed destination sheet. From this, all unnecessary text will be removed, and only the sales data will be processed and formatted into:

Column A	**Column B**
String Array (SellerNameProductType)	Number of pieces

Table 10 Converted data format by running VBA Macro countthings()

Therefore, the number of the entire sold piece during the counting period would be easily extracted and pasted into the table. The Project Assistant was able to be flexible in counting on a weekly or monthly basis. However, CX still demanded to have sales results updated every day. Thus, the tool has been run daily to count sales.

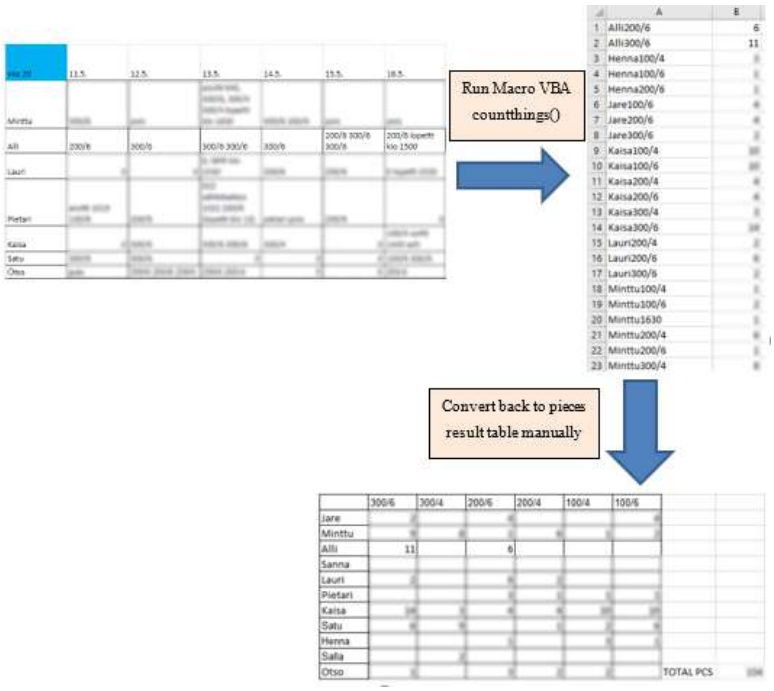


Figure 17 Counting process with VBA Macro countthings()

The tool was run to count and calculate sales entry for every sales day in June. For each time it takes approximately 5.5 minutes (5 minutes 25 seconds) to complete the sold pieces counting task. To be detailed, VBA Macro countthing() usually takes:

- Approximately 4 seconds to click and run the tool
- 1 minute and 51 seconds to delete unnecessary data, such as text, notes, etc.
- Approximately 3 minutes 30 seconds to update results back into pieces table.

Stage 4: Using VBA Macro structurethings() in constructing the master database for A/MS&A/RS

Description:	**Countermeasure**	**Follow-up evaluation:**

Large time-consuming for structuring data to generate pivot tables for making monthly/ weekly sales report leads to the demand of constructing of a master database. The researcher starts to clean and structure the database from January to June 2020.	Structuring the master database with macro VBA structurethings().	- The database has structural data that could easy query needed data and support the company's employees in generating weekly and monthly report. - The demand of making a sales data entry tool which could direct entries to the master database is arisen. => countermeasure is accepted

Table 11 Do, Check, Act Stage 4's main points

The suggestions concerning the sales database management were discussed. The researcher suggested to transform the project with three main criteria:

- The project will be operated and managed by Google's tool.
- The project will have a structural and clean master database with all of the sales data within the year 2020
- The project will have a sales entry tool (forms) that can store data into a structural construction master database for sales data from July. The system will be named: A/MS&A/RS

Firstly, the master database needs to be retouched. Instead of keeping data as spread tables within monthly sheets, all of the data would be re-structured into prescribed order by utilizing the VBA Macro structurethings(). The detailed script of VBA Macro structurethings() can be found in Appendix 3.

Similar to macro countthings(), the VBA tool user can paste the data table from the Google Sheets file "Tulokset viikko ja kuukausitasolla" into the prescribed sheet. After running the macro structurethings(), the data will be converted into formatted data type and order and be pasted into the prescribed destination sheet. The order of data would be converted as below:

Column	Column A	Column B	Column C	Column D	Column E	Column F
Column Header	Date	Seller	Type	Value	Week number	Month
Column content	To record the date that seller made sales transaction	To record the name of seller who made sale transaction	To record product sales type of each sales transaction	To automatically calculate the value of each sales transaction	To automatically generate the week number of each sales transaction date	To automatically generate the month number of each sales transaction date
Formula	From VBA tool	From VBA tool	From VBA tool	=IF()	=WEEKNUM()	=CONCAT(MONTH(),CONCAT(".", YEAR())

Table 12 Preliminary order of formatted data in master database

DATE	SELLER	TYPE	VALUE	VK	MONTH
03-07-2020	Alli	200/6	40	27	7.2020
03-07-2020	Kaisa	100/6	20	27	7.2020
03-07-2020	Kaisa	300/6	60	27	7.2020
03-07-2020				27	7.2020
03-07-2020				27	7.2020
03-07-2020				27	7.2020
03-07-2020				27	7.2020
03-07-2020				27	7.2020
03-07-2020				27	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
06-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020
07-07-2020				28	7.2020

Figure 18 A view of A/MS&A/RS master database

It is acknowledged that the database became a vital resource that supports significantly further steps. Some of the steps that the master database supports such as querying needed data, making pivot tables for monthly and weekly reporting system, and syncing into the automated sales dashboard, which was made by using Google Data Studio in the later stage. After completing the construction of the master database, the researcher moved to another phase which was to make the sales entry tool (forms) that linked to the master database for A/MS&A/RS.

4.2.4.2. Do, Check, Act: Google App Script and Google Sheets Pivot tables

Stage 5: Using Google App Script to make the sales and note transaction entry tool for A/MS&A/RS:

Description:	**Countermeasure:**	**Follow-up evaluation:**
The researcher transfers all sales data of June 2020 into the new database. The researcher starts to make the sales transaction entry tool. The sales entry tool is launched and used for sales transaction from 1st of July.	Utilizing Google Sheets App Script to make Sales Transaction entry. The sales entry tool is connected to the master database.	- The tool automatically structures the data from the sales transaction entries to the master database - Generated pivot tables that query needed data for reports are automatically updated whenever there is any new entry for sales transaction => countermeasure is accepted

Table 13 Do, Check, Act Stage 5's main points

After the database was constructed, the demand for making a tool for sales data entry was prioritized. The tool needs to meet conditions:

- Easy to use and adapt to employee turnover situations.
- The training program for using them must be as simple as possible.
- The sales entry techniques through the tool are rule-based.

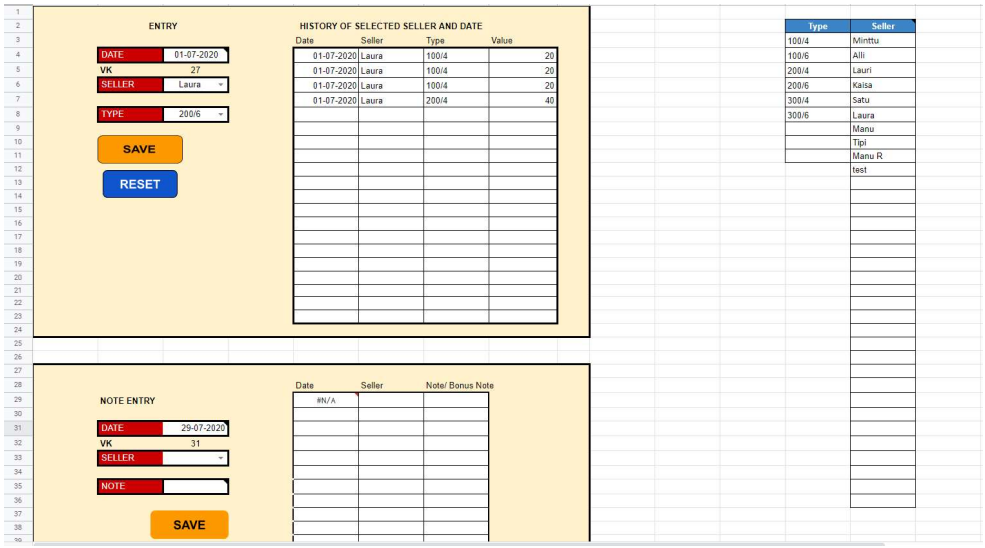


Figure 19 A view from the A/MS&A/RS 's sales and note transaction entry tool

It was decided that the entry through the tool would separate the note entry and sales transaction entry. There are two different entry forms made. In the first form, the sales transaction entries can be made, when in the second form, any note about personal notes, bonus notes, and working time notes can be noted.

Whenever the tool user clicks the command button, which is the “Save” button in the first form, there are some consequences:

- The sales transaction will be made as a single entry. It will be recorded and transferred to the master database
- The sales will be queried up and showed in the “History of selected seller and date”
- According to each chosen product type of the sales transaction, the tool will calculate the price of the product type automatically and add into column D of the master database
- According to the chosen date of the sale transaction, the tool will generate the week and the month of the chosen date automatically and add into column E and F of the master database
- According to the recorded product type, the tool will identify the product collection (4kk or 6kk) which is important to manage the commission issue.

