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Improving Service Process Flow Chart

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Preface

Service business has been the center of my life professionally as well as in my free time. When I started work as a service manager in the case company it was great to notice that the development ideas for the service business were taken seriously, and colleagues globally were supportive of my task.

Due to the high workload in the case company, it was not possible to concentrate on the development ideas enough, which is the main reason why I enrolled to the master's program, in industrial management. With the great support of my supervisor, we decided that this development task for the service process is too important to not to act with the attention it deserves. Therefore, we agreed that the project will be done under the master's program. The contribution from all colleagues across the organization was splendid, and it was amazing to see how easy it was to arrange interviews and workshops.

During the thesis project, I learned a lot about the operations inside the case company, which is a valuable lesson. Also, time management skills were in high use during the thesis process, due to the tight schedule and challenges in other work areas. The main engine to keep the schedule was the support and feedback from fellow students and lecturers. Their feedback during the thesis feedback process was guiding the work in the right direction and keeping it in motion. Especially I would like to thank my thesis instructor Thomas Rohweder, who made the right corrections and gave ideas if I was stuck. Final and the greatest enabler for the completion of this thesis is my family and relatives. Here I want to compliment my children, who had the courtesy to sleep their day naps and go to bed early enough for me to be able to write the work, while they slept. I would also like to thank my spouse and grandparents for looking after the kids and the family dog, if I was about to miss a deadline. Final thanks belong to our family dog, who forced me to take breaks from my writing and get outside to have new angles to the thesis work.

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Abstract

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The business challenge for the case company was lost service business and revenue related to it. Which was caused by a too complex and slow service process. To improve the situation of the case company, an improved service process flow chart needed to be created. The improved service process flow chart was created by first defining the objective and outcome of the thesis, after which research and data plan were created. The thesis then continued to current state analysis (CSA) stage, where the current practices of the case company were studied. In the CSA section a stakeholder on each process phase was interviewed, and it revealed several strengths and weaknesses, of which three main weaknesses were chosen to be the focus of the improvement. These were the complexity of the current service process, unclear roles and responsibilities. To solve these issues a conceptual framework (CF) was produced using academic literature as source material. The CF is based on lean philosophy, which is utilized to solve the three main weaknesses, with value stream mapping, RACI charting, and continuous improvement. Value stream mapping was used to recognize the activities in the original service process that add value to the customer. Then the rest of the original process activities were categorized either as waste or necessary waste. Based on this outcome, the service process flow map was rebuilt and simplified, to have the minimum number of actions, that create value, or are necessary waste. The RACI chart was created based on the newly created service process flow chart. The purpose of the RACI chart is to define in more detail what is expected to happen by the stakeholders in each process face. Since the time frame of this thesis does not allow for a full-scale pilot, also a continuous improvement plan was created, to prevent bottlenecks from forming in the process, when the new process would be implemented. The final improvement for the service process flow chart was a definition of how the information flow through the process should be handled. The improvement in information flow was made by creating simple rules that should be followed when communicating within the company and with clients. In addition to the communication rules, a continuous improvement plan was created, to improve the flow of information once the new process has been established in full scale. With the improved service process flow the case company can achieve faster reaction times to service enquiries with less resources.

Keywords: Service, Process, Improvement, Lean, Simplification

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1 Introduction

Service covers a large portion of the revenue in modern industrial business. The service business can include in example spare parts, extended warranties, Inspections, consulting preventive maintenance, corrective and total maintenance programs, equipment retrofits and modernization.

Service business is usually fast phased by nature, and clients want to have their spare parts or service work as soon as possible. Because of this the service process needs to be lean and work well. The fastest quote might win the service deal, even if it would not be the most affordable if the client receives the quote rapidly. After the quote has been sent hastily to the client also the service or the part should be arranged for the client with the same rigor.

With a clear and efficient service process flow, one can get a competitive advantage, by quoting before competitors, and by providing better quality quotes right after the first contact. Efficient process, that is above the industry average, makes it possible to serve a larger number of clients and to create more revenue than competitors.

1.1 Business Context of the Case Company

The case company is a leading cleantech company that designs and delivers connection and electrification solutions. The focus of the company is to enable the decarbonization of ports and industrial applications worldwide. Case company has more than 40 years of experience, our systems ensure safe, efficient and sustainable operations for a wide variety of customers and applications.

The case company operates through 18 locations, 11 services and sales centers, five Centers of Excellence, innovation center and headquarters the

total amount of staff in the case company is 640 persons. The services business unit was established in 2018 and employs 85 service experts and operates in over 80 countries, supporting installation base of 24 000 products. Services provide stable revenue for the company through long-term service level agreements (SLA), the chance to gather information for product development, and new sales opportunities. This is why the service business is considered as a major contributor in the case company.

1.2 Business Challenge, Objective and Outcome

The services organization doesn't have a clear process to handle orders from first contact up to the last point where invoicing of the client happens. Service requests arrive through multiple channels, which include customer contact (e-mail, phone call) warranty claims, scheduled service visits (SLA), spare part sales, and warranty product upgrades. The Services organization is working globally across country and continent borders. Any country with sales center can do a service sale. The Field Service Engineer (FSE) can be dispatched from any service center with a suitable skill set, and availability. Without a clear service process the organization wastes time and money, from quoting to invoicing.

Now the process to handle warranty claims differs from the process of handling sold service labor, which differs from the process of handling spare parts orders. All these example processes might have different process flow depending on the country and business unit where the sales have been carried out, which service center executes the order, and which product is in question. The lack of common service process flow for all services related sales articles causes major issues in new service sales, organizing the service schedule on multiple sites and making sure the client receives a quality report in the promised time frame. A service process flow chart, that describes the service process from all current input points, names responsible persons to carry out tasks during the process, until the process is completed with invoice either to

client or internally in the case company is needed to improve the operations of the services organization.

The thesis's objective is to create an improved service process flow chart, and its outcome is the improved service process flow chart.

1.3 Scope and Outline of Thesis Report

This thesis focuses on the services process flow of the electrical, hydraulic, and mechanical field service business, and spare parts sales. Software related services without FSE on site are excluded from the scope of this thesis, because of the different nature of the software business when comparing to physical presence on site.

This study contains six sections. The first section introduces the topic of the study. The introduction is followed by Section 2, where the research approach and data collection are presented. Section 3 is about the current state analysis (CSA) and summarises the findings of the CSA. In section 4 a literature review is conducted after the CSA, to produce a strong background for section 5. In Section 5, the results from section 3 and 4 are used to produce the initial service process flow chart. The service process flow chart will be piloted in section 6, and the process flow chart will be finalized based on the feedback given by the stakeholders.

2 Project Plan

The second chapter of this thesis explains how the thesis has been built, by describing the project plan. The project plan is divided into three sections, research approach, research design, and data plan. The Research approach subchapter explains the reasoning behind the chosen research methodology. In the research design chapter, a visualization of how the study has been conducted is presented. It also explains how data was collected and how data collection rounds were carried out, and why the chosen data is important for the study. The section finishes by an explanation of how the collected data was analyzed and what methods were used to do it.

2.1 Research approach

While a scientific study is carried out the research can be conducted as basic/Fundamental/pure research or applied research. Basic research is used for theoretical and academic studies carried out in “traditional” universities, with a small focus on the practical application of the subject. Applied research on the other hand focuses on the practical side of research, focusing on immediate problems in real life operations (Kananen, 2013). The research for this thesis is carried out in a short time window of some five months. Due to this time limitation traditional action research, with multiple iterations cannot be applied. Parts of the action research philosophy can be used, such as dealing with organizational issues and working with the stakeholders who are directly involved with the problem at hand. Due to the practical and operational nature of this thesis, and the time limitations for the whole project, this research is carried out as applied action research (Kananen, 2013). This research method draws from action research combining it with faster data collection methods and removing the iterations.

2.2 Research Design

This research is carried out in four stages, including three data collection points. The outcome of each stage supports the data collection for the next stage. The Stages of the thesis are current state analysis (CSA), literature review, initial proposal (IP), and proposal validation (PV). Data 1 provides information to carry out the first stage (CSA), The literature review draws from academic studies on service process flows in a similar industry and data 2 and the outcomes of the previous stages support the stage 3 (IP). The Outcome of stage 3 is then used together with data 3 as input to the final stage. The research design structure can be seen in the illustration below.

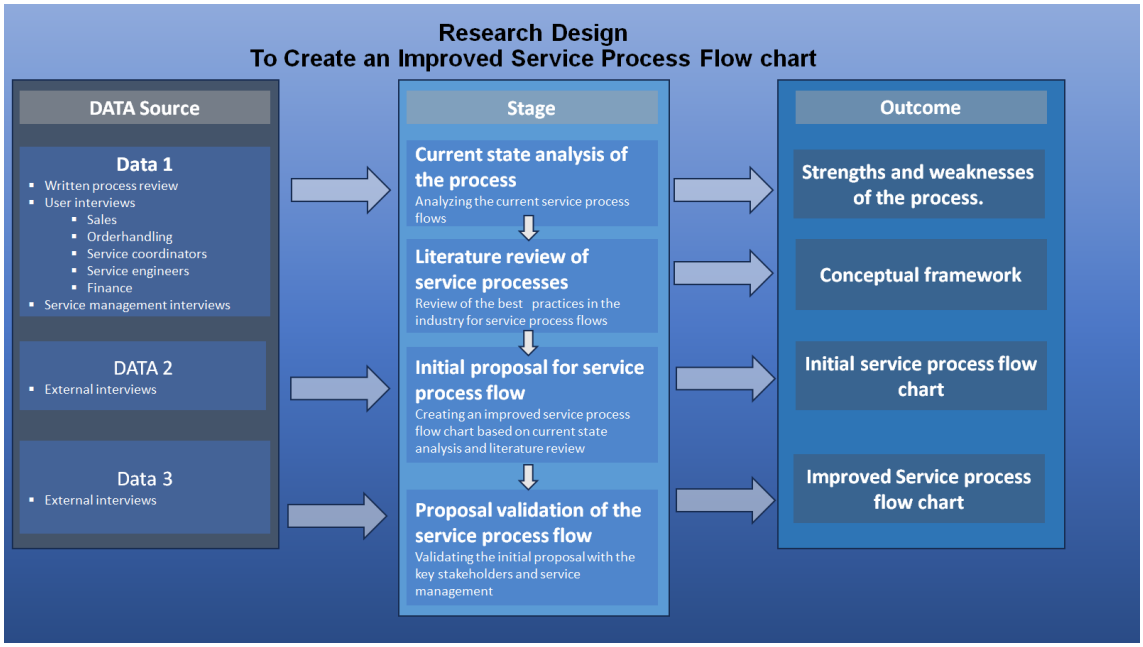


Figure 1: Research Design to Create an Improved Service Process Flow Chart

The objective of this thesis is to improve the current service process flow. To make valid improvements to the current process, the original state of the process needs to be known. As seen in figure 1, Data 1 informs the current state analysis. The Data 1 data set is gathered mainly by interviewing the stakeholders in the current service process. Some data is also drawn from written documentation of the current service process. The interviews ser central

to this data set, because the written documentation is not commonly in use, and largely not suitable for the current workflow. Data 1 is then used in the first stage of the thesis, where a current state analysis of the service process flow is done. The outcome of stage 1 is a process flow chart of the current operations together with pros and cons of the current process.

The second stage in the research design is literature review. This stage consists of researching relevant literature on service process flows in a similar industry to that of the case company. The outcome of the literature review is a conceptual framework, which is then used together with the CSA findings to feed stage 3, together with the data 2 data set.

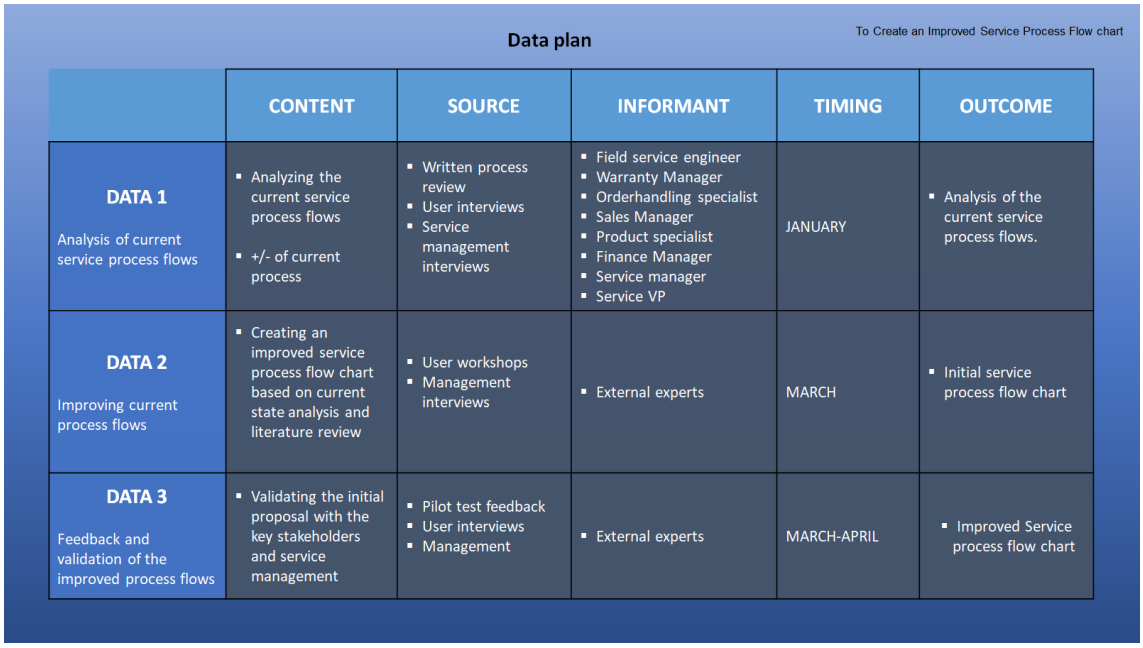
Stage 3 draws from the previous stages as mentioned before. Data 2 is gathered mainly through small workshops, with stakeholders from functions working together. Based on the data gathered, and the conceptual framework the initial service process flow chart is co-created.