The second form (Note Entry form) functions are similar, and all the entries will be saved into separate databases (Note database) but are still connected and within the tool.

The combo box Seller in the sales transaction entry form and the note entry form are generated as a drop-down list. The sellers' or agents' list is easy to manage as adding a new employee or deleting the departed employee. The actions can be done within column N of the sheet Form. With this function, the tool answers the demand for adapting the employee turnover situation. One notice here is that when the person's name is deleted, the database regarding the person's sales activities is still restored.

The tool with two separate entry forms was made based on the utilization of Google App Script which embedded code mostly into the command buttons: "Save" button and the "Reset" button in both forms. The detailed scripts for the functions in the Save button and Reset button of the Sales Transaction entry form and Note entry form can be found in Appendix 4. After the sales transaction entry and note entry tool is launched, the sales transactions from the 1st of July have been made through the tool.

	Total time consumption (in minute)	Working days in months	Average time consumption per day
April	540.6	22	24.6
May	300.33	21	15.25
June	121	22	5.5
July	28.9	23	1.25

Table 14 Time consumption on counting, calculating and updating sales of April, May and July

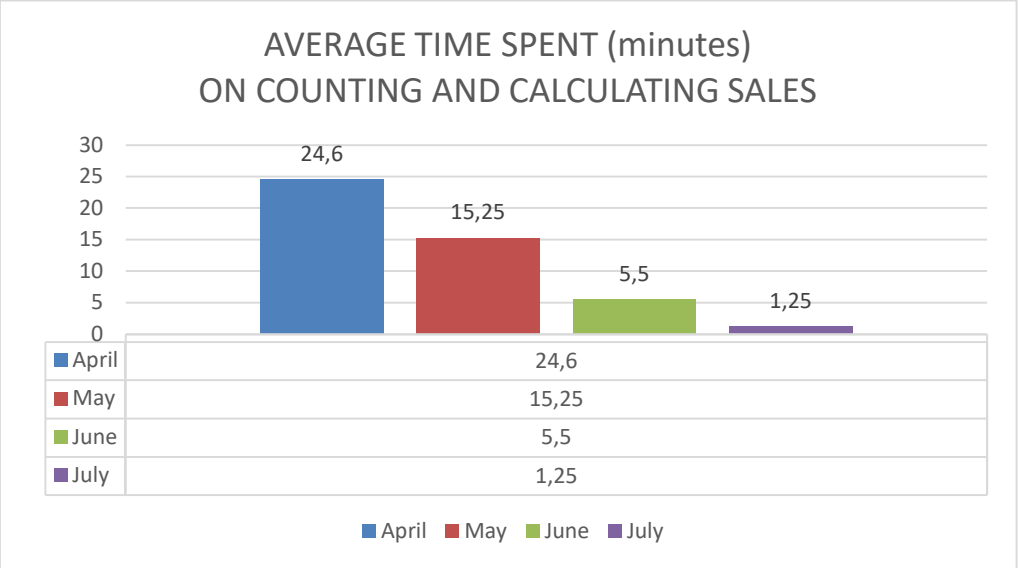


Figure 20 Average time spent of TULOKSET Project's daily task

On average, on every working day in July, with the daily task, CX could save average approximately 23.35 (improved 94.9%) minutes task in comparison with April 14 (improved 91.8%) minutes in comparison with May, 4.25 (improved 77%) minutes in comparison with June.

The entire pieces and accordant value are automatically counted and calculated by generating two simple Pivot tables: one for total sold product pieces, one for total sales value. The Pivot tables' layout in figure 21 shows the total sales monthly, similar to two result tables in figure 16 in the old system Google Sheets: "Tulokset viikko ja kuukausitasolla". The two tables are connected with the master database, refreshed and updated automatically whenever there is a new sales transaction made through the sales transaction entry tool in A/MS&A/RS.

PCS

COUNTA of TYPE		TYPE						
DATE - Year-Mo	SELLER	100/4	100/6	200/4	200/6	300/4	300/6	Grand Total
2020-Jan Total								
2020-Feb Total								
2020-Mar Total								
2020-Apr Total								
2020-May Total								
2020-Jun Total								
2020-Jul	Alli	10	8	11	13		2	44
	Kaisa	17	45	1	6		3	72
	Laura	31	5	18		5	2	61
	Lauri	18		5		3		26
	Manu	32	6	4	3	2	2	49
	Minttu	24	14	1			1	40
	Satu	5	33		12	1	10	61
	Tipi	6	10		22		1	39
2020-Jul Total		143	121	40	56	11	21	392
2020-Aug Total								
2020-Sep Total								
2020-Oct Total								
Grand Total								

VALUE

SUM of VALUE		TYPE						
DATE - Year-Mont	SELLER	100/4	100/6	200/4	200/6	300/4	300/6	Grand Total
2020-Jan Total								
2020-Feb Total								
2020-Mar Total								
2020-Apr Total								
2020-May Total								
2020-Jun Total								
2020-Jul	Alli	200	160	440	520		120	1440
	Kaisa	340	900	40	240		180	1700
	Laura	620	100	720		300	120	1860
	Lauri	360		200		180		740
	Manu	640	120	160	120	120	120	1280
	Minttu	480	280	40			60	860
	Satu	100	660		480	60	600	1900
	Tipi	120	200		880		60	1260
2020-Jul Total		2860	2420	1600	2240	660	1260	11040
2020-Aug Total								
2020-Sep Total								
2020-Oct Total								
Grand Total								

Figure 21 All months' total sales result tables in pieces and in Euros c

HISTORY OF SELECTED SELLER AND DATE

Date	Seller	Type	Value
31-08-2020	Minttu	200/6	40
31-08-2020			
31-08-2020			
31-08-2020			

In terms of a method for verifying the accuracy, the system has the query table, which usefully supports the process of verifying whether the entry for each seller on the specific sales day is accurate or not. Thus, the entry mistake could be proofed effortlessly and could be fixed as soon as it is noticed without harming other sellers' entries. As the result, the efficiency was improved in both timing and accuracy.

Figure 22 Query table for verifying accuracy

Since the improvement is resulted as significantly progressive, the process of working with the project on daily tasks could be standardized. In the following of July, CX continues using the new working method for TULOKSET Project's daily task for August and September.

4.2.4.3. Do, Check, Act: Google tools: Google Slides, Google Sheets and Google Data Studio in making monthly and weekly sales performance report for A/MS&A/RS

Stage 6: Monthly and weekly performance report:

Description: Substage 1	**Countermeasure:**	**Follow-up's evaluation**
There is not any standard or sample process for making monthly and weekly report. The reporting process is not consistent. Hence, there is a demand to make rule-based reporting templates.	Making semi-automated reporting templates with Google Sheets and Google Slides.	The reporting system by Google Sheets and Google Slides is semi-automation. There is still large time-consuming and unnecessary motion waste. It could be improved. =>countermeasure is adjusted

Table 15 Do, Check, Act Stage 6.1's main points

The time for structuring the data to generate necessary charts and pivot tables was improved significantly, thanks to a well-structured master database. However, there was the acknowledgment that CX did not have any reporting templates for weekly and monthly sales reports. Hence, there were unnecessary time consumption, and confusing for the Project Assistant to make reports. On the other hand, the lack of sample reporting processes or instruction may consume a large amount of time training new employees who would receive the task. It appeared the demands of making a standard process for monthly and weekly sales reports. It would be even more ideal if the reports could be generated automatically by itself.

The making of the report process standard was divided into two substages. Firstly, in substage 1, the researcher created "Tulokset Reporting templates," which was connected with the A/MS&A/RS tool. In the templates, there are step-by-step instructions and prescribed data tables. Each data table had its own relevant chart to describe the accordant reporting issue. The data table relates to the chart. Hence, whenever the data within data tables were changed, the charts will be simultaneous updated. By doing this, any task-

responsible employee can effortlessly collect the most crucial data by following the instruction and finalize the sales reports as a requirement. The time for generating charts can be reduced.

Description: substage 2:	**Countermeasure:**	**Follow-up's evaluation**
Strived to improve the automation of the reporting system by generating automated sales reports which could be synced to the master database, be refreshed and updated automatically	Generating automated sales dashboard with Google Data Studio.	The reporting system are matched with the desired goal: automatic and less time-consuming. The reporting system can be standardized. =>countermeasure is accepted

Table 16 Do, Check, Act Stage 6.2's main points

Secondly, in substage 2, the researcher utilized the advantages of Google's tool, Google Data Studio, to visualize the most essential sales data into dashboards that could represent the most highlighted moments of the sales performance. The dashboards are synced with the master database. Whenever there is a sales transaction entered, the automated sales dashboards are automatically updated simultaneously. The sales dashboards have filters option which allows the user to freely manipulate to observe or compare the sales performance with the chosen month(s), or all times as well. At the end of substage 2, CX could cut down labor, cost, and time to make sales reports every week or every month. The labor can focus on higher-skilled tasks or can be transferred to another responsibility or task that cannot be replaced, such as making creative content or marketing cold calls.