The initial service process flow chart is piloted in a local organization of the case company. Feedback is gathered from the end users as well as the management. Data 3 collected at this stage is then used to finalize, the improved service process flow chart.

2.3 Data plan

The four stages of the thesis are supported by three sets of data. The Data plan for the research describes what the data sets are including how and from where the data was collected, and who were the informants on each data set. It also sets the timetable for the data collection at each stage, as well as states the outcome of the data set for the research stage linked to it. Table 1 presents the data collection plan in detail.

Table 1:Data plan for improving service process flow chart.



As can be seen in table 1, Data 1 was collected with two ways. The base data was collected from an existing process description and process flow maps. There was, however, a reason to suspect the validity of this data. To confirm the validity of the current process documentation, all stakeholders of the service process were interviewed.

Data 2 was gathered by arranging workshops for the key stakeholders. In the workshops Data 3 was gathered, by user interviews, management interviews, and user feedback based on the pilot test. The User interviews provide a subjective view of the improved service process flow and tell if the improved process is better to use. The Management interviews point out if the targets that the management wants from the process have been achieved. Feedback from the pilot test was gathered through an anonymous questionnaire, to prevent any social distortion of the results. After the thesis project, more detailed data will also be collected to gain objective process times, and process accuracy on invoiced work carried out.

2.4 Data Analysis

Thematic content analysis was used to understand the collected data. The process map, that was created during the CSA process, was used to place weaknesses which the informants revealed during the interview process, into the process flow chart. The strengths and weaknesses of the current service process were categorized and placed under fixed themes. The found strengths and weaknesses were then placed in order of importance, and key weaknesses were chosen to be the focus of the thesis.

When multiple stakeholders discussed the problems of the existing process design and compared it to the conceptual framework. A discussion between the stakeholders of the service process was deemed to be the most efficient way to bring best practices for the case company to the same table. At this stage, also the role of management became more apparent. The voice of the management directed the work done in the workshops, and management interviews therefore took place before the stakeholder workshops. The management interviews were carried out mainly online and recorded for documentation purposes. The workshops were carried out in two stages, first the local group gathered, and white board together with post it notes were used to draw and modify the conceptual framework. The result of this was then digitalized and another set of workshops were arranged online. The global service organization was able to participate in these workshops, on a digital whiteboard.

The data collection for the thesis was conducted with the scientific principles in mind, and the original data inputs can be found from the appendix of the thesis. In the next chapter the analysis of the data 1 is conducted, as the chapter concentrates in the current state analysis of the service process flow.

3 Current Analysis of the Service Process Flow

The third chapter of this thesis goes through the current state analysis (CSA) investigation of the service process flow in the case company. The first subchapter describes an overview of the current service process, and how the process is used in different parts of the company. Headings under this first subchapter concentrate on separate service flow streams, which are warranty service, single service visit, service level agreement (SLA) service, SLA maintenance, and spare parts sales together with service. Section 3 finishes by explaining how the CSA have been conducted and what the strengths and weaknesses of the current service process are.

3.1 Overview of this data stage

The current state analysis (CSA) was conducted for the service process in the case company. The service organization is built around three service centres, and the focus of the current state analysis is on the service process of the Finnish service centre. The other two service centres (Italy, and Norway) are also included in the analysis, but more superficially.

The analysis was conducted mostly based on interviews, and there is an individual interview for each function of the service process. The total amount of interview roles is ten, and the total amount of informants is fifteen. In addition to the interviews, a legacy documentation is used to understand the status of the service process. The CSA is conducted to be able to have a thorough understanding of the current state of the service process, which is needed for improving the process. The local functions of the service process were interviewed face to face, whilst using a Teams meeting to record sound and screen for note taking. External and shared resources were interviewed only through Teams. The structure of the interviews was built to match the organisational structure, and the written description of the existing process. The process was started with an interview with the first stakeholder in the existing

process, and then the next and the next. Each interview built the process map of the existing process, and in the end the whole process was mapped with inputs from each person involved. The interview process was built on three steps, first the subject and the methodology of the thesis was introduced to the informant. Second the current process map was presented to the informant, based on the inputs of the previous informants and the written description of the process. Once the process was introduced, changes and missing parts of the process were added to the process map together with commentary. The third and last step of the interviews, included filling a questionnaire. The Number of questions was limited to 6, to keep the comparison between the informants manageable. The questions were as follows:

1. What is your role in the service process?
2. What is good about the current process?
3. What is bad about the current process?
4. What is the largest bottle neck on the current process?
5. What is the second largest bottle neck?
6. What is the third largest bottle neck?

The interviews can be divided into four categories which are, service, sales, Center of Excellence (CoE), and support functions. In the service category, there were four informants. To have a full picture of the current service process, the following stakeholders were interviewed:

Service

Service manager (EMEA)

Service manager (Nordics)

Service team lead (Finland)

Service technician (Finland)

Sales

Area sales Manager (Ports)

Key account manager (Industry)

Inside Sales (Nordics)

CoE

Service product engineer (Mooring)

Service product engineer (Connectors)

Warranty manager

Support functions.

Order handling specialist.

Senior GL accountant (Finance Manager)

VP Deal fulfilment

With the above stakeholder interviews the whole service process was covered from customer contact to invoicing the customer. Then the strengths and weaknesses can be studied from the current process map, to be improved. The documented interview notes can be found in the Appendices of this thesis.

From the existing written documentation, a process map for single service visits was found, as well as spare parts sale, but there was no written documentation about the process for SLA related work or warranty work. The SLA and warranty work currently cover 90 % of the workload for the service organization of the case company. While building the process map of the current process flow, it became evident that the written documentation was not used for the

single service sales, due to organizational changes, which made it impossible to follow the written process. Spare parts sale was able to follow the written process, but the process was noted to be inefficient and slow. Also, the interviews revealed that half of the spare parts sales include service work to install the required part. For this kind of combination, the process is missing. Figure 2 presents the written legacy process flow chart which has been in use for a short period in all service centers.

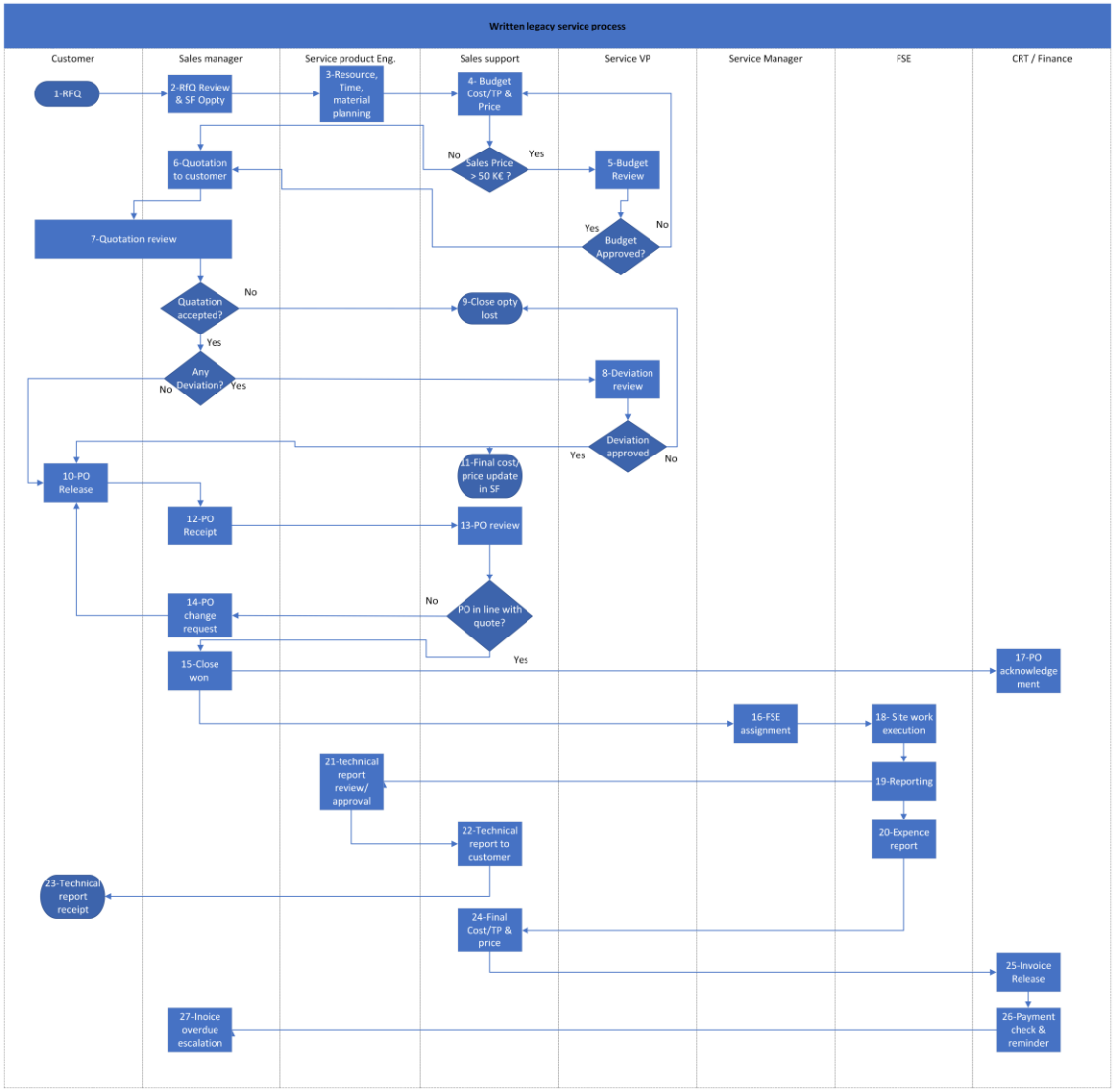


Figure 2: Legacy process flow chart.

As shown in figure 2 the service process is straight forward and relatively simple, or even simplified. Worth noting here is not what we can see in the written legacy process, but rather what is missing from it. This process works as long as the starting point is the customer's request for quotation, and the request is simple maintenance without special part requirements. The major weakness of this process is that it does not fit in with the current company organization. Some roles in the chart do not exist anymore and some roles have been added. Together with new roles in the organization some of the old roles have changed, to have different responsibilities. Due to this the process has evolved in each service location, to match the available resources.

The service division of the case company operates in a multinational organization, where many of the resources are shared between countries. In Europe there are three different service centers. The one in Italy oversees middle Europe and southern Europe. This service center is in the same building as the factory and is most heavily supported. The second largest service center is in Norway. The Norwegian center operates in the Nordics and Baltics, and remotely manages the third center which is in Finland. The Finnish service team is concentrating on the service work in Sweden, Finland, and Estonia, while the Norwegian organization manages mostly Norway and Denmark.

Each of these three service centers has a slightly separate way of working on the service process. The differences originate from the written service documentation and process map. This written process was forced at an extremely fast pace to all service centers, but due to poor process design and changes in the organization soon after the launch, the written process was never in operational use. The different shared resources in each location have affected the direction of the current service process in each location. Because the processes vary between the locations, and some resources are still shared, friction between service centers is created. Unique ways of doing the same thing can lead to misunderstandings between service centers, which can in the worst case halt the whole service process.

In addition to the service centers, all global sales centers can sell services in the European area, or loan service resources to execute service tasks globally. Without a common service process, this creates surprises and slows down the entire process. Sales centers which operate without their “own” service department are especially prone for mistakes in the services sales and estimations on duration, and making sure the parts are correct and in the correct place.

3.2 Description of current service processes

The current state analysis is based on written documentation and interviews with the service process stakeholders. The process has ten distinct functions, client, center of excellence (CoE), sales, inside sales, global services product management, service management, project management, field services, sales order specialist (SoS), and Finance. The process map in figure 3 illustrates the service process flow. The process map was created during the CSA process, and describes how these functions are linked to each other, and on a superficial level how the function operates in relation to the service process flow. These ten functions are managing the following five different service streams: Service level agreement (SLA) maintenance, SLA repairs, single service visits, Warranty repairs, and spare parts sale together with service. The complete service process is illustrated in figure 3 below.

Figure 3: Current state of complete service process flow chart.

As can be seen in figure 3, the overall view of the service process is extremely complicated and forms several loops in the middle of the process. The areas marked in red are the most common bottlenecks in the process. This means that the function is either done improperly, not efficiently, not as a routine, or in the wrong place and two of these bottlenecks are repeated in several parts of the current process. The first bottleneck is the confirmation of the site situation on site from the end customer, and the second is the spare parts availability.

Confirming the actual site situation from the end user at the site is the most crucial step in the process. If this is not conducted properly, none of the other parts of the process can really succeed. This is because the actual site situation dictates what parts are needed together with what skills are needed and how long the job would take. Due to its importance this step appears several times in the process map. Also, several distinct functions are doing it. The red color often in the case of confirming the actual site situation from the end customer means that it is not done routinely, or it is only partly conducted. As an example, when sales gets a request for quotations (RfQ) they often talk to people who work in the management and office environment of the client company. There have been cases where the client company is doing a poor job in root cause analysis, because of lack of skilled workers in their own organization, which causes them to order incorrect spares to fix their problem. It is possible that nobody at any point is in touch with the end user, to find out what is the actual issue on site. The difficulty in our organization is to contact the end user. Often our products are operated around the clock, and firsthand information about the issue can be difficult to attain, if there has been shift change between the time of the incident and the time when the intervention to the site is planned. The quality of the information from the end user is something that needs to be reviewed in the service process. When the sales team does this review, they often are missing the technical knowledge to determine how plausible the customer hypotheses is, which can then result in selling incorrect parts, which leads to selling incorrect labor. In the process, the contact just to confirm the actual status is also mentioned several times, and it is part of several different

confirmation loops. If the current process would not be cemented and made sure each phase is conducted in a timely manner, the end customer would get several phone calls in a short time period from different people, to talk about the same subject. From the customer point of view this would be seen as an inefficient and non-professional process. A strategic decision should be made here, to determine whose responsibility this is. If done in the initial stages of the process, the amount of unnecessary work can be minimized later in the process. But this would mean a new loop in the process or technical training for the sales personnel. If the site situation is mapped too early in the service process, it can cause problems when things are changing between the initial mapping and the actual site visit.

Spare part availability is the second most problematic area in the process. As said by one of the interviewed service product engineers (SPE).

“90 % of the work carried out is done together with sold spare parts.”

When looking at the service history this can be seen as a truthful statement. Site surveys and initial inspections are the only service work types which are conducted without parts. Often also these visits lead to parts being needed on site to fix the issue at hand, but it will happen on a separate visit.

The spare part issue can be divided in two subcategories: Spare part availability, and spare part “quality.” The term spare part availability is self-explanatory, but the spare part “quality” needs to be opened. The quality of a spare part in this context, does not mean the physical workmanship and how well the part is made type of quality, but rather how the spare part is fit for purpose, how it is shipped and where, are there enough spare parts of the correct type, and can the spare be used on site as intended.

Spare part availability is mostly a problem due to long and unknown lead times. When a client faces a problem on site the client wants their operational assets

to be fixed as soon as possible. Due to the complexity of electronic product data management systems in the engineering department, sales and service departments have difficulties finding part numbers. This increases the time between RfQ and sending the initial quote to the client, which can be weeks in the case company. When the client is expecting some days for the issue to be fixed, they start to look for services elsewhere when the time to give them the quote is weeks plus the actual lead time of the parts. The lead time for the parts is also longer than what the client expects. There is only minimal spares stock at the case company premises, and that is in middle Europe. Due to the coordination the time to get the part from the warehouse to the site is usually about a week. Since the critical spares warehouse at the factory contains only the most critical parts, the average delivery time for parts from the RfQ to site is several months. The client often does not accept this, and they go for third parties to get the parts faster. Or the local service team purchases the parts locally.

When the parts are purchased locally, the account of the case company is used. The cost of the purchased part comes to the finance system of the case company some months or so after the purchase has been conducted. These local purchases are difficult for the process for two reasons. The time it takes for the invoice to arrive at the office is longer than the time it takes for the report to be finished. The Report is sent to the client after it is ready from the approval reviews and is not tied to the invoicing. This creates a situation where the client has a working unit and the report has been delivered, but the invoice is still pending. This could lead to a situation where the client is not willing to pay, since they have what they want (report and operating product), and there is no leverage to get the payment from the client.

The late arrival of the invoices is also creating extra work for service management and the finance department when the invoiced expenses need to be processed separately. The other problem with locally purchased parts and services is the missing reference to case company invoicing system. In the case

company Salesforce is used to create opportunity numbers for things that are to be sold, and case numbers for warranty work. The finance system that is in use only recognizes opportunities that are closed as won, and the customer has sent a PO. When urgent service is conducted on site, the opportunity/case is usually created after or during the completion of the job, which means that all the parts and supplies that are bought for the job, cannot have the opportunity number as a reference on the invoice. In the current process service management adds the opportunity number manually as a comment to the invoice. The finance department then needs to manually add this information to the ERP system to make it possible to forward the invoice to the client. As mentioned earlier, this is problematic due to the timing of the invoicing.

Invoices that are not transferred to any party will be paid by the case company's local sales office. With larger warranty expenses, the revenue of the sales office can be cut by a large margin due to this practice.

The client's point of view of the service process is not transparent. Due to the complexity of the process and multiple different contact points for the client, a false set of expectations can be created for the client. In the process sales has only a loose connection to the service, when repairs, maintenance and commissioning are sold to the clients. The promises made can then be hard or impossible to fulfill, which seems like bad service quality from the client perspective. Not meeting client expectations then leads to difficulties in future sales, and increased mental load when work is conducted on site.

Due to the complexity of electronic product data management systems in the engineering department, the sales and service departments have difficulties finding part numbers, which would be known to fit the client's product. The revision handling of drawings is not correctly managed. This leads to a situation where the product specific drawings are not found, and if the drawings are found, it is not possible to verify if the parts in the drawings are correct. In the service process this increases cost, when service resources are sent to the

sites with parts, only to notify that the part does not fit the unit on site. Often in these cases the correct part will then be sourced locally, and the cost is buried as mentioned above. This same issue also makes the quotation process longer, or even impossible, when part numbers are not available in the system, quotes cannot be sent to the client.

Spare part availability has been described above. The spare part “quality” has an equal importance. When parts are sent to the work site, information about the shipment is not transferred to the service resource attending the same site. Packing lists are often incomplete or use too wide “parts kits” where it is impossible to see what has been sent to the site. As an example, the factory could send Part A to a work site and inform the service manager that the part has been sent. Then the service manager allocates a service resource to the site. When the resource arrives, it can be noted that indeed part A has been delivered to the site, but fastening bolts and glue needed for the installation are missing. Usually this leads to increased costs due to missing parts are sourced locally and the cost buried into the system. It also usually disturbs the scheduling of the service resources since extra time is needed to source the parts locally.

The difficulties finding the part numbers and lead times for spare parts cause the scheduling for the work to be difficult and unpredictable. All of this comes across from the customer’s point of view as bad customer experience, which basically means long lead times to get the quotation. After receiving the quotation, it will take a long time to schedule a service resource to conduct the work task. There is also a risk of a need to make a repeat visit due to missing or incorrect parts.

3.2.1 Warranty repair

The service process for warranty repairs follows the same path as a single service visit. But instead of the external client the client is internal. The differences between the warranty process and the single service process are created after the work has been conducted. This can be seen from the figure 4 below.

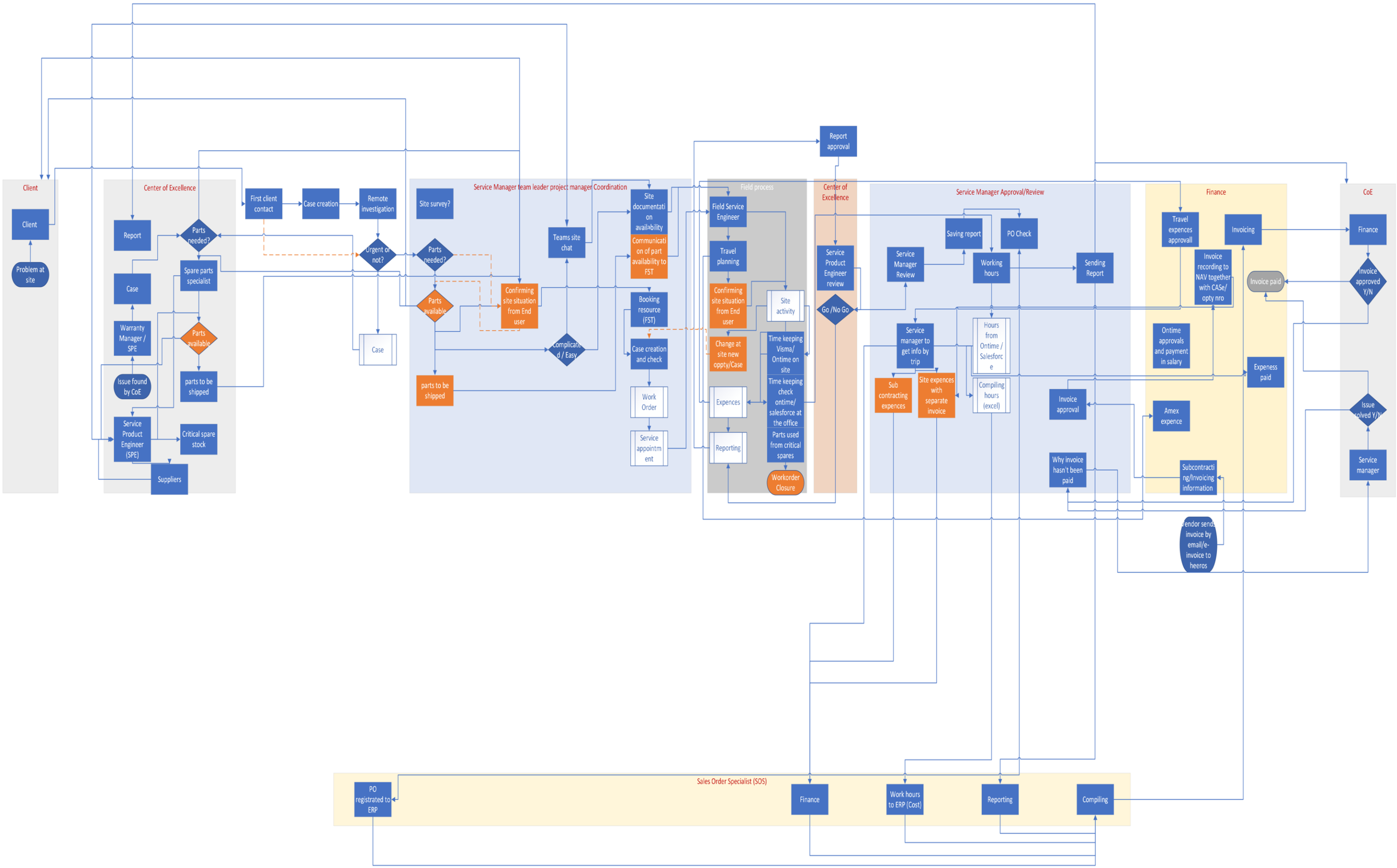


Figure 4: Warranty repair service process.

As seen in figure 4, in the warranty process, the work report is sent directly to the factory, and there is no PO from the factory to the service center. The missing PO from the factory makes invoicing warranty expenses extremely difficult. Handmade invoices can be sent to the factory but without PO there is no obligation to pay the invoice. And usually, the invoices are left unpaid. Unpaid invoices are then blocking the finance system and causing problems in the bookkeeping. If the warranty expenses are left on the country unit, this also makes bookkeeping difficult, when the country unit can be making a negative profit due to warranty expenses.

3.2.2 Sold single service.

The existing written process is made for single service visits. The process was tried briefly when it was launched, but it was noted to be too rigid and slow for the requirements of the clients. The process started to change, and after a short while each service team followed their own system. One way of doing service business formed to the Finnish service team, another in Norway, and a third in Italy. Organizational changes were conducted around the same time when the written process was launched, which made it even more difficult to ground the new process. The current process that is followed in the Finnish service team is displayed in figure 5 below.