At the end of stage 7, the A/MS&A/RS has its final completed structure:

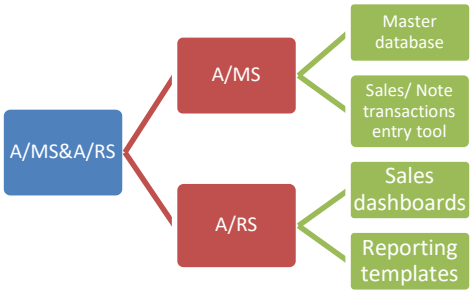


Figure 23 Final structure of A/MS&A/RS

4.3. Result Comparison

From July 2020 to September 2020, stage 7 of the TULOKSET Project transformation was happening parallelly with the process of making A/RS. The researcher desires to compare the performance of the new A/MS&A/RS with the old manual system in terms of timing aspect and quality of the results aspect. On 30th September 2020, the automated sales data management and reporting system has been in use for approximately three months. From the 1st of July until the 30th of September, there were 66 sales days which are represented for 66 samples of quantitative research. For three sales months, 1065 sales transactions and 151 note transactions are made through the sales transaction entry tool and are managed by the automated sales data management and reporting system. In terms of the database, in total from January 2020 until September 2020, there is 3157 sales transactions are constructed or made through the sales entry tool in the master database. After 30th September 2020, the final qualitative interviews were implemented as well. This section mainly summarized and analyzed the final qualitative interviews result.

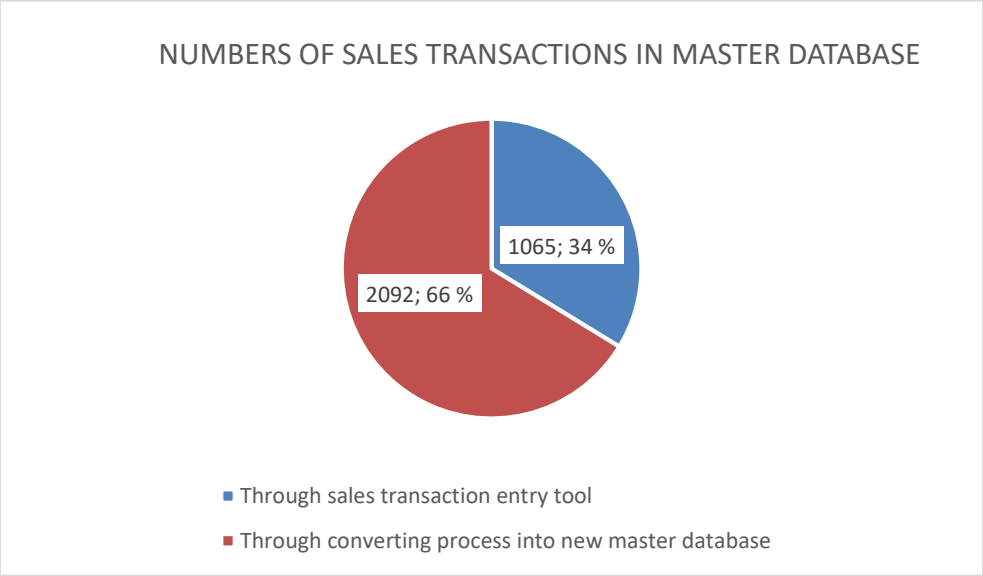


Figure 24 Allocation of sales transactions in master database

4.3.1. Timing aspect

Daily entry task:

The time consumption to complete daily tasks on each system was recorded on daily basis and separately. Under here is the comparison between two project implementation methods: using the automated sales data management system method and doing manual method. The data is extracted from the quantitative follow-up surveys on Google Sheets:

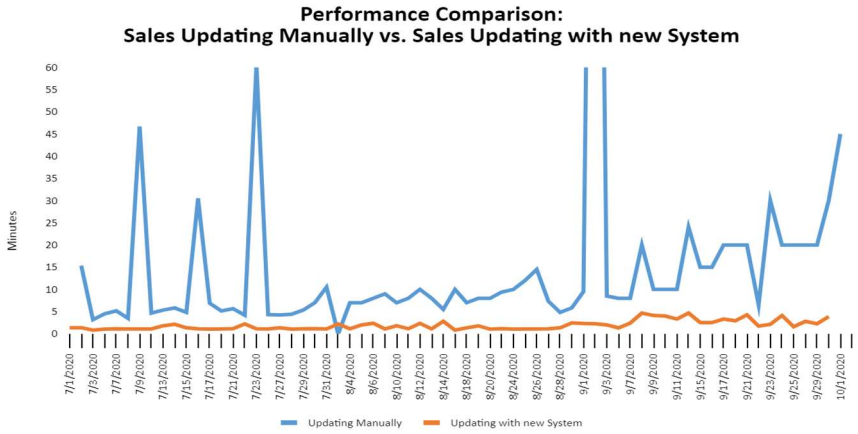


Figure 25 Timing aspect comparison

The time that was spent on counting manually and the time that was spent on counting with A/MS&A/RS were recorded separately. As a general impression, the time spent by counting manually significantly more fluctuates than the time spent by counting with the new system. For 3 months, the longest time spent by counting manually accounted up to 240 minutes and was on the 2nd of September. As the clarification from the Project Assistant trainee, "*the time was spent mostly for verifying the accuracy of the whole previous sales month (August). The purpose was to prepare data for the August sales report*." The shortest time spent on updating sales manually was 3.2 minutes on the 3rd of July. On the other hand, the time spent on the daily task with the A/MS&A/RS was more stable and always less than 5 minutes per day. To be specific, the longest time spent with the daily task was 4.67 minutes on the 8th of September and 14th of September. The shortest time was on 0.82 minutes on the 2nd of September. As the average, for three months (from July to September), with the manual method, it took an average of approximately 15.81 minutes for counting sold product pieces, calculating sales value, and updating sales results. On the other hand, it only took 1.92 minutes to complete all of the tasks on daily basis within the project by working with the A/MS&A/RS. The timing perspective was improved significantly, 87.9%. Ms. K. also claimed that *"Project Assistant are able to deliver accurate sales result on a fast pace."*

According to the quantitative follow-up sheets and qualitative interviews during the testing phase and after the system is launched, all two project support staffs claimed that "*the improvement of time spent on this task led to the more involvement in other projects*". They were able to "*finish more tasks per one working hour than before"*. To give three detailed examples for clarifications: the improvement of time spent on the task of updating daily would produce more results in other tasks in quantities. Firstly, with the task of collecting data for the database which is Ms. H.'s daily task from July. "*As average, one full data registration (one work unit) would account to approximately 4.5 minutes*." When the time spent on the task of updating sales for CA was reduced, H. was able to make more units for collecting data for the database task.

Stage / Task	BEFORE LAUNCHING THE NEW SYSTEM		AFTER LAUNCHING THE NEW SYSTEM	
	Minutes	Work units	Minutes	Work units
Updating sales for CA	15.81	1	1.92	1
Collecting database	44.19	9.82	58.08	12.9

Table 17 Number of produced work units per 1 hour - Task: Collecting database

Similarly, the second example is the task of making cold calls. Mr. T. has this task as one of his daily tasks from July. "*With every working hours, I was able to make approximately 7 to 8 phone calls. Thus, the approximately average time spent on each cold call (one unit) is 7.5 minutes*."

Stage / Task	BEFORE LAUNCHING THE NEW SYSTEM		AFTER LAUNCHING THE NEW SYSTEM	
	Minutes	Work units	Minutes	Work units
Updating sales for CA	11.57	1	1,92	1
Making cold call	44.19	5.89	58.08	7.74

Table 18 Number of produced work units per 1 hour - Task: Making cold calls

Thirdly, CX described one of the common tasks at CX is to support its customers in "*filling in inquiries forms and validate reCAPTCHA (human identification test) for marketing purpose. The task was reported to the customers as to complete the list of 100 forms, it took CX 3.5 hours. In average, it takes 2.1 minutes in completing one form (one work*

unit).” The customers were charged by CX according to the total work unit done and not by the hours. Thus, the more work units are done, the better CX can make a profit.

Stage / Task	BEFORE LAUNCHING THE NEW SYSTEM		AFTER LAUNCHING THE NEW SYSTEM	
	Minutes	Work units	Minutes	Work units
Updating sales for CA	11.57	1	1.92	1
Filling inquiries forms	44.19	21.04	58.08	27.65

Table 19 Number of produced work units per 1 hour - Task: Filling inquires forms

Until this point, the researcher can prove that thanks to the efficient A/MS&A&RS, resource efficiency, and labor productivity as the number of produced working units per worker has been increased.

Weekly task and Monthly task:

The weekly tasks and monthly tasks have been applicable since July. At the beginning of July, there was a demand for making Monthly Sales Report for June. From then, on every Monday of the week, there would be a weekly task as making the previous week’s sales report. Similarly, on every second day of the month, there would be a monthly task as making the previous month’s sales report. With the time spent on generating the weekly reports and monthly reports, there is even more exceptional improvement. The efficiency improvement on the weekly task and the monthly task is divided into three stages, which are before the A/RS system is made after the semi-automated reporting system is made, and after the A/RS is made.

Firstly, in July 2020, the project team included the researcher was participated in the team making the monthly report for the sales performance in June 2020. According to the working time reporting system, the team spent a total of 1.5 working days (approximately 12 hours) to complete and submit the June sales report to the project manager. The problem was identified as large time consumption on constructing and formatting the type of sales data for generating appropriate and appealing Pivot tables and charts, and manually calculating and analyzing commission situation for each seller by separating sales of 4kk and 6kk.