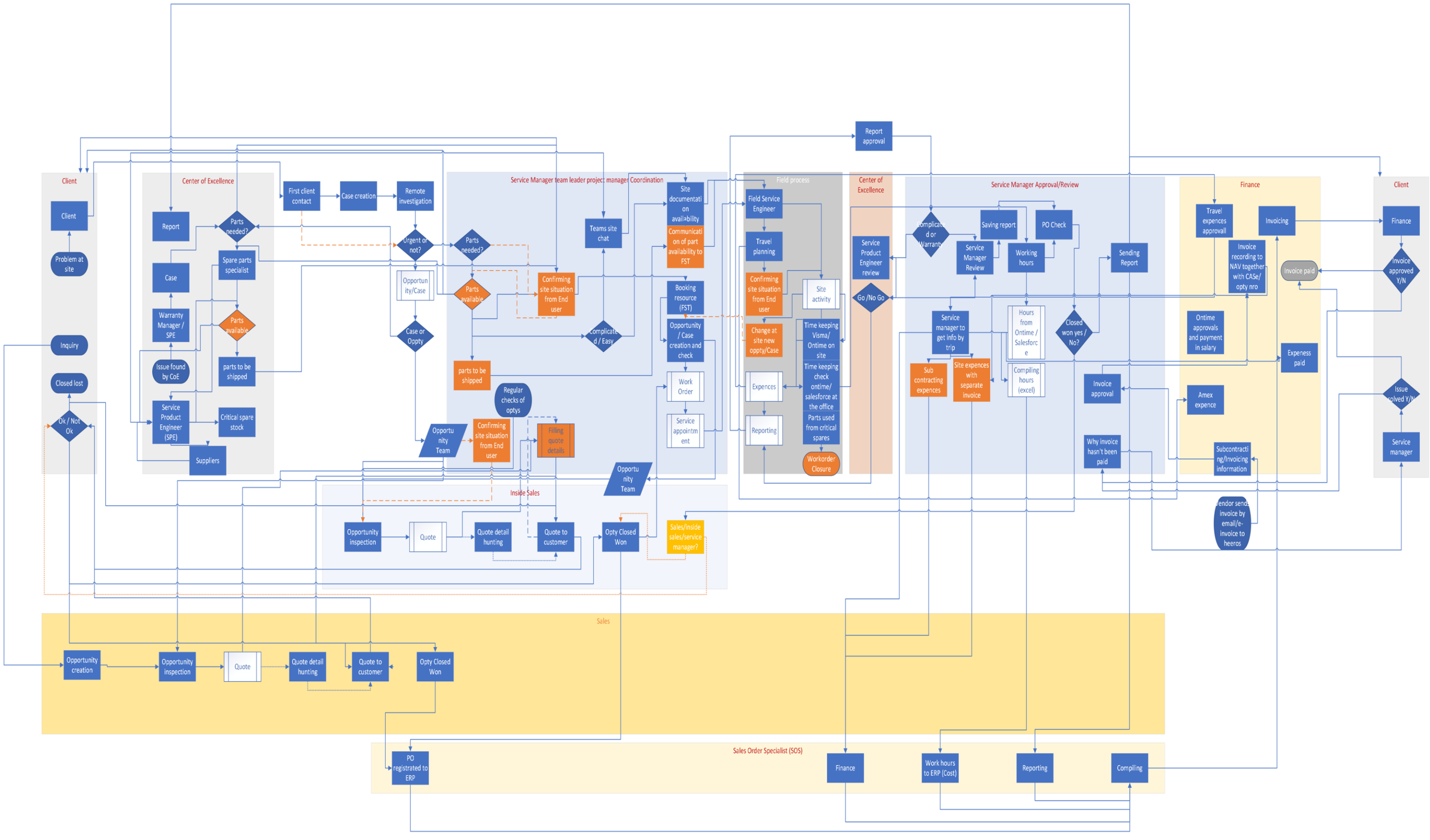


Figure 5: Sold single service process map.

Because the written process was spread to the service organization, all three main service centers had a similar starting point. This has given a common structure for the separate ways of running the service process in each service center. There are different resources at each service center, which has then formed separate ways of managing the service business. The European service organization operates with shared resources, and now the case company have separate ways of doing the service business between each country. This creates friction between the people working on the service flow, makes the process inefficient, and slow. Due to the complexity of multiple service centers, and their different processes. This CSA is concentrating on the service process in Finland and touches the service processes of the other service centers only for the parts, where shared resources are needed.

The key issues, which can be seen in figure 5, with the single service visits, are spare part availability information, and long lead times when parts are ordered. The time taken from inquiry to giving a quote to the client is too long. This leads the local service or the client to purchase the parts from local sources. This means that the parts often take a short cut and are not registered to the PO. This then creates difficulties in the invoicing stage when invoices for used parts and subcontractors need to be chased through different systems. The confidence of the clients suffers when they can purchase many of the spare parts even before the case company has delivered a quote for the parts. The delivery of the spare parts is the second issue in the process. Lead times for the parts are usually longer than expected, and often there are changes in the lead time. The changes in lead times need to be transferred from the ERP system to CRM by hand and are usually done by two different people. These changes are often missed and not communicated to the client. Once the spares are delivered and the work can be conducted, changes in the planned work require revisiting the entire process, which takes too much time to be practical. This often leads to a situation where unplanned work is conducted without a PO. A comparable situation happens when a client calls about an urgent malfunction of their

system. To prevent any further damage, and risks to health, safety, and environment (HSE), in these cases, whatever parts might be needed are purchased locally, and work on site conducted before a PO has been placed. Manual work is then again required to trace the invoices for the purchased parts, and how many working hours have been spent. This information is then manually entered into the offer which can be sent to the client.

3.2.3 SLA Maintenance

The SLA maintenance is work that is predetermined by preventative maintenance schedule. All spare parts needed are sold inside the SLA contract and the maintenance work. Since the parts and cost of labor are predetermined for years to come this is the simplest path in the service process, as illustrated in figure 4. Despite the simple nature of the SLA maintenance process, there are two pain points in this process. The first one is the lack of spare parts that are needed for the maintenance. Due to the common practice of outsourcing everything, and keeping nothing in stock, the case company does not have the necessary parts in stock, and neither do the suppliers. Clients have often sold their buildings and do not have any place to store the parts in controlled environments. The second pain point is the trigger to send the invoice for the maintenance. There is no automation to do this, since for each service there is no separate PO. Invoices need to be sent manually, and pricing for the invoices needs to be checked each time the invoice is sent. The SLA maintenance process flow is illustrated below in figure 6.

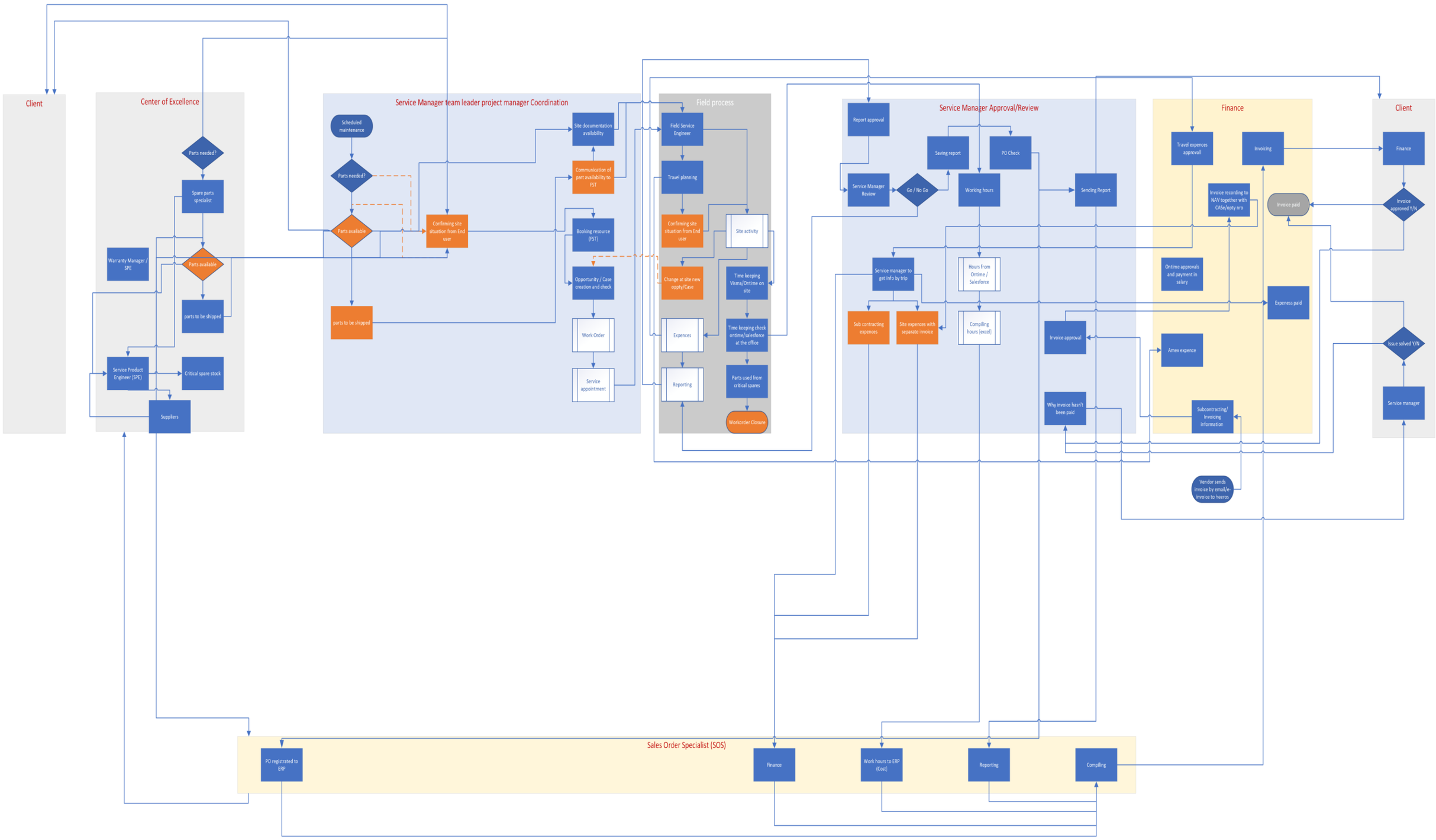


Figure 6: Current SLA maintenance process.

As can be seen in figure 6, the process is not simple. Several functions have been cut out when compared to the complete service process. And the bulk of the work is handled by the service/project manager. The pain points remain the same, with difficulties with maintenance consumable logistics. As well as confirming from the end client if there is some additional work on top of the regular maintenance scope. A major issue in the SLA process is related to the structuring of the CRM software that is used in the case company. The software is not supporting the concept of predetermined service visits that can be invoiced as agreed in the frame contract. This then causes issues with invoicing and reporting.

3.2.4 SLA repair

The SLA repair has similarities with the SLA maintenance process. Similar to SLA maintenance, also the SLA repair process has predetermined terms for the repairs done. In figure 7 the SLA repair process is described in its full form. Some parts of the process may not be needed depending on the comprehensiveness of the repair work.

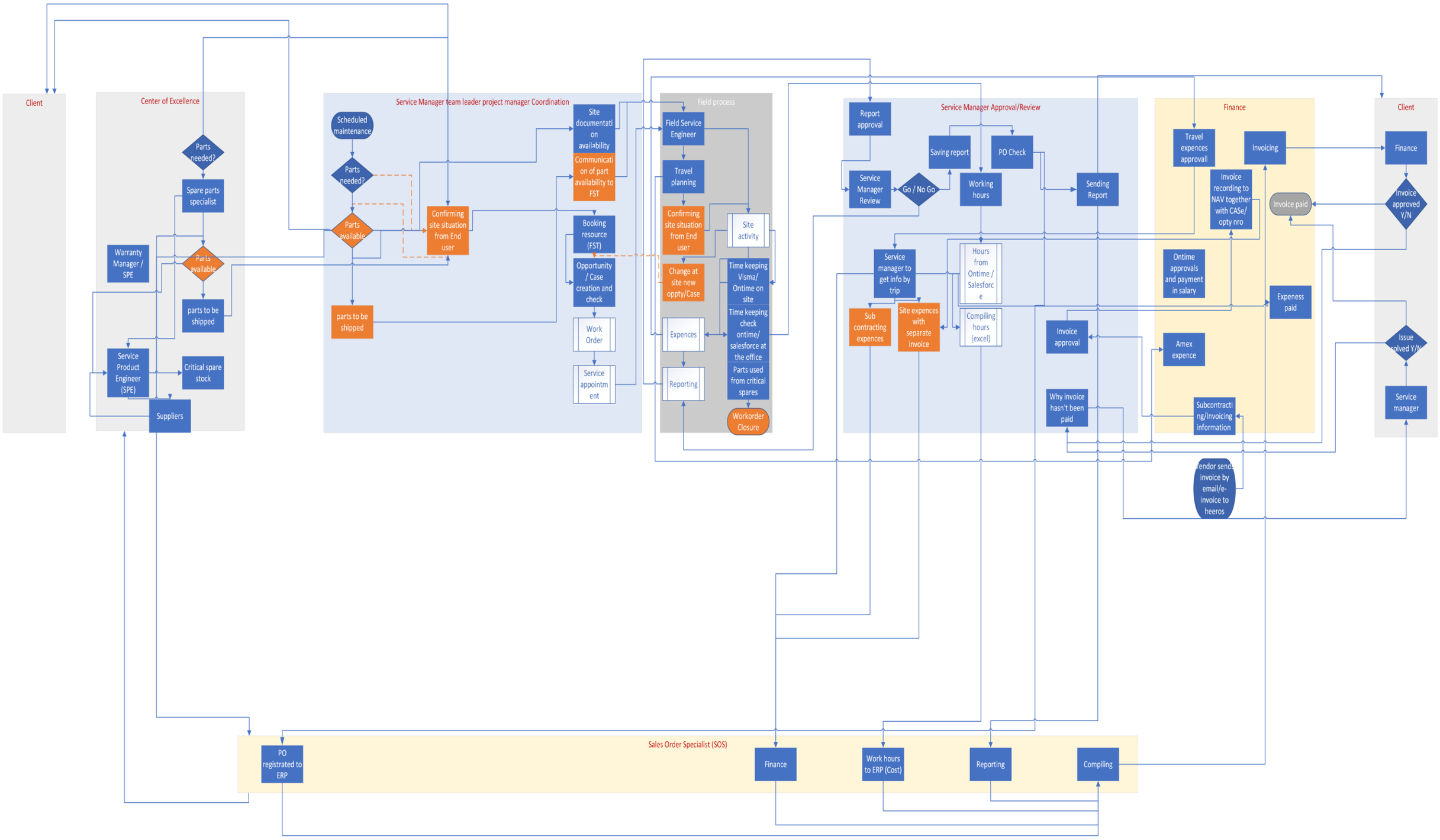


Figure 7: SLA repair service process.