Secondly, after the database is constructed, for the July sales report, the time spent on formatting the database is totally deducted. The researcher first innovated the new rule-based reporting process by generated needed Pivot tables and created Report templates for monthly reports and weekly reports by Google Sheets and Google Slides. As result, the total time consumption was summed to approximately 1 hour for monthly reports and about 35 minutes for weekly reports. This system, however, is a semi-automated method since the task-responsible personnel still needed to hand-in for:

- Step 1: manually counting, calculating, and analyzing sellers' commission issue
- Step 2: extracting crucial numbers from specific Pivot tables as instruction
- Step 3: pasting into the prescribed cells in Google Sheets Report templates
- Step 4: making a copy of the new generated charts and tables
- Step 5: pasting into the Google Slides Reports templates

Thirdly, after the automated reporting system with Google Data Studio is made, the process of making the report is magnificently simplified. The commission issue has been generated automatically. The reports with Google Data Studio are synced with the master database. Hence, whenever there is a new sales transaction recorded, the reports will be automatically refreshed and updated. The task-responsible personnel only need to access the report by Google Data Studio for extracting the charts, and tables to put into the Google Slides Report templates. The process usually takes up to 5 minutes, rounded.

In conclusion, A/MS&A/RS has advanced the timing aspect of every task of the TULOKSET Project incredibly. The decrease in the total time spent on TULOKSET Project can be seen through the following line chart:

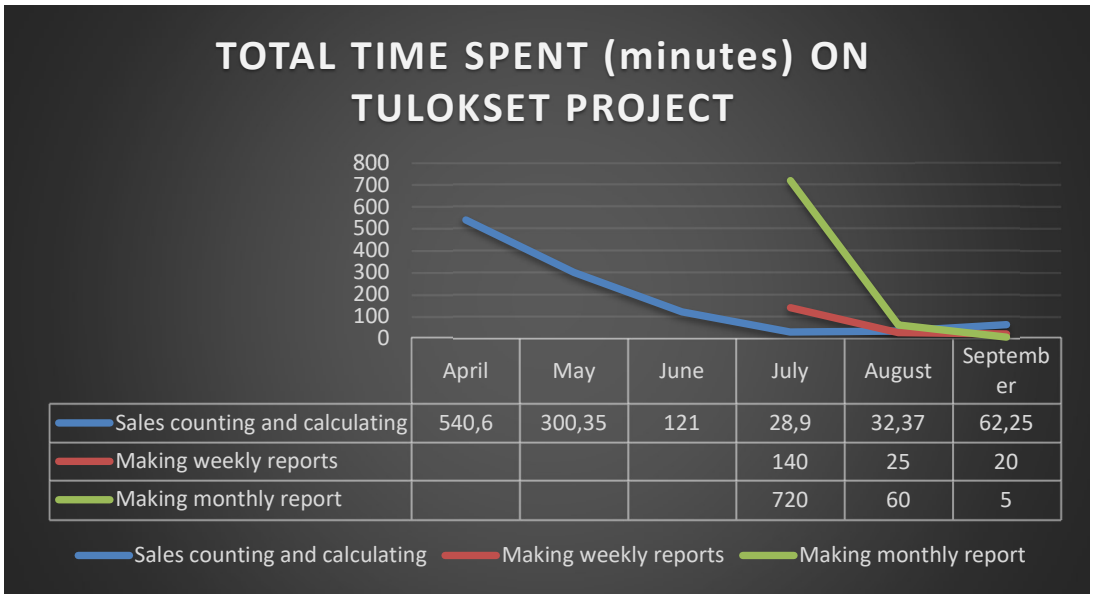


Figure 26 Total time spent on TULOKSET Project (in minutes)

4.3.2. **Quality of the result aspect**

In terms of quality, the system has participated significantly in ensuring the reported sales data are validated. According to after-A/MS&A/RS interviews' results, all interviewees agree that the system, especially the query tables has simplified the result accuracy verification process. Besides, the query table has made the mistake-proofing process more visible since the entry error could be track and fix it easily. As a positive result, unnecessary motions, such as to re-count, or to fix the sales data results are eliminated. When Mr. T. ran the daily counting task manually, there were several errors reported which were mistakes from counting. From July 2020 to September 2020, there were 66 working days. Among 66 working days, there were 14 days that errors from the manual counting method were reported. The mistakes affected strongly the final sales results. On the other hand, there was not any problem related to the accuracy of sales results which was confirmed by Ms. K. The quality aspect has been upgraded.

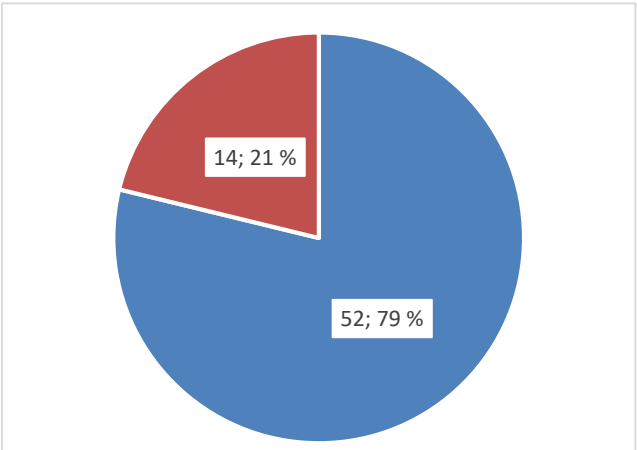


Figure 27 Amount of day with/without errors reported (Manual system)

5. CONCLUSION

5.1. Main findings

At the end of the thesis work, the researcher has created a preliminary transition from a manual working method to a more automatic working method by making the Automated Sales Data Management and Reporting system and contribute to the Lean transformation process of CX.

5.1.1. Identified problems are solved

Firstly, the set of identified problems that related to project working methods at the Plan Step have been solved completely.

- In the plan step, it was identified that "*the project's working method lacked rule-based system; and the visual of sales data were unorganized which can cause confusion*." After the A/MS are launched, the sales entry methods have become rule-based by recording sales transactions and through the entry forms. Besides, the master database has been constructed. Each sales data has been formatted into well-structured formats and be stored in the master database.
- It was said the project implementation and result delivery method were time-consuming and inconsistent between each responsible staff. After the A/MS&A/RS system is made, every task within the project became rule-based and automatic, the task implementation and delivery method have become consistent. The confusion in training techniques and systems for the new workers has been replaced with the simplified training system.
- Previously, with the manual sales data counting and updating method, the accuracy and validation of sales results were among the top priority problems that needed to be solved. During three months of working with A/MS, the accuracy of sales results is improved significantly.
- *"The error tracking and fixing were one of the most time-consuming implementing actions when working with the project*". The A/MS has the query table that helps the user easily tracks the entry errors and fix it as soon as the errors are identified. Especially, the action of fixing entry errors is specified and independent from other sellers' transaction entries and other sales days.

- There were several files and data transferring stages for making the weekly and monthly reports with the old manual system. Thus, security and data protection could be violated. In addition, the accuracy of the results throughout many transferring stages could be harmed. After the A/RS is made with Google Data Studio Sales Dashboard, the implementation of weekly tasks as generating weekly sales report and monthly task as making monthly sales report has been simplified.

5.1.2. The set of goals are achieved

Secondly, according to the interview after the use of A/MS&A/RS, the determined goals have been achieved mostly:

- **Satisfy CA**: CX has advanced its fast and accurate response rate in implementing and delivering the sales results to CA.
- **Cut down the workflow**: CX has successfully cut down the multi-stages workflow when they are working with the project. However, the new working process is not totally matched with the desired workflow in figure 15. The current process is:
    - The sellers submit the sales performance to the project assistant;
    - Project Assistant makes sales transactions for all sellers through the sales entry tool in A/MS;
    - The Project Manager supervises and monitors the sales situation through the A/MS;
    - To observe the sales situation, the Project Manager or Sales Manager just needs access to the A/RS as a sales dashboard by Google Data Studio herself. Project Assistant can make weekly and monthly reports by copying automatic generated charts and tables from A/RS into Google Slides Report templates and submit to the Project Manager if needed;
    - Project Manager reports the weekly sales and monthly sales to CA's Sales Managers
- **Reduce labor-/time consumption on the project to reduce cost**: The A/MS&A/RS has cut down total time spent on daily tasks, weekly tasks, and monthly tasks. Furthermore, it creates more working time per hour to produce more works in other tasks and projects
- **Make the task and project more accessible**: The A/MS&A/RS has a systematic manipulation technique. The most important technique in using the A/MS&A/RS

that needs to give out instructions is to make transaction entries. Other necessary techniques, such as to do the counting, to do calculating, to do updating Pivot tables, and to make reports are synced to the master database and be automatically refreshed and updated all the time.