In figure 7 the following can be determined. The SLA usually determines fixed hourly price, as well as response time, and critical spares that need to be available when needed. Unlike the SLA maintenance, the repair activities are not done predicatively, but reactively. This raises the importance of spare part availability even higher than on the SLA maintenance. There is also a slight flaw in the common design of the SLA contract. The contract usually states the hourly rate for the service, which means that faster dispatch times for field service personnel to be on site can be used. But there is no such short cut for the spares needed. This means that under the SLA repair process, usually only the first investigation visit to site, can be conducted in a fast phase. After this normal quote process needs to take place before the issue at hand can be fixed. If a client has a full stock of critical spares, this can be avoided.

One issue in the SLA repair process is the long lead times from the first inspection visit to the repair visit when the parts have arrived. There can be months between these two events. Follow up with the parts and expected lead time is manual work in the current process. The SLA repair is usually made from two parts, site work and spares that are used. In these cases, the site work needed can be added to the same PO together with the parts. This makes the invoicing a little easier if information about the completion of the work reaches the financial department. Due to the lack of PO for the work, the financial department only knows from the ERP system when the parts have been delivered. The completion of work needs to be manually communicated between departments.

3.2.5 Spare parts with service

Spare parts sale is the simplest process in the service business. Spare parts sales normally follow the sales process, which is well defined, and operates well. However, half of the spare part enquiries come together with service requests. This is the part included in this thesis, and the process can be seen below in figure 8.

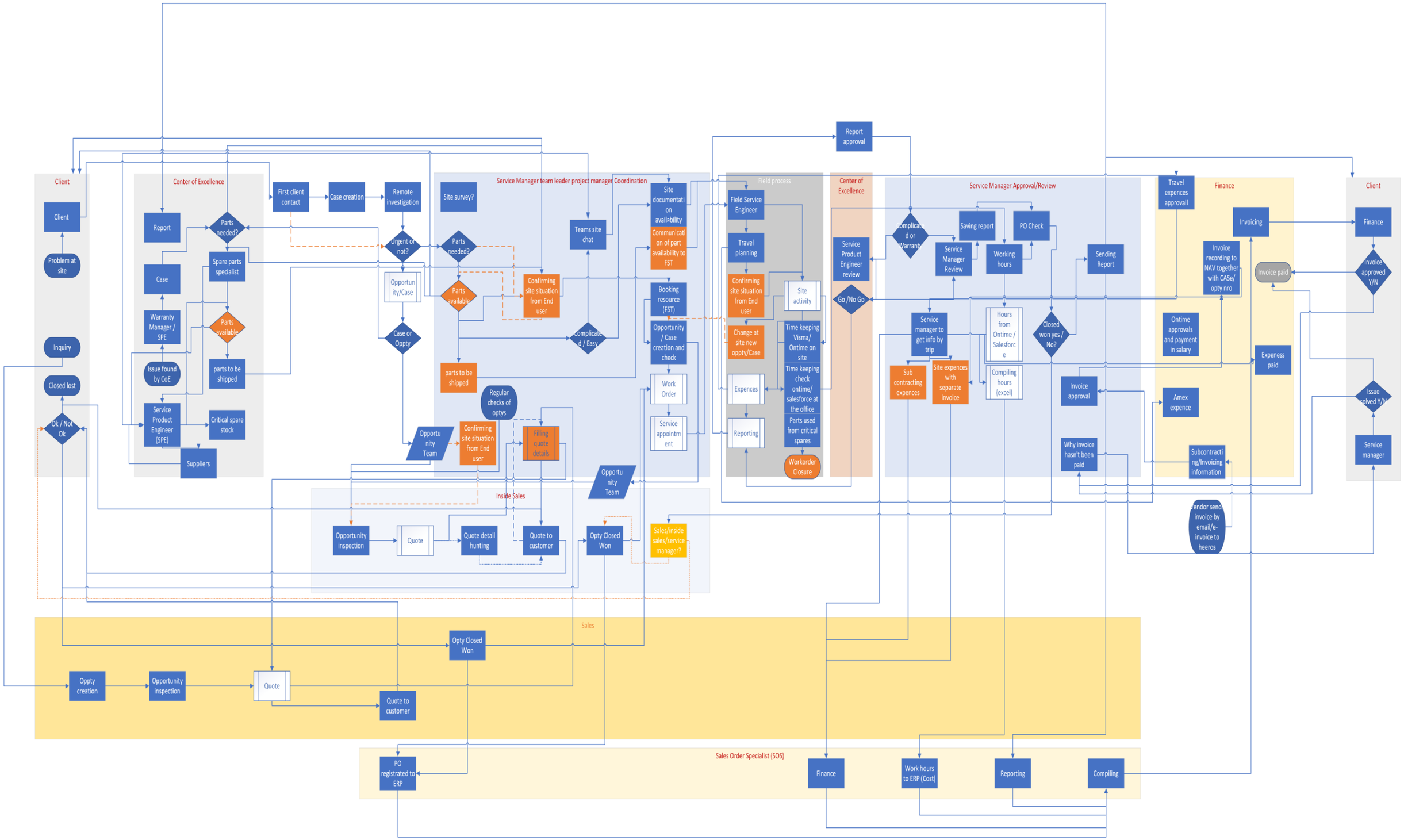


Figure 8: Service process for spare parts with service.

As seen from the process map in figure 8, to do site inspection/survey to verify what parts are needed, install the parts, or supervise the site, a lot of process steps are needed in the current process. The process of adding service work to the offer can be done in an uncomplicated way, just as products. The problem comes from getting the needed information to add enough man hours and check the availability of the service resource. The Finnish sales/service unit in Finland manages this with face-to-face discussions. If the sales office operates without a local service team, they are extremely limited with the information of the service offer part. This creates problems on two fronts. First the customer might get an offer which does not match the need of the customer. There might be incorrect parts, and/or too little or too much installation time sold together with the parts. Secondly the service organization has little or no visibility for the coming workload.

These problems can create bottlenecks which could have been solved with planning. Incomplete preparations for the site visit can also increase the psychological load of the resources attending to site. This can also lead to a dangerous situation, if the job that needed to be done on site is not as simple as it was supposed to be, and if the resource on site does not have a suitable skill set to perform the task needed. Similarly, if the parts are insufficient, it is exceedingly difficult to explain to the customer why service failed, despite using a lot of time and money for external expert. Invoicing rules also vary between different sales offices, some sales offices invoice parts immediately when those have been shipped, and some only after the service related to the work is also conducted. Different operation modes can lead to confusion on the client side, especially if the same client is operating in multiple countries.

3.2.6 New build, together with commissioning

A similar process to the spare parts sale is used for new builds, which are sold together with commissioning. There are three distinct types of commissioning sales deals that are sold to the clients. Products without site activities, products with commissioning supervision and products with full commissioning, which can be seen in figure 9.

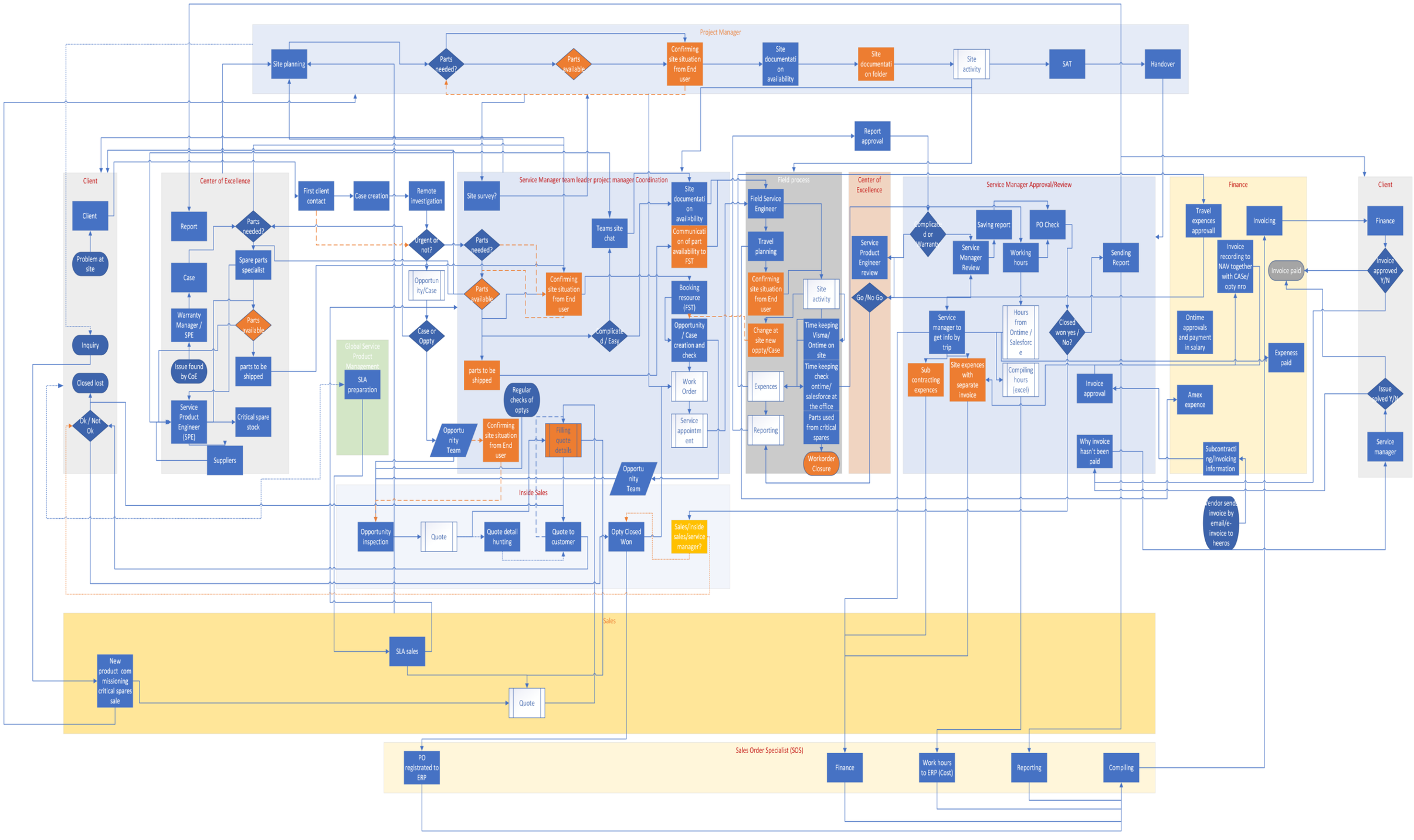


Figure 9: Process for new build with commissioning.

The process without site activities is simple from a service standpoint, as service might just give some superficial documentation and simple advice to the client about the commissioning process, which is not covered by figure 9 above. Products with commissioning supervision and products with full commissioning, can be seen in figure 9, are equally difficult to manage in the service flow, with the biggest difference being the time spent on site. In both process flows the hurdles are the same. The time taken to do the commissioning work is not usually clear to the sales and/or the client. And the major problem related to the time estimates is the sharing of responsibilities during the commissioning. The project manager of the case usually has difficulties making sure each party in the project knows their responsibilities, and especially the points where one person ends his job and the next carries it out. For example, when units are mechanically commissioned, who will lift the units in place, who will bolt it in place, and who brings the bolts. And regarding electrical connections, who will provide electricity, who will pull the cable, who will connect the cable, and who will turn the power on and test the system.

3.3 Strengths and weaknesses analysis of the current process

During the current state analysis (CSA) the process map of the current process was drawn, though a structured interview with the informants. The overall tone of the interviews was neutral with some informants giving the current process slightly positive or even positive rating when others gave slightly negative or very negative rating. During the interview process, a pattern started to emerge from the answers of the informants. Interestingly the pattern formed on both sides of the neutral axis, with the same adjectives being listed as both strengths and weaknesses of the current process. Next the strengths and weaknesses of the process are opened in more detail.

3.3.1 Strengths of the current process

In the interview process multiple different strengths were listed by the informants. The informants gave very similar answers, which can be condensed in the strengths of the current process, listed in table 2 below. The individual strengths can be seen in the left column and a higher category in the right column.

Table 2: Strengths of the current process

Strength	**Category**
+ Software	IT
+ Step by step structure	Structure
+ Local direct/personal support	HR/Personnel
+ Good will of the involved people	
+ Flexibility	

As seen in table 2, there are five individual strengths (software, step by step structure, personal support, good will, and flexibility). that can be divided thematically into three main categories (IT, Structure, and Personnel).

The software that is listed as a strength is the customer relations management (CRM) software that the case company uses, but not the enterprise resource planning (ERP), or the tailor made excels. Software was listed as a strength by some functions, which can use the software most efficiently, and only need the CRM software in their daily work. The main strengths of the software were noted to be the versatile nature of the software, together with the comprehensive way it can be used by all involved parties.

The same informants that listed the software to be a strength raised the step-by-step structuring of the current process as a strength. Their part of the workflow is well structured, which allows the software to work as designed, in an easy and clear manner.

The personal support that is happening locally face to face has been recognized as a major strength of the process. This was noted by all the informants, with some being the key to drive the whole process forwards, and other felt as support to their daily work. The same personal support can be interpreted as good will of the personnel, stretching beyond working times and responsibility areas of the personnel. The goodwill and the personal support of the parties involved then build a flexible process that can be used in many ways without a strict and formal written structure. The flexibility is especially good when the product range that the service works with is broad and often mass tailored to the customer needs. The customers also operate in distinctly different business areas, which leads to very different needs for the service of their assets.

3.3.2 Weaknesses of the current service process

The weaknesses of the current service process are divided into three categories which can be seen below in table 3. The number of individual weaknesses is greater than the number of strengths, which is clear indication that a change in the current process is needed.

Table 3: Current process weaknesses.

Weaknesses	**Category**
- Incorrect use of software	IT
- Missing links between software	
- Data input quality	
- Spare parts availability	
- Lacking automation	
- Too rigid	Structure
- Information flow	
- Unclear responsibilities	
- Complex	
- Work done outside of any process (no paper trail)	
- Missing resources	HR/Personnel
- Inconsistent information	
- Flexibility/lack of process	

As can be seen in table 3 several weaknesses have been categorized under the already familiar categories of IT, Structure and HR/Personnel. The IT category consists of incorrect use of software, missing links between different software, quality of data input to the software, spare parts availability, and lack of automation. As mentioned earlier the case company uses three main software, one for CRM, and for ERP and what does not work with the above software is handled with specific excels. The skill level between the users for the given

software varies tremendously, from position to position, and country to country. This leads to software to be used completely incorrectly, and the quality of the input data can be partial, or some requested data might even be completely missing. The software that the case company is using is not purpose built for service work, which creates difficulties when different information from different software is needed to be compiled. For example, it requires considerably manual work and involvement of different people from different departments, to get spare part availability information. There is no automation inside the individual software, and between the three main tools used, but the data usually needs to be transferred by hand.

Structuring and having clear responsibilities are key issues in the service process. As an example, the interviewees expressed that the current process is too rigid and there is too much bureaucracy, but at the same time other informants in the process described the process to be too flexible and lacking boundaries. The missing responsibility matrix makes this possible with the “written legacy process” that some countries and departments are still trying to use, while others have completely stopped using it.

Similarly to the structuring of the process, the human resources of each sub process and country vary a lot. This gives different shape and capabilities to each country and sales office within the country. On some parts of the process there is a lack of resources, while others are happy with their workload. Not a single informant signaled that there would be too little work for them to do, but many signaled that they are often overwhelmed by the amount of work. This then forces different people to support each other past their normal work roles, which then makes the process more complicated and scatters information across the organization. It also contributes to the lack of a written process when different people in different positions work as they feel is the best way to move things forward, instead of trusting the documented process.

3.4 Summary of the current service process flow

There are many aspects of the current process that can be considered as a strength and as a weakness as seen in figure 10.

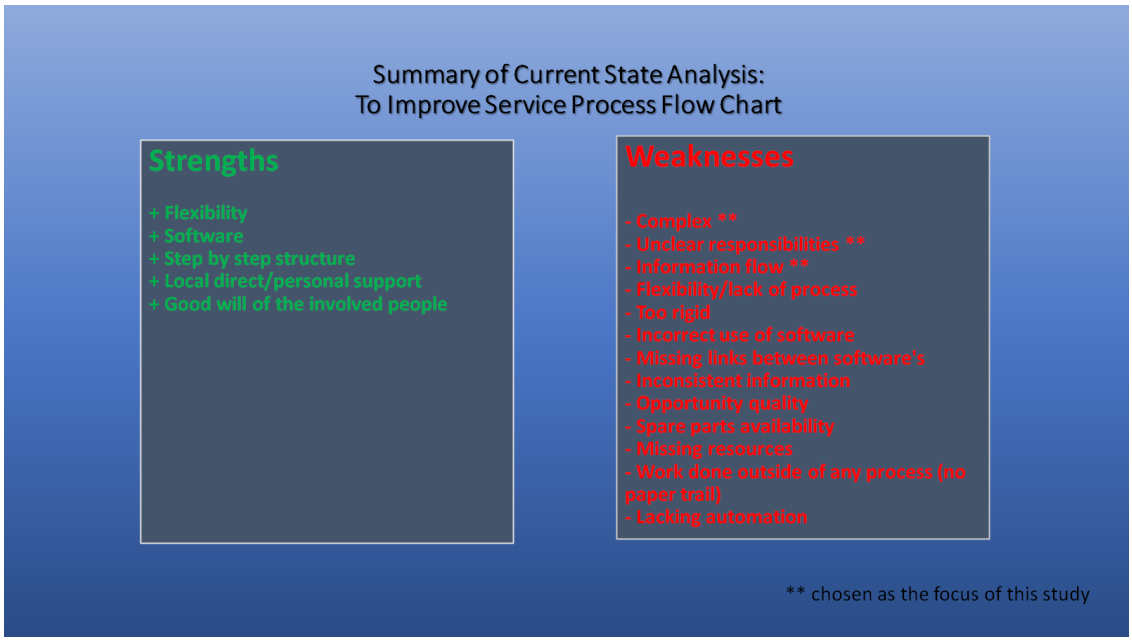


Figure 10: Summary of the strengths and weaknesses.

As it can be seen in figure 10 the flexibility which is built into the poor organization and unclear responsibilities of the process is one of the strengths in the process. Unfortunately, it is also a weakness at the same time, because too much flexibility prevents smooth operations in the process. Some service functions also in some service centers reported that the process is too rigid. This is true for their specific subprocess in the specific country organization but cannot be said for the whole service process.

The software to manage the entire process has been pointed out to also be a good thing, but at the same time not suitable, and not integrated enough. The CRM software is good in parts of the process but not used as well as it could, other bits of the process use excel files due to lack of suitable tool. The integration between CRM, ERP and several excels requires manual labor, and is prone for mistakes.

The goodwill of people in the process and personal support have been listed as major benefits. Unfortunately, this mostly applies to service centers which can

contribute also to other functions. Sales offices without a service function are not benefiting from direct support.

The main weakness of the service process is the unclear responsibilities in the process and complexity of the process. When these issues are solved, it will clarify the needs and future pain points. Most of the issues in the remaining process will start to solve themselves after the responsibilities are clear and the process is streamlined.

Overall, the mapped current process is very chaotic, and inconsistent. The major weaknesses that need to be addressed first are unclear responsibilities and structure of the process. In the next chapter literature and academic studies are addressed to create a conceptual framework, which can then be used to build a working service process for the case company.

4 Literature review on service process flow methodology

Literature is researched in chapter four of this thesis. Academic journals of best practices are reviewed on the relevant topics, which were described in more detail in the current state analysis. In this chapter the existing theoretical studies are brought closer to the real world, and real-life application within the thesis study topic. The literature study concentrates on process development, especially on the simplification of complex processes, and how to share the workload and responsibility as a member of the process. Consequently, a conceptual framework is created, which describes the methods of working and how the method is brought to an operational level. The conceptual framework acts as a guide which can be used together with the current state analysis (CSA), to create an initial proposal for improved service process flow chart, in chapter 5.

4.1 Overview of this chapter

The literature review is based on the strengths and weaknesses that have been found in the CSA section of this study. The objective of this thesis is to improve the current service process flow chart, which is why the major focus of the literature review is on the weaknesses that have been found. The literature review is based on source material that can be found from online libraries, as MetCat Finna and Springer eBooks. The sources that were eventually used as a source material in this thesis were selected from a wide range of sources. Main search words for the literature included “Process improvement”, “Service Process improvement”, “Process development” and “Lean process”. The search words mentioned above are just an example of the search terms used. Relevant material was first studied on superficial level, and selected sources were studied in more detail. The theoretical studies were broken down into smaller sections to be able to find the parts that can be used in operational manner as a conceptual framework.

4.2 Complexity

The complexity of the current service process flow chart is the major issue. This causes problems in other areas, like unclear responsibilities for each process phase, and disturbs information flow. The issue of responsibility of each process phase and issues with the information flow, are covered in separate sections below.

4.2.1 Lean Methodology and Value Stream Mapping

Lean methodology (Bicheno, Holweg 2023) was chosen as the major approach to solve the complexity issue of this thesis. Based on the lean principles everything that does not add value for the client is considered as waste. The complexity of the current process flow chart makes it difficult to clearly define waste in the process flow. Value stream mapping (VSM) is used to find the activities within the process that add value for the customer.

Lean is a philosophy that was originally created by Toyota in Japan. The lean system is therefore based on the principles that Toyota has created, but there is no organization to govern over the lean philosophy and dictate how it can and should be used. In figure 11 below the lean philosophy shows how the concept of “flow” is in the core of everything.

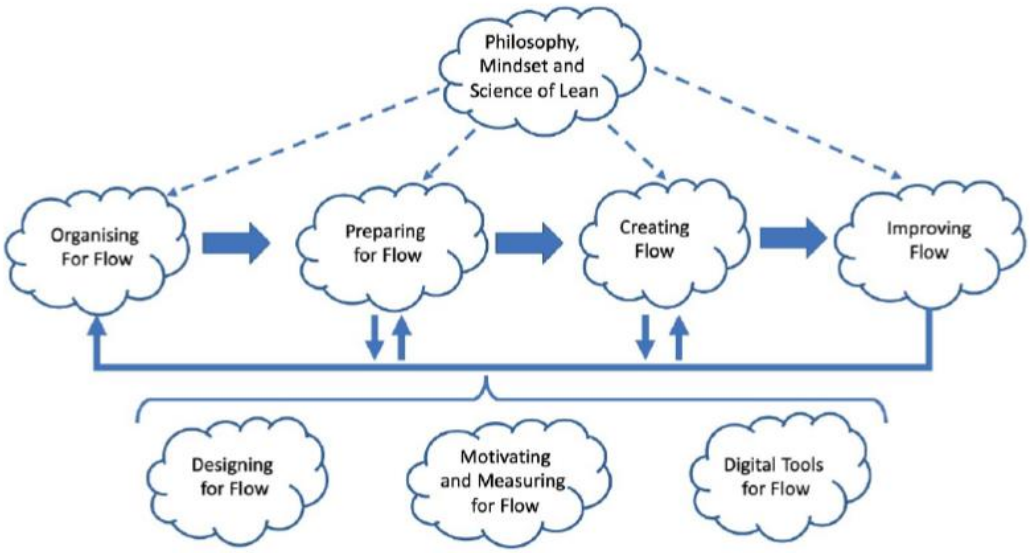


Figure 11: Lean flow concept.

As seen in figure 11 the concept of flow is in the center of the lean philosophy. The tools that lean philosophy introduces are used to make the flow more streamlined. This is accomplished by removing 3 m's that are defined by Toyota as Muda (waste), Mura (unevenness), Muri (overburden). To simplify the concept of lean in this thesis all three are considered as waste that disturbs the flow. The flow can be anything, it can be flow of goods on the automotive manufacturing line, as it was in the early days of lean practices at Toyota. But it can be also intangible flow, as a process flow like in this thesis. (Bicheno, Holweg 2023).

Lean is about moving ever closer to uninterrupted flow in the sequence of operations that deliver perfect quality (Bicheno, Holweg 2023)

The goal of the lean process improvement is to create a perfect process, which produces best quality with the least resources. Due to the nature of process work with several stakeholders and fluctuating customer needs, the process is built on several variables. This means that the process is continuously

changing, and the aim is that it changes for the better. In essence, the philosophy is universal, the tools are not. (Bicheno, Holweg 2023).

The lean philosophy can be stated with five principles.

1. Value specification from the point of the customer
    - What is considered valuable for the customer.
2. Value stream
    - How the value is created through the process.
3. Flow
    - Keep the process moving, nothing should be stationary and waiting.
4. Pull
    - Process should be run from the back to the front, as much as possible.
5. Perfection
    - Aim for perfection through continuous improvement.