5.1.3. The sources of wastes are reduced

Thirdly, in terms of effort for eliminating the source of wastes, by totally shifting to a new project working method with A/MS&A/RS, CX successfully discards the following wastes:

- **Defects**: Defects are erased or prevented thanks to fault detection tools i.e. data query table. The quality of sales data results and reports is enhanced. Some of the defects that have been solved, such as:
    - Miscounting
    - Miscalculating
    - Inaccurate and invalidated sales performance results and reports
- **Motion waste**: unnecessary motions, such as verifying counting mistakes, fixing mistakes, extracting crucial data for reporting, unnecessary files, and data downloading and transferring are eliminated with the final A/MS&A/RS. These motions are coming out from defects. By solving defects, the unnecessary motion wastes are simultaneously eliminated
- **Processing Waste**: several unnecessary working stages has been deducted, such as:
    - Project Assistant needs to carry out the sales data counting and calculating manually,
    - Sellers need to verify if their selling performance is counted and calculated accurately or not,
    - Project Assistant needs to make weekly reports every week or monthly report every month,
    - The Project Manager needs to report weekly sales and monthly sales frequently.
- **Waiting time**: Since the working process has been simplified, the large amount of waiting time between the working stages is reduced. Instead, waiting time is transformed into value-added actions for other tasks and projects. Some of the eliminated waiting time types, such as:

- Project Assistant waits for the sellers to verify their sales performance that was counted and calculated
- Project Manager waits for Project Assistant to count solved product pieces and calculate sales value for each seller on each day
- Project Manager waits for Project Assistant to make the weekly report and monthly report
- Whenever defects occur, every party waits for the Project Assistant to fix the counting and calculating mistakes

5.1.4. Lean principles are accomplished

Fourthly, to compare with Lean principles that were described in the theoretical part, by using A/MS&A/RS, CX is now following some Lean principles:

- **Simplification**: The A/MS&A/RS has simplified the complicated project's working process by cutting down unnecessary process wastes. The results by working with A/MS&A/RS are higher quality than working with a manual system. The working process of the TULOKSET Project with A/MS&A/RS has significantly less complicated input (process, time consumption, and labor), while still maintains the same output or even higher quality outputs.
- **Cleanliness and Organization**:
  - The master database is clean and well-structured. 5S methods have been applied to:
    - Seiri: Sort out data by types. Each type has its own format. Sales transactions and Note transactions are made by different entry tools and stored in different sections within the master database. There is not any combination between number and text in the new master database anymore.
    - Seition: Set up necessary Pivot tables within the A/MS, which can enhance the data-driven aspect.
    - Seiso: The query table participates significantly in explicit the problem from later transaction entries.
    - Seiketsu: The working process with A/MS&A/RS has become rule-based and have step-by-step for completion
    - Shitsuke: The Project Assistant has the responsibility to maintain the cleanliness and organization of the master database. Besides,

the Project Assistant is trained to derive needed system training to other project- or task- responsible staffs in the future.

  - The sales dashboard is divided into sections (i.e. monthly or weekly) and organized in a logical order from the general situation to detail an individual's sales performance.

- **Visibility**: There are effective visualizations in:
  - Project Workflow: Currently, all party that are involved in completing the project on daily basis, weekly basis, and monthly basis, understand their work duties and knows how to perform their duties in order to implement the project.
  - Reporting Issue: The layout of the weekly report and monthly report are well-visualized.
- **Measurement:**
  - Measurement tool in A/MS: in A/MS, the query table acts as a measurement tool to identify if the entries of the specific seller on a specific date are accurate or not
  - A/RS as a measurement tool: The sales dashboard becomes a competent measurement tool for the sales performance of CA in general and each seller in specific. Through the sales dashboard, the Project Manager and Sales Manager can monitor and evaluate if the sales performance is compelling or not. Besides, Project Manager, Sales Manager, and Sellers can also track their progress to understand, for example, their current commission-earned situation based on their performance.
- **Variation reduction**: Before, there were variable ways of working with the manual counting and the sales reports. On each time the results or a report were submitted to the Project Manager, there was a chance of having rejection or suggestion for changing methods. The A/MS&A/RS are institutionalized to become an official working process and method for the CA's TULOKSET Project, CX has avoided variability during the project implementation process.

5.1.5. PDCA cycle and Kaizen Continuous Improvement are effective models to improve flow efficiency, resources efficiency and labor productivity

Throughout the thesis working period, the method of Kaizen Continuous Improvement and PDCA cycle has been utilized as most as possible and is a main working tool for the

researcher. By applying the PDCA cycle, the researcher has a strong mindset of continuous improvement in evaluating output from each countermeasure and in re-thinking improvement plan for fails or can-be-improved countermeasures. Thanks to PDCA and Kaizen Continuous Improvement, large sources of wastes have been eliminated and amounts of Lean principles have been achieved by CX. These methods are proved as an effective tool for transforming the non-Lean process into a more-Lean approach.

As the most important result, the theoretical framework has been worked effectively in the empirical procedure to improve **flow efficiency** which leads to the advancement of **resources efficiency** and **labor productivity**. A/MS&A/RS allows the company to reduce the input resource such as timing and labor force, while ensures the amount of the output are exactly the same as before. The outputs mean sales being counted, calculated and updated every day with high accuracy, weekly sales reports, and monthly reports are delivered in fast-paced, on time, correctly and in well-visualization. Furthermore, A/MS&A/RS increases the effective usage of labor and time consumption. The saved input resource can be invested into producing more work units in other projects and tasks.

5.2. Validity and Reliability

Jorma Karanen mentioned that in order to have credible research and valid and high-quality research result, the creditability of raw material is important to be ensured. Hence, the quality of the quantitative results and qualitative results need to be examined carefully for validity and reliability. (Karanen, 2013, p. 177-178). During the thesis working period, qualitative and quantitative methodologies have been utilized parallelly. Each methodology would have a different method to examine validity and reliability.

With qualitative research, reliability and validity are defined by how consistency and how competency of the received data is. (Karanen, 2013, p.188-189). The reliability is high since the interviewees are senior staffs or direct users of the A/MS&A/RS. Reliability has been even strengthened more since the researcher was also a part of the project who carried the self-observation by experience working with the project manually. The validity of the research is high since the list of questions is inspired by the theories of PDCA cycles and the Kaizen Continuous Improvement approach. The right questions have been asked to support the problem identification, problems' root caused analysis within CX's project implementation methods in order to define the improvement goals.

In terms of quantitative research, reliability is examined by measuring the stability and the consistency of the quantitative approach, and validity is proved by how the theoretical framework is derived into an empirical framework. (Karanen, 2013, p.183-184). The quantitative research's main purpose is to compare the timing aspect and accuracy aspect of two different project's implementation methods: manual system and A/MS&A/RS system. The timing aspect and accuracy aspect has been tested frequently and stably every working day from July 2020 to September 2020, which are 66 working days. On each working day, the Project Assistant and the researcher recorded the time spent in detail and separately for each method. Accordingly, the reliability of quantitative results is high. In terms of validity, the researcher aims to prove the concept of validity is high. By applying the PDCA cycle and Kaizen continuous improvement in creating the A/MS&A/RS, there are significant improvements in terms of timing aspect and accuracy aspect. The PDCA cycle and Kaizen Continuous Improvement are proved as effective Lean tools for any business that wishes to eliminate wastes and accomplish the Lean principle. In conclusion, with quantitative research, reliability and validity are high.

5.3. Limitation

The thesis content, main finding, and implementation method is tailor-made for one project of company X (CX) only. The main point of this study would be only for answering the company's personal problem. Thus, it could not be applied to other case companies or to other tasks and projects within CX that do not have similar scopes of working purpose and methods.

Secondly, due to the study major of the researcher in International Business, which is mainly about general management study, the researcher could not fully perform needed programming and coding techniques for the automated sales data management and reporting system, but could only mainly give suggestions, construct the master database from the given tools, build up automated reporting templates, and conduct the efficiency and productivity comparison between the old and the new system. The researcher had to seek for supports and advices from external parties as well as taking necessary courses for VBA and App Script coding and programming skills.

5.4. Recommendation

One of the top recommendations to CX is to maintain Lean thinking. CX should be aware that they have the responsibility to maintain the loop of the continuous improvement cycle. The A/MS&A/RS could be assessed as effective for the current moment and situation of CX; however, according to Lean thinking, it is not the final destination of the efficiency and productivity improvement process. The evaluation for the system and the project's implementation method should be re-made period by period for enhancement. As well, every project- and task-responsible personnel should always be highly conscious of striving to make the project's implementation method better and more efficient every day.

The transformation of the project's implementation method resulted positively as total time consumption was improved, the results' quality was enhanced, and the labor/ total cost was reduced. CX could standardize the implementation methods and creates similar A/MS&A/RS for other similar projects. Automation can contribute to the business in terms of improving flow efficiency, productivity as produces more work units per one working hour and definitely also profitability. The success comes from A/MS&A/RS should become the motivation for CX to seriously invest more in automated transformation and digitization of other working processes. The company can seek for hiring a digitalization and automation specialist who can support them in digitizing working processes in other tasks or projects.

As for suggestions for further research, CX can strive to create an accessible training system for the sales agents (sellers). By doing that, the sellers should be able to make sales transaction entries by themselves. By doing that, the working process could be simplified down one more stage and the accuracy of sales results can be even better enhanced. When the data goes under the transferring process from one party to another, the accuracy could be harmed due to some circumstances, such as typos, for instance. The sales data is in the most accurate and reliable status when it could be entered directly from the people who have made the sales.