Improving the current service process flow with lean methodology requires us to recognize what is adding value in the process and what is waste. Finding the value adding activity is called value stream mapping (VSM) and the remainder is waste. The waste that is remaining can be divided in two categories, non-value adding waste, and necessary non-value adding waste. The way to separate value adding activity from waste is sometimes difficult when looking at a process. Value adding activities are the activities that the customer is willing to pay for. Non-value adding activities and necessary non-value adding activities are differentiated by the nature of the activity. Self-evidently necessary non-value adding activities are crucial to the process and cannot be removed without breaking the process. (Bicheno, Holweg 2023). One example is invoicing. Invoicing is not adding value to the customer, but without it all the activities before invoicing are useless, since money doesn’t flow.

To measure the process cycle efficiency (PCE) the value adding (VA) activities are divided by the total time the process takes. In the case study of this thesis this cannot be done accurately, due to the variation that exists in the process. The value adding activities have variance, as well as the total duration of the process, which can be anything from 8 hours to 80 days. However, the efficiency of the improved process flow can be measured, using the formula VA time / process lead time = PCE (Bicheno, Holweg 2023).

In a service process the concept of waste has two separate viewpoints, the one from the service company, and more importantly the viewpoint of the customer. The waste in a service process, from the customer point of view, can be divided into the following seven categories according to Bicheno (2023).

1. Delay
    - Waiting time for a service, or a response. Wasting customer's time, does not have direct impact on the cost for the service company, but a huge cost for the paying customer.
2. Duplication
    - The need to repeat the same information on several locations within the service organisation.
3. Unnecessary Movement
    - Possible multiple locations for the service
4. Unclear communication
    - Stating the problem clearly, and clarifying the current situation, can lead to unnecessary movement and to duplication.

5. Incorrect inventory

    - Lack of stock, unable to deliver promised parts or services in a given time frame. Need to substitute products with others.

6. Opportunity lost.

    - To retain and win customers, customers need to be seen and supported in a polite and professional manner. This might take more time but pays off in the end.

7. Errors

    - Bad service or part quality, causing rework, and consuming time for the client and the service company.

In the CSA section of this thesis, the seven wastes are used in the value stream mapping of the case company's current service process flow chart. The first step in VSM is to map the current state. From the data collected in the CSA, a process map is then produced. This map is then worked with the VSM principles, starting by recognizing stable and instable parts of the process. The priority in the process map re-organization is making the process as stable as possible. Only then is it possible to simplify the process further.

To have a structure on the process simplification, Simon Dodds 4N chart can be used to help with making decisions about what should be left on the process and what should be cut out as a waste. Figure 12 shows the 4N chart.

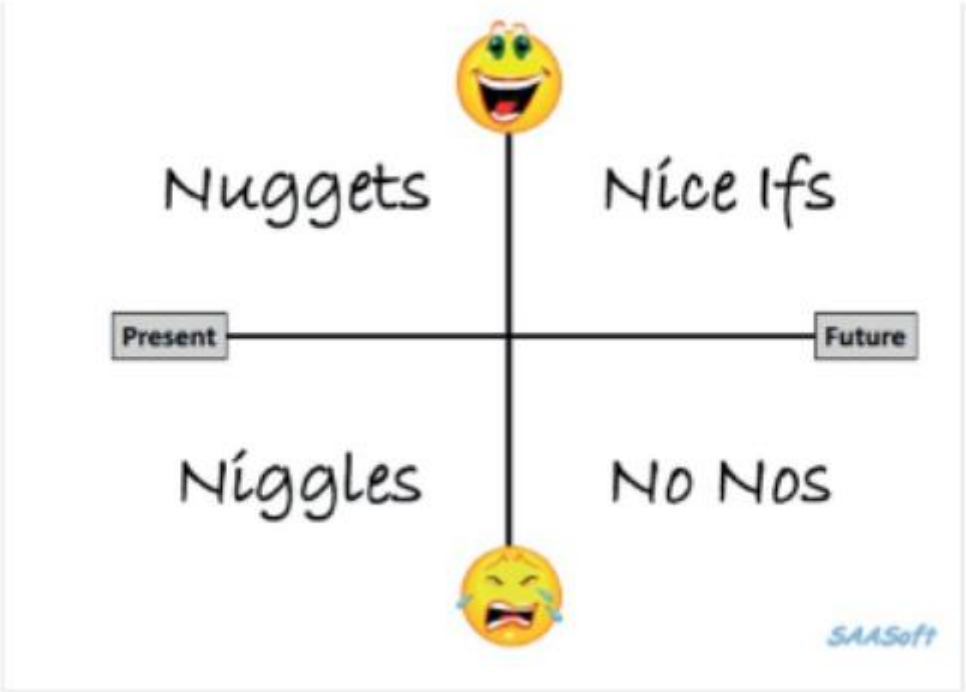


Figure 12: 4N chart. (Bicheno, Holweg 2023)

As seen in figure 12, 4N chart includes two negative aspects, and two positive aspects. A vertical axis splits the chart into the present on the left and future on the right. The horizontal axis is the split line between the negatives at the bottom, and positives on the top of the chart. When using the chart, the system of five whys is first applied to the bottom left of the chart, where five negative things on the current process are written down. Then the thought is moved to the box on the top left to track down five aspects that should be cherished in the current process. After this the same is done on the right side of the chart.

The real purpose of mapping is to design the future state. It is a visualization exercise – a vision of the current state and of the future state. (Bicheno, Holweg 2023)

4.3 Responsibilities

The second most important issue in the complicated service process is the unclear responsibilities that it causes. It is not possible to simplify the process flow chart without setting clear responsibilities for the process phases. In the next subchapter the methodology of defining responsibilities within the service process flow chart is explained. The last subchapter 4.3.2 describes how the responsibilities are studied in the frame of continuous improvement, after the improved service process flow chart is completed.

4.3.1 RACI charting

Role and responsibility charting can be done in several ways. One of the most used is called RACI charting. RACI stands for Responsible, Accountable, Consult, Inform. Smith and Erwin (2005) state the following.

Responsibility Charting is a way of systematically clarifying relationships pertaining to:

1. Communication or actions required to deliver an acceptable product or service

2. Functional roles or departmental positions (no personal names).

3. Participation expectations assigned to roles by decisions or actions. (Smith, Erwin, 2005)

These points are needed in the simplification of the service process flow. The relationship between role and responsibility charting and simplification of the process flow chart with VSM techniques, are tied to each other. The first cannot exist without the second and vice versa, or the service process flow would not be functional. Due to this dependency the process simplification and defining roles and responsibilities needs to happen in unison. The main rule to define roles and responsibilities is that the responsibility of a given task should be with

the role that works with the task. The responsibility cannot be with the management, several levels higher, but needs to be as close to the actual work being done as possible.

According to Smith & Erwin (2005) in their article Roles and Responsibility charting (RACI) every role is built on three assumptions:

1. Role conception
    - What the person in the role thinks he/she should do in the given role.
2. Role expectation
    - What others in the organization think that the person should do in the given role, and how the work should be carried out.
3. Role behavior
    - What is happening in the given role.

With the simplified process flow map all parties in the given process will have an aligned view about the three assumptions of the role of each person in the process. In essence all three assumptions can be condensed under one topic, which is role behavior. Everybody in the process knows what the person should do and what the person does. To get help achieving this common understanding a RACI model can be used within the process organization.

The RACI charting starts by defining the persons involved in the process and what actions are done in the process. Each action should be given one responsible person(s) and one accountable person. This means that a team of one or more people can have the responsibility to carry out a given task, but only a single individual can be accountable for the task, never a team of people. These two roles are most important and need to be defined for each action. In

addition, there are the roles of consult and inform. The person(s) in the consulting role should be an expert on the given matter and give their input prior to a final decision. The inform role means all the people that need to be informed after the decision or action has been made. They could for example be the people responsible for the next step of the process. Below figure 13 shows a simple RACI chart for taking care of family dog. *(Smith, Erwin, 2005)*

	Mother	*Father*	*John*	*Sally*	*Mark*	*Kids**
Feed the dog	A	C	R			
Play with dog	I	I	A			R
Take dog to vet	R	A/R				C
Morning walk	C		A/R	R		
Evening walk	C		A/R		R	
Wash dog	C		A/R			
Clean up mess	C	A	R			

Figure 13 Example RACI chart.

As shown in figure 13, in the left side column the actions of “dog” process, and in the top line all contributors to the process have been listed. What is especially worth noting is that there is only one “A” as accountable on each activity. But there can be more than one R, C or I, as multiple people can be responsible, consulted, or informed. The source material did not give explanation for the asterisk (*) in the column for the kids, but it is important to be there. This is a good example how the RASCI chart should not be filled. The task “play with dog” is under the responsibility of the “kids” but since it is a plural form, it can create a situation where none of the kids does the action and are unaware of it. This set up would then need a subsidiary RACI chart for play with the dog, and “kids” should be opened to individuals.

After the RACI charting has been done, it needs to be reviewed, there should not be concentrations of any roles (letters) to any individual in the process. All letters should be spread across the chart as evenly as possible, to spread the overall load of the process. In a complicated process such as the subject of this thesis, it is also important to have enough consults and informs, to make sure that information that is moving through the process is correct, and all parties who should know about the actions do get the information. At the same time the RACI chart needs to be kept as clean and simple as possible, without having any extra “C” or “I” in the chart.

4.3.2 Continuous improvement

The Instability of parts of the process is creating problems with set responsibilities. When the workload to conduct a specific process phase is varying a lot the current process will be difficult to follow. As Bicheno, Holweg (2023) states in the Lean Toolbox:

A principle aim of Lean is steady, reliable FLOW.

Due to the short time to work on the thesis study. multiple Plan Do Check Act (PDCA) iterations cannot be carried out, to prove the stability of the improved process. This leaves the possibility for the improved process to start changing shape, and reform in each center of excellence, just as the first written process flow has done. To overcome this hurdle, all unstable zones of the service process flow, need to be identified and then addressed in a continuous improvement project to stabilize them.

The same applies to RACI charting. Due to changes in the organization and individuals who are assigned to different roles in the process, the responsibility of each task tends to “drift”. The RACI chart needs to be continuously monitored and revisited, to make sure that all roles and responsibilities are defined, and the whole process team knows their own, and coworkers' roles.

4.4 Information flow

The last focus area of the literature review chapter presents ideas about solving communication issues within the service process. In the case company of this thesis, the process is spread over different countries and cultures. The previous sections have described how the process flow chart should be laid out, and how responsibility within the process should be set. What is still missing is the communication between different process tasks, and the responsible roles within the process. The majority of current communication issues are related to the previous issues of complexity and unclear responsibilities within the service process. This section describes recommendations that can be found in the literature to achieve efficient communication flow, between case company process stakeholders.

4.4.1 Communication channels

There are several different types of communication channels/methods. Effective communication and soft skills by Bhatnagar & Bhatnagar (2012) describe communication in the following way.

The Source conveys messages through the channel to the receiver. Channels are vehicles that carry messages from one point to the other. (Bhatnagar & Bhatnagar 2012)

Worth noting here is that there is always a source and a receiver, as well as a channel for communication to go through. Communication can be either interpersonal within a group or mass media. In the context of this thesis only interpersonal communication and group communication are studied, as mass communication is not practical inside a process. Interpersonal communication can be further divided into two different communication channels verbal and nonverbal. These two can be further divided into facial, gestural, postural,

proxemic, artifactual and vocalic. Depending on the method that is used for the communication some of these communication channels are not “transmitting” the message. As an example, when a technician, from the Nordic team, is talking on the phone with The Italian product specialist, the gestural and postural communication from the Italian person is not transmitted to the technician.

4.4.2 Communication tools and practices

Within the service process, communication is usually carried out from person to person. This can either happen face to face if the stakeholders are working in the same physical location, or over IT tooling such as e-mail, instant messaging or online meetings. In the case company several different communication tools are used, as revealed by the CSA interviews. There are phone calls, e-mail, instant messaging through several software, as well as processing software tasks and messages, for example inside of the Customer Relationship Management (CRM) tool. Many of these communication methods have their strengths in some areas of the process, but the most efficient method of communication for each process stage needs to be predefined. Human beings have evolved to use face to face communication; therefore, this should be always the number one choice for communication in the process. (Bhatnagar & Bhatnagar 2012) Due to the wide geographical area, where the process stakeholders have been spread, this is only possible in rare occasions, and in distinct parts of the process. To utilize facial expression in communication, video calls should be preferred, instead of instant messaging. In the case organization this is especially important, since process participants are from different cultures and language areas to keep the process flow moving, notifications and tasks should be used inside of the CRM software. David Berlo’s (1960) communication model seen in figure 14 is a model that can be used to estimate how communication between two parties works.