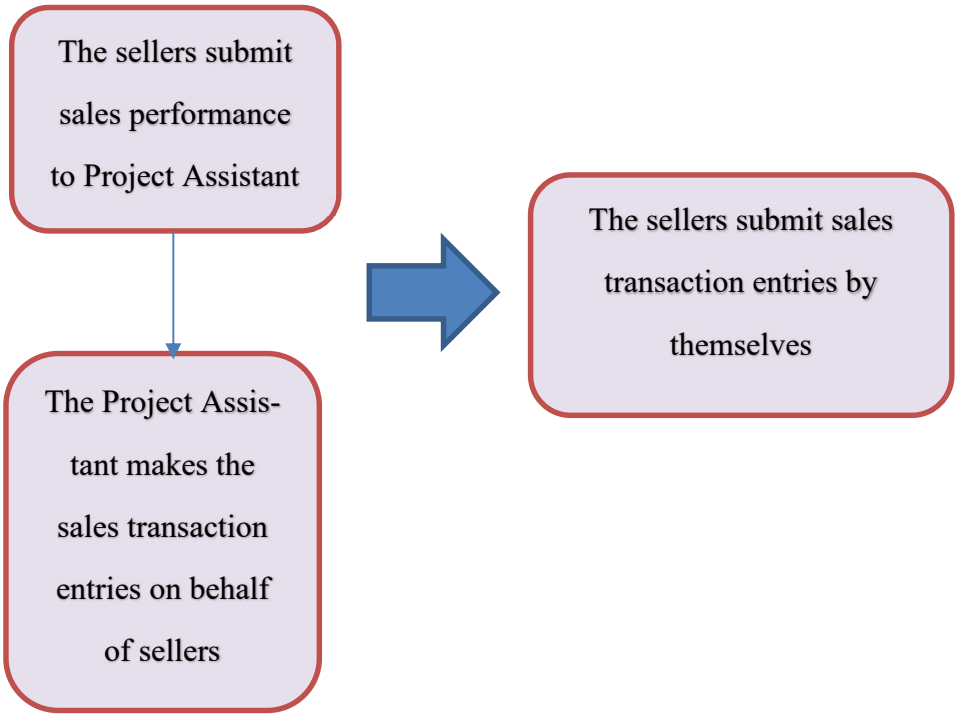


Figure 28 Suggestion for simplifying sales transaction entry task

The manipulation of large amounts of sales data could be tricky sometimes, especially with high peak sales days. Since the Project Assistant still has obstacles sometimes in identifying the entries errors, there should be an even more effective and more automatic method to mistake-proofing and error detection for the sales transaction entries.

Besides suggestions for the project's implementation method, there are several suggestions for the managerial and cultural aspects of CX's and CA's business operations. If both CX and CA desire to reach the highest point of efficiency in this sales project, there should be consistency in managing sales performance in every office of CA. CA should invest in the more centralized and office-crossed Automated Sales Data Management and Reporting System. To maintain the consistency of this project implementation method, both CA and CX should have an appropriate and more effective plan to reduce the employees' turnover. Last but not least, the international aspect should be promoted more by using the same language in both communication and working system. As mentioned, one of the problems with the TULOKSET Project is language. The primary communication language between CX and CA are Finnish. This means the sales data system and the reports for monthly sales and weekly sales are in Finnish. On the other hand, CX's project assistants are mostly of international nationalities and are lacking Finnish skills. Language becomes a barrier and factor that can affect labor productivity.

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Appendix 1: Qualitative questionnaires

Part 1: Before A/MS&A/RS:

Section 1: General questions:

Question 1: Can you give introduction about CX company? (Background)

Question 2: Can you describe the relationship between CA and CX and what specific project that CX oversees giving support to CA? background

Section 2: Questions for the Plan stage:

Question 3: Describe the process of counting and calculating monthly sales? Can you describe more about the sellers commission monitor method?

Question 4: What are obstacles that you were facing with when you implement the projects and its tasks?

Question 4.1: Why would CA employ CX for only one office? (Root-cause analysis)

Question 4.2: Why would it take large time spent on the tasks within the project? (Root-cause analysis)

Question 4.3: Why would it need the several people involved in the task implementation, management and reporting? (Root-cause analysis)

Question 4.4: Why there are frequently have problem with quality of the result? (Root-cause analysis)

Question 4.5: Why would not CA or CX have a more effective management system? (ERP, SAP) (Root-cause analysis)

Question 5: What are suggestions and demands that you would want to include in the new sales management and reporting system?

Question 6: How can CX satisfy CA by its performance in your opinion?

Part 2: After A/MS&A/RS:

Question 1: What do you think in general about the A/MS&A/RS and its master database?

Question 2: What are challenges that you are facing with when you implement the TULOKSET Project with A/MS&A/RS?

Question 3: How did A/MS&A/RS improve the timing aspect of daily task, weekly task and monthly task? How did A/MS&A/RS improve your work performance productivity with other tasks in specific?

Question 4: How did A/MS&A/RS improve the accuracy and quality of the sales data results (daily task, weekly task and monthly task)?

Question 5: In comparison with old manual system, what are significant improvements of A/MS&A/RS?

Question 6: What are obstacles that you are facing with when you implement the TULOKSET Project with A/MS&A/RS?

Question 7: What are obstacles that you are facing when you strive to derive instruction for using A/MS&A/RS to other staff? (Ms. H. is responsible to train Mr. T. in using A/MS&A/RS)

Question 8: In your opinion, what could still be improved in A/MS&A/RS?

Question 9: Do you think A/MS&A/RS can be a motivation which can encourage CX in transitioning of other tasks and projects to become more automation?

Appendix 2: Quantitative Follow-up Sheets

For daily task: Sales transaction entry

Part 1: Daily task: Sales transaction entry. For user of A/MS&A/RS:

Date	User's name	Duration	Error occurred (x if error)	Other responsible tasks/projects:	Duration	Completed work unit (s) for other tasks/projects:

Part 2: Daily task: Sales data counting, calculating and updating task. For user of the old manual system:

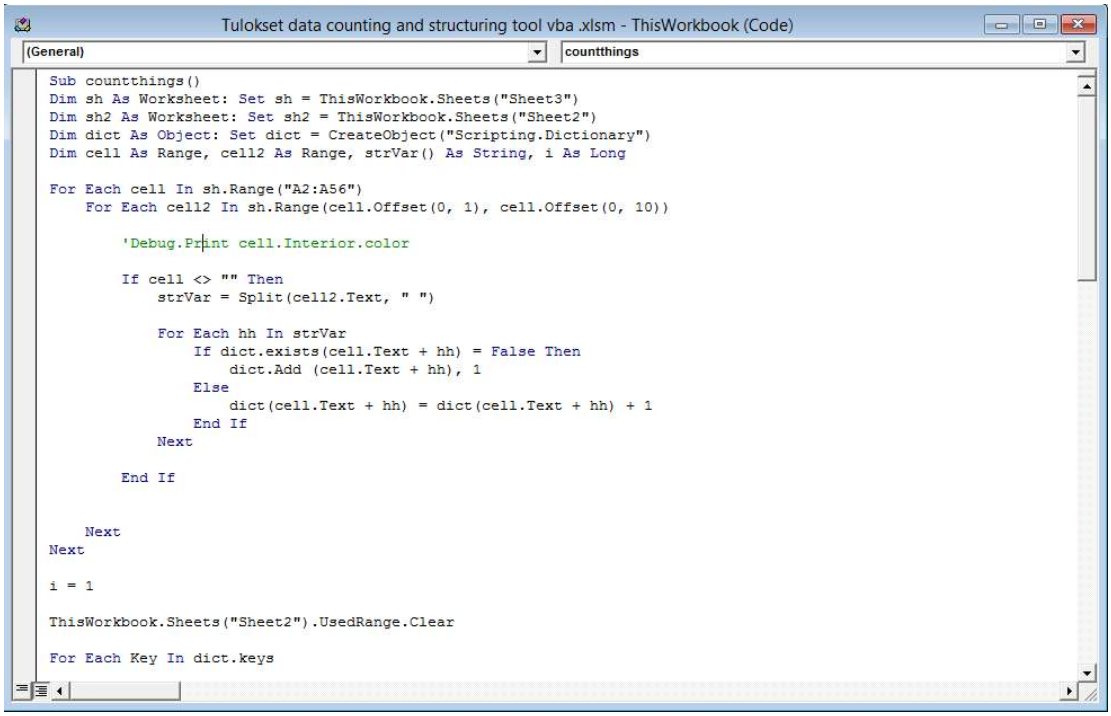
Date	User's name	Duration	Error occurred (x if error)	Other responsible tasks/projects:	Duration	Completed work unit (s) for other tasks/projects:

Part 3: Weekly task and Monthly task with A/MS&A/RS:

Date	Name	Choose the task:		Duration
		Weekly report	Monthly report	

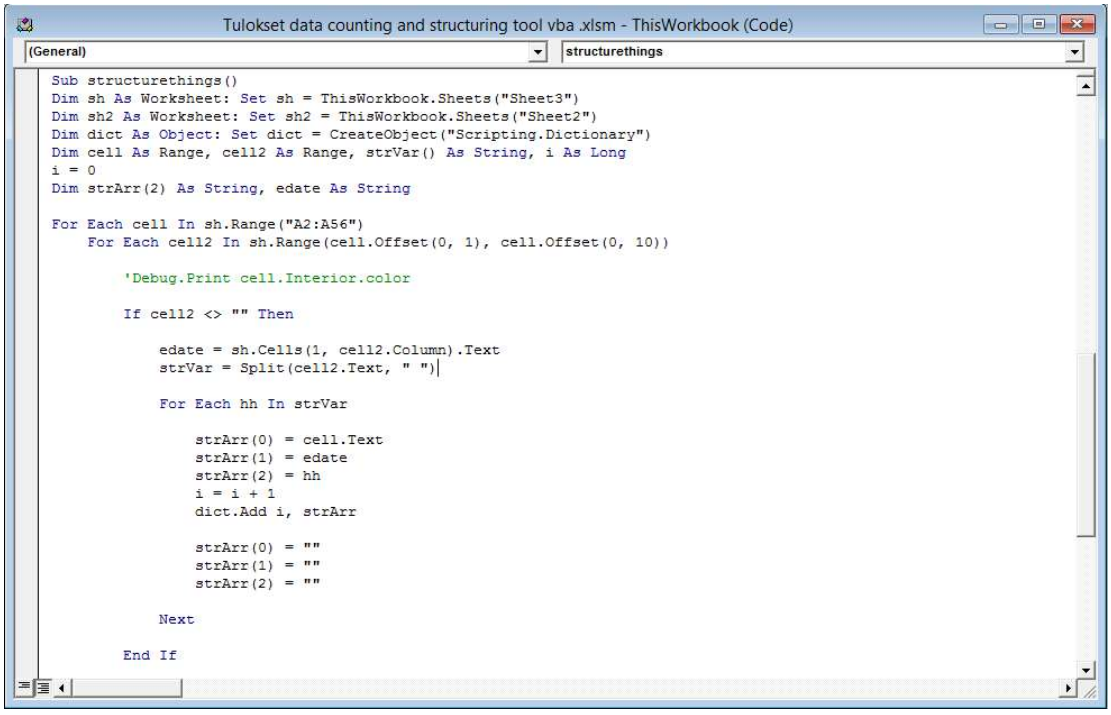
Appendix 3: Excel VBA Scripts

Part 1: Excel VBA macro countthings():




```
Sub countthings()
Dim sh As Worksheet: Set sh = ThisWorkbook.Sheets("Sheet3")
Dim sh2 As Worksheet: Set sh2 = ThisWorkbook.Sheets("Sheet2")
Dim dict As Object: Set dict = CreateObject("Scripting.Dictionary")
Dim cell As Range, cell2 As Range, strVar() As String, i As Long

For Each cell In sh.Range("A2:A56")
    For Each cell2 In sh.Range(cell.Offset(0, 1), cell.Offset(0, 10))

        'Debug.Print cell.Interior.color

        If cell <> "" Then
            strVar = Split(cell2.Text, " ")

            For Each hh In strVar
                If dict.exists(cell.Text + hh) = False Then
                    dict.Add (cell.Text + hh), 1
                Else
                    dict(cell.Text + hh) = dict(cell.Text + hh) + 1
                End If
            Next

        End If


    Next
Next

i = 1

ThisWorkbook.Sheets("Sheet2").UsedRange.Clear

For Each Key In dict.keys
```

Part 2: Excel VBA macro structurethings():




```
Sub structurethings()
Dim sh As Worksheet: Set sh = ThisWorkbook.Sheets("Sheet3")
Dim sh2 As Worksheet: Set sh2 = ThisWorkbook.Sheets("Sheet2")
Dim dict As Object: Set dict = CreateObject("Scripting.Dictionary")
Dim cell As Range, cell2 As Range, strVar() As String, i As Long
i = 0
Dim strArr(2) As String, edate As String

For Each cell In sh.Range("A2:A56")
    For Each cell2 In sh.Range(cell.Offset(0, 1), cell.Offset(0, 10))

        'Debug.Print cell.Interior.color

        If cell2 <> "" Then

            edate = sh.Cells(1, cell2.Column).Text
            strVar = Split(cell2.Text, " ")

            For Each hh In strVar

                strArr(0) = cell.Text
                strArr(1) = edate
                strArr(2) = hh
                i = i + 1
                dict.Add i, strArr

                strArr(0) = ""
                strArr(1) = ""
                strArr(2) = ""

            Next

        End If
```

Appendix 4: Google App Script for different entry tool

Part 1: Google App Script for Sales Transaction entry tool:

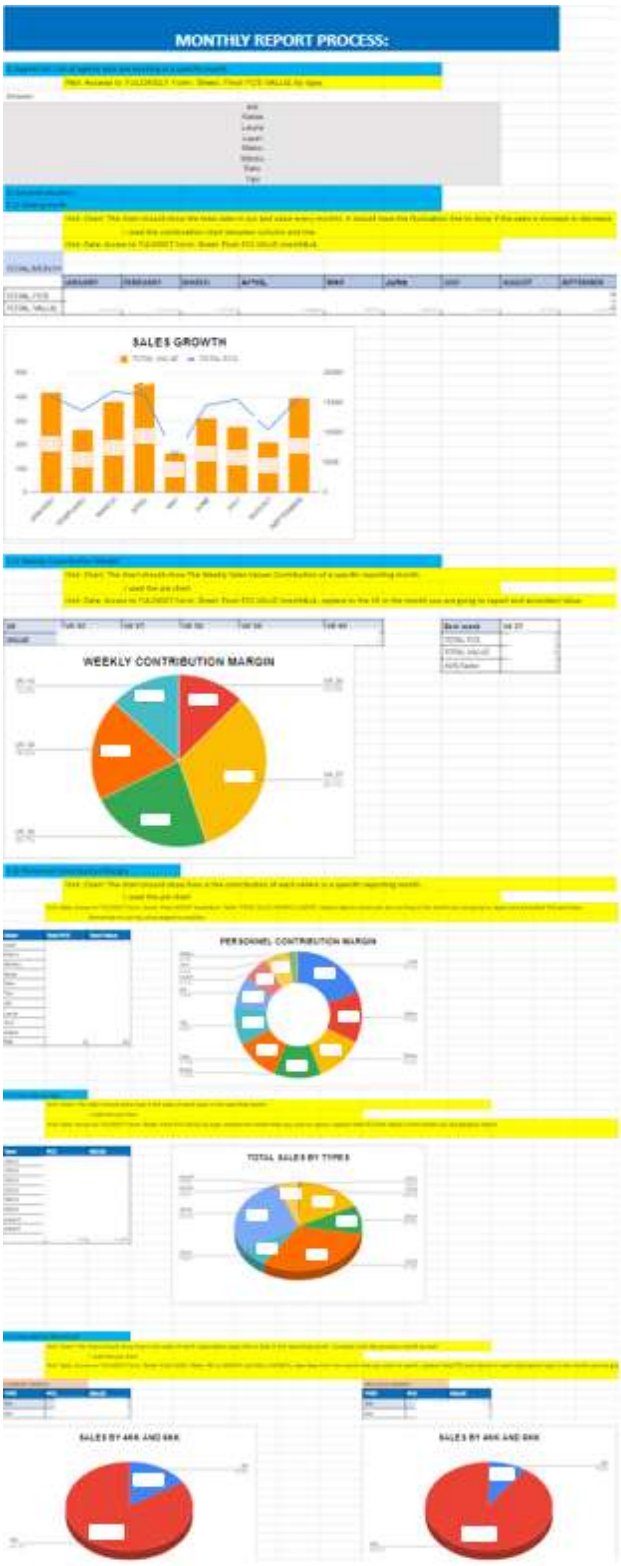
Code.gs

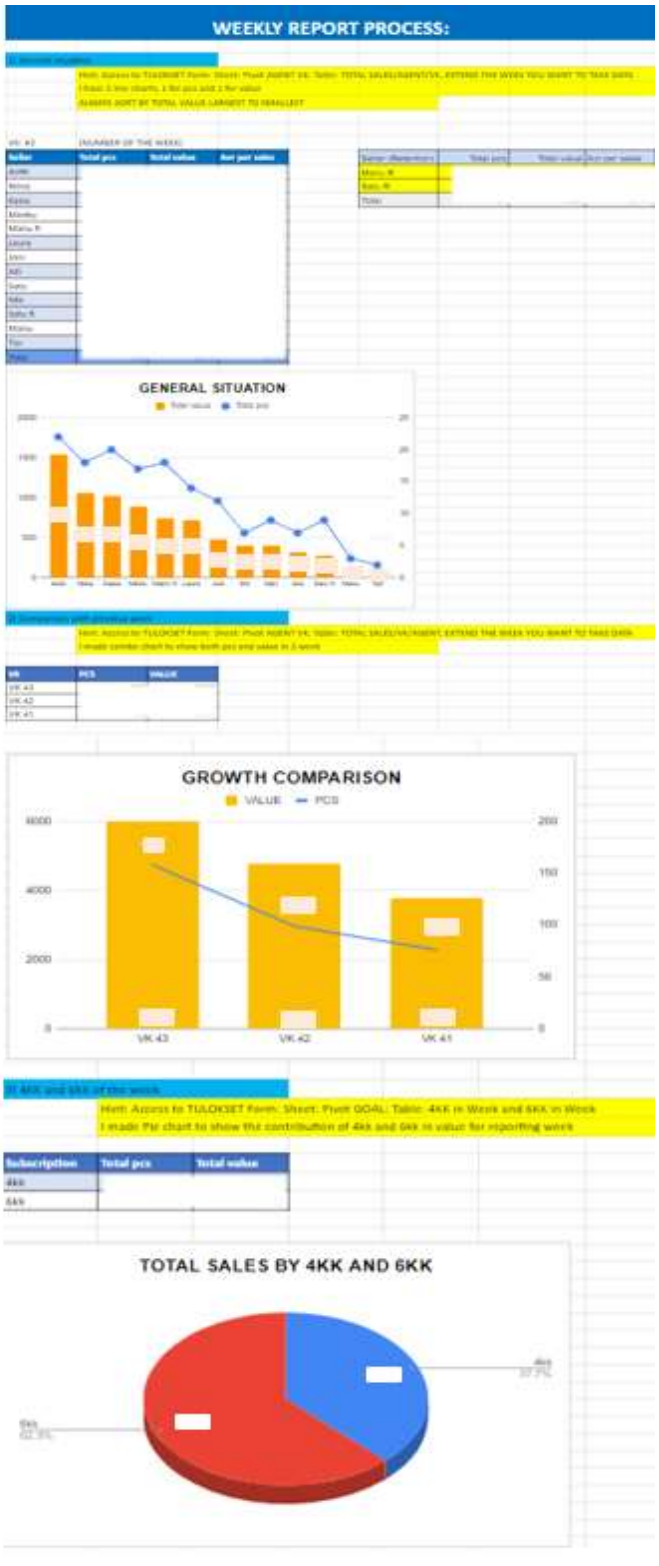
```
Date.prototype.getWeek = function() {
    var onejan = new Date(this.getFullYear(),0,1);
    return Math.ceil((((this - onejan) / 86400000) + onejan.getDay()+1)/7);
}


function submitData() {
  var ss        = SpreadsheetApp.getActiveSpreadsheet();
  var formSS    = ss.getSheetByName("Form"); //Form Sheet
  var datasheet = ss.getSheetByName("Data"); //Data Sheet

  //Input Values

  var price = 0
  var date = formSS.getRange("C4").getValue()
  var vk = date.getWeek ()



  if(formSS.getRange("C8").getValue() == '100/4') {price = 20;}
  else if(formSS.getRange("C8").getValue() == "100/6") {price = 20;}
  else if(formSS.getRange("C8").getValue() == "200/4") {price = 40;}
  else if(formSS.getRange("C8").getValue() == "200/6") {price = 40;}
  else if(formSS.getRange("C8").getValue() == "300/4") {price = 60;}
  else if(formSS.getRange("C8").getValue() == "300/6") {price = 60;}

  var values = [[date,
                 formSS.getRange("C6").getValue(),
                 formSS.getRange("C8").getValue(),
                 price,
                 vk]];

  datasheet.getRange(datasheet.getLastRow()+1, 1, 1, 5).setValues(values);
}
function ClearCellsData() {
  var sheet = SpreadsheetApp.getActive().getSheetByName('Form');
  sheet.getRange('C6:C8').clearContent();

}
```

Part 2: Google App Script for Note entry tool:

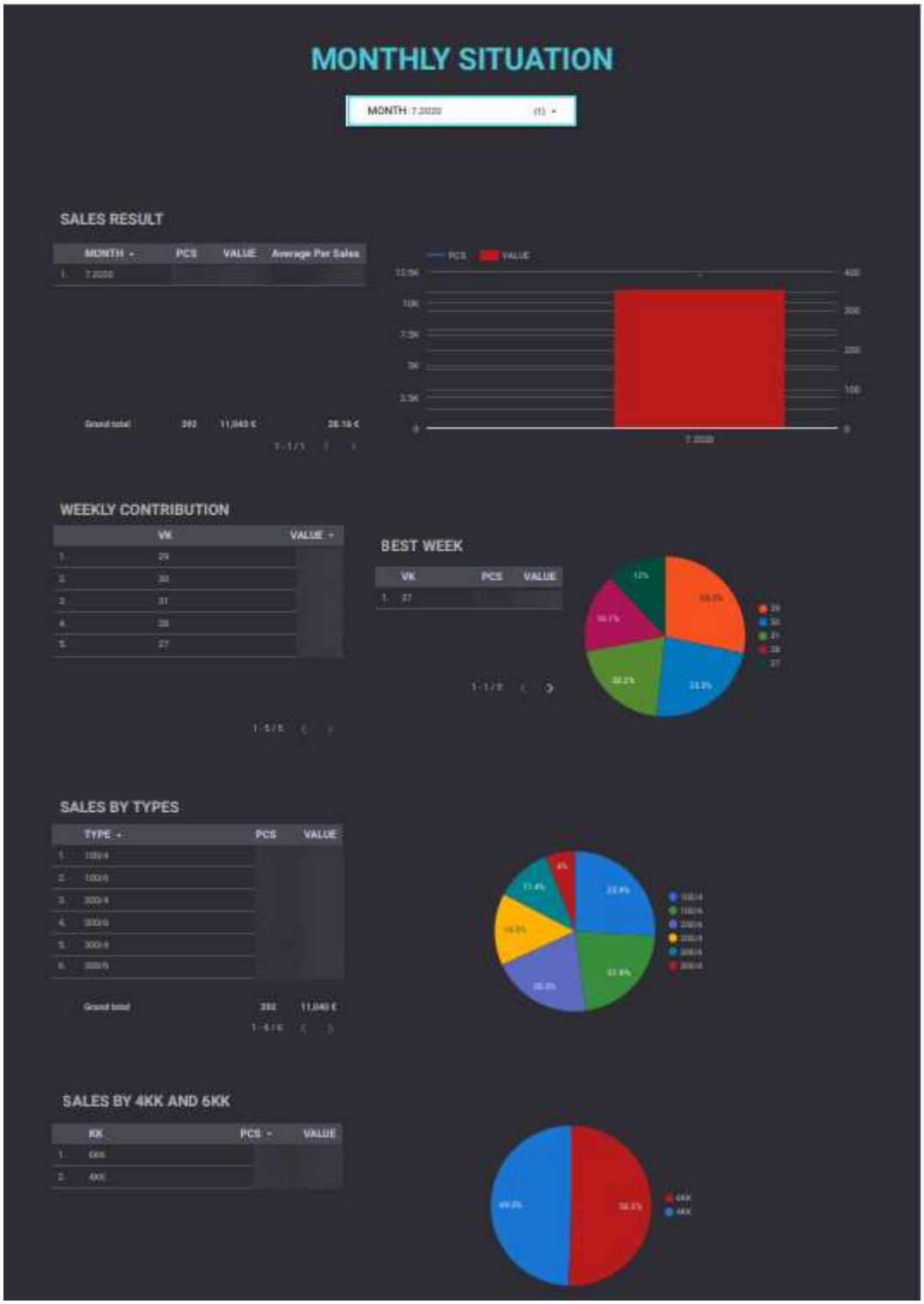
```


function submitNote() {

  var ss        = SpreadsheetApp.getActiveSpreadsheet();
  var formSS    = ss.getSheetByName("Form"); //Form Sheet
  var datasheet = ss.getSheetByName("Note"); //Note Sheet

  //Input Values

  var date = formSS.getRange("C31").getValue()
  var vk = date.getWeek ()

  var values = [[formSS.getRange("C31").getValue(),
                 formSS.getRange("C33").getValue(),
                 formSS.getRange("C35").getValue(),
                 vk]];

  datasheet.getRange(datasheet.getLastRow()+1, 1, 1, 4).setValues(values);

}

function ClearCellsNote() {
  var sheet = SpreadsheetApp.getActive().getSheetByName('Form');
  sheet.getRange('C33:C35').clearContent();

}


```

Appendix 5: Semi-Automation monthly report template by Google Sheets





Appendix 6: Automated Sales Dashboard



INDIVIDUAL SALES PERFORMANCE

VK

Month: Exclude October (-1)

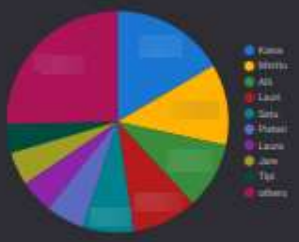
PCS

TOTAL VALUE

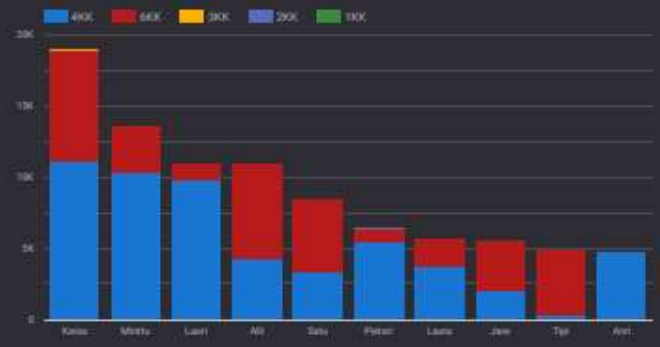
TOTAL SALES PER AGENT

	SELLER	PCS	VALUE	Average Per Sal...
1.	Kasia			
2.	Mirella			
3.	Ali			
4.	Lauri			
5.	Satu			
6.	Petteri			
7.	Laura			
	Grand total			

1 - 27 / 27



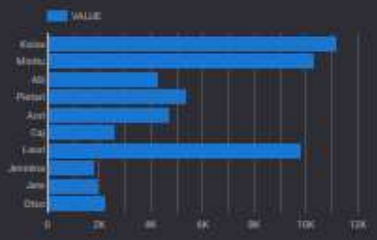
AGENTS PERFORMANCE BY SUBSCRIPTIONS



4KK

	SELLER	PCS	VALUE
1.	Kasia		
2.	Mirella		
3.	Lauri		
4.	Petteri		
5.	Anni		
6.	Ali		
7.	Laura		
	Grand total		

1 - 25 / 25



6KK

	SELLER	PCS	VALUE
1.	Kasia		
2.	Ali		
3.	Satu		
4.	Tipi		
5.	Jane		
6.	Mirella		
7.	Mario R		
	Grand total		

1 - 20 / 20