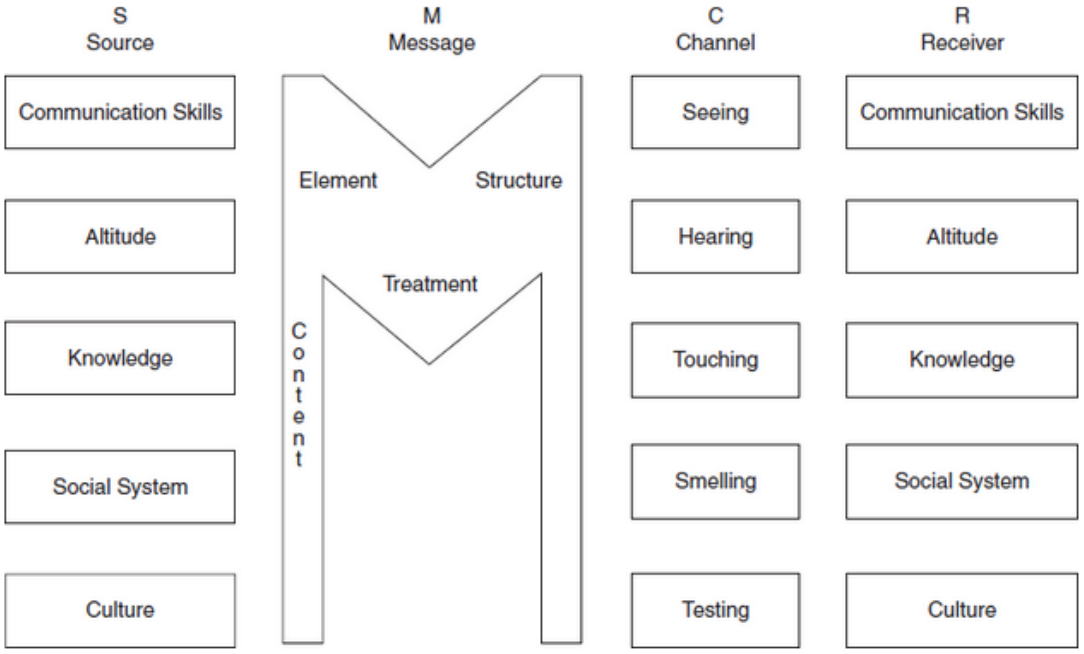


Figure 14: Communication model.

As shown in figure 14, the source and receiver of the communication both have five attributes that have a role in the success of message going through. In addition, the way the message is devised, and which communication channels are used, affects the success rate of the message. By using as many communication channels as possible, with well-structured messages, it is possible to increase the success rate of transferring the information.

To put the above in short practical rules:

1. In complex matters, always use face to face communication when possible. Physical contact first Video over voice, and voice over text.

2. Process flow notifications to be executed inside the CRM tool.

3. E-mails should not be used within intercompany communication.

With these three simple rules communication can be unified between different units within the company. Unified communication contributes to better understanding between the parties involved.

4.5 Conceptual framework

The conceptual framework of this thesis is built from the parts discussed in the previous chapters. Illustration 15 shows the main components of the conceptual framework.

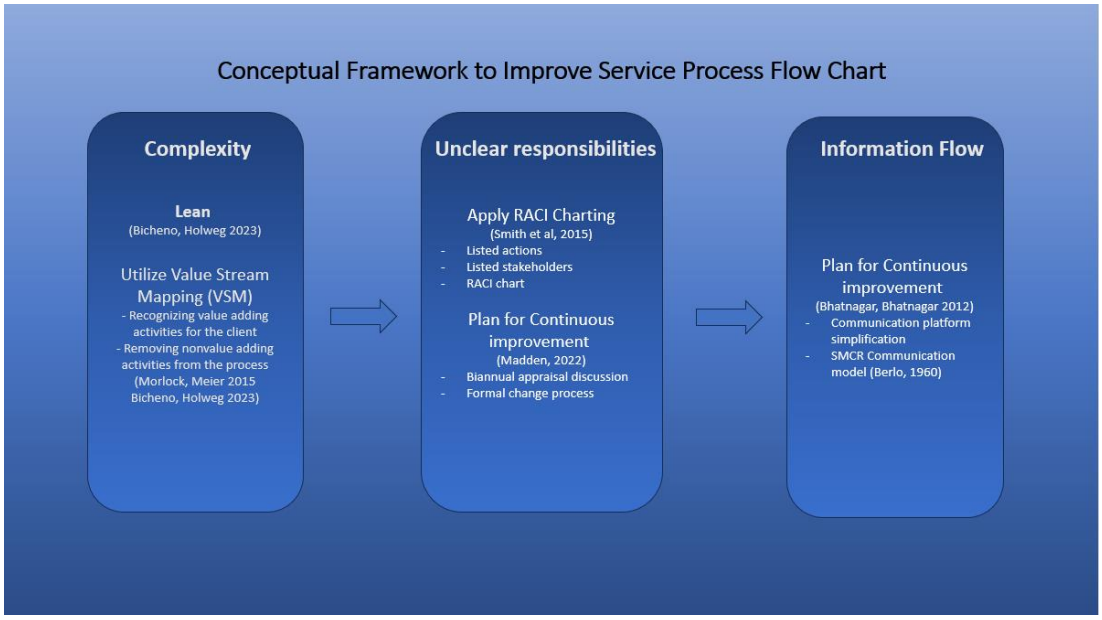


Figure 15: Conceptual framework.

As illustrated in figure 15, the conceptual framework is based on solving the complexity issue of the case company's current service process flow. The philosophy behind the whole conceptual framework is Lean, and reduction of waste. To simplify the current service process flow chart, a technique called value stream mapping (VSM) (Morlock, Meier 2015 Bicheno, Holweg 2023) is used. After the process has got the simpler form new roles and responsibilities needs to be defined. RACI charting (Smith et al, 2015) is used as tool to determine the roles and responsibilities of each process task and each stakeholder in the process. The lean philosophy requires the process to be constantly reviewed through continuous improvement. Unfortunately, the time

limitations of this thesis study will not allow multiple PDCA cycles, and therefore continuous improvement is only planned into the conceptual framework. The process structure together with well-defined roles and responsibilities create a working service process flow map. To get the same map to work in practice the communication through the process flow needs to work. David Berlo's communication model is used to define which tools are used in each process phase to get the most reliable communication between process stakeholders.

The conceptual framework is used together with the CSA results to build an initial proposal for an improved service process flow chart. In the next chapter, the conceptual framework and CSA results are reviewed together with external experts. The process is built around workshops where viable solutions are discussed, based on a loose model, that is built on the conceptual framework.

5 Improving the service process flow of the case company.

In the chapter five the current state analysis (CSA) and conceptual framework (CF), which have been covered in the chapters three and four, are used to build initial version of the improved service process flow chart. The strengths that were found in the CSA are kept as well as possible, in the improved process flow. The selected weaknesses of complexity, unclear responsibilities, and poor information flow are in the focus of the improvement areas. The improvements are carried out using the results of the conceptual framework. Two external experts, “K” and “M” have contributed into the building of the initial proposal. Based on the input of the external experts, CSA and CF an initial proposal for new service process flow chart is formed. This initial proposal is then used in chapter six, and validated with external experts, to be ready for application.

5.1 Overview of the improved service process flow

The objective of the thesis and this chapter is the improvement of the service process flow chart of the case company. The author of the thesis has not been working in the case company after the CSA section. Therefore, the resources of the case company have not been available for the chapter five of this thesis. Instead of stakeholders in the case company, external experts have been used to contribute to the initial proposal. Total of two external experts were giving their input. In this thesis they are called as expert “K” and expert “M” The external experts were invited to a set of separate workshops, where the improvement ideas for the improved service process flow chart were discussed. As a base material a RACI template was provided as well as the results of the CSA. In the first workshop the basic concept was recorded, and then visualised to be used in the second workshop. In the second workshop the ideas were used put in the frame of the case company, which then resulted in a type “M” of a model for the improved service process flow chart. The same set of workshops was repeated for the second external expert, and a type “K” of improved process flow chart model was created. Both workshops were carried

out online due to the geographical distance of the involved parties. Documentation of the workshops was carried out by screen and voice recordings. To create the initial proposal of the service process flow chart, both “M” and the “K” models were joined together to create the most practical solution for the case company. External expert “K” is working in the case company, as a service manager with a decade long history on service business. External expert “M” has been employed in leading positions in different service organisations for several decades

.

5.2 Findings of Data 2 stage initial improvement of the service process flow chart

The business challenge described in the beginning of this thesis can be solved by creating an improved service process flow chart. The improved service process flow chart is created based on the current state analysis (CSA) results and the conceptual framework (CF). Selected weaknesses at the CSA stage and tools in the CF section are utilized to produce the improved service process flow chart as seen in the table 4 below.

Table 4:Overview of the initial proposal building

Issue recognized in CSA	Tools found from the CF	Co-created solution
Too complicated process	Value stream mapping, and removal of non-value adding activities	Finding value adding activities from the customer point of view. Recognizing necessary waste from non necessary waste and removing the non necessary waste from the process.
Unclear roles and responsibilities	RACI charting, and continuous improvement plan	Defining RACI for the mapped process. Reducing the amount of process tasks and number of stakeholders, to match the pre-created flow chart, then reducing the number of roles to the minimum.
Problems in information flow	Continuous improvement plan with the help of SMCR communication model	Plan for future development to improve the information flow with the improved process flow chart. Defining a schedule for themed quarters in the context of SMCR

As seen in the table 4 the improved service process flow chart is comprised of three elements. Complicated structure, Unclear responsibilities and problems with information flow. These three elements are studied more closely in the next three chapters.

5.2.1 Decreasing Process Complexity with Value Stream Mapping

Complexity of the service process flow chart is the main weakness that was recognized in the CSA. Decreasing the complexity is done through lean philosophy, utilising value stream mapping. First, (customer)value adding parts of the process are identified. The remainder is non-value adding processes, which can be further divided into necessary nonvalue adding processes, and non-value adding processes. Once the different process sections have been identified, the process is simplified by merging as many value adding processes as possible. And eliminating as many non-value adding processes as possible. As a result, a light and still flexible service process flow chart is created.

Identifying value adding activities

The task for value stream mapping started by defining what is valuable for the client. External expert “K” condensed the value for the client as follows.

“Client finds value in operational assets”.

This statement can be further examined. Keeping the client's assets operational can be viewed from two starting points. Firstly, preventative maintenance should be done in a way that no assets would be operational, secondly broken assets need to be fixed as fast as possible. All parts of the service process flow that are contributing to these two end results can be considered as valuable. These were marked to the CSA process map with green highlighter. Total of 31/106 process steps were recognized as value adding activities.

Identifying non-value adding activities

Non-value adding activities can be divided into seven waste categories, which also help to identify the waste. The CSA process map was reviewed with the help of table 5. All process non-value adding phases were reviewed against the seven wastes and was given a number based on the waste category.

Table 5: Waste categorization

#	Waste	Example	CSA process result
1	Delay	Waiting time for a service, or a response. Wasting customer's time, does not have direct impact on the cost for the service company, but a huge cost for the paying customer.	1. System should report faults and abnormalities automatically, if not client should have clear channel to report faults 2. Service flow gets stuck and periodic checks are needed to find stuck items in the flow. 3. Finding and filling quote details takes a lot of time 4. Delays in part availability information, can seize the process 5. Missing documentation causes delays
2	Duplication	The need to repeat the same information on several locations within the service organisation.	1. Case/opty creation happens in several locations during the process. All necessary information like team members should be defined right in the start. 2. Site situation should be confirmed during first contact and case creation. 3. First contact should decide if the task is complicated or easy. 4. Opportunity should be clear with all information fields populated. 5. Part availability should be communicated to FSE automatically when the need for parts is checked. 6. Some reports are reviewed twice. 7. Working hours are recorded in two places and need to be approved twice. 8. Order handling team is archiving data that has already been saved elsewhere.
3	Unnecessary Movement	Possible multiple locations for the service	1. Opty team should be created when the case /opty is created. 2. Service flow should be moving constantly, if stuck for some reason, the system should notify automatically. 3. Spare parts can be found by maintenance manager, no spare parts specialist needed. 4. Service manager should have the right to decide on warranty status. 5. Report moved from desk to desk for reviews. 6. Report saved to several places after creation, instead of saving the report initially in the correct file. 7. Working hours are turned into expense manually. 8. Once Quote is ready it should be automatically sent to client 9. Won PO should be automatically closed as won. 10. PO's should be registered without manual work 11. SLA should be prepared in joint venture with service manager and sales
4	Unclear communication	Stating the problem clearly, and clarifying the current situation, can lead to unnecessary movement and to duplication.	1. Understanding the problem at hand is often difficult. 2. All communication should happen inside the created work order. 3. Multiple locations for the documentation make it difficult to find correct documentation. 4. Part availability information is often missing from FSE. 5. Poor information flow makes it difficult to fill in the quote. 6. PO check should be done by the system. 7. Often misunderstanding in the work definition causes problems with unpaid invoices
5	Incorrect inventory	Lack of stock, unable to deliver promised parts or services in a given time frame. Need to substitute products with others.	1. Unclear inventory and lead times cause delays in the process. 2. Incorrect part information for FSE causes delays on site. 3. Price and lead time availability is often missing causing delays for quote process
6	Opportunity lost	To retain and win customers, customers need to be seen and supported in a polite and professional manner.	
7	Errors	Bad service or part quality, causing rework, and consuming time for the client and the service company.	1. Breakdown in operation should not happen 2. Faulty units should not leave the factory

As seen in the table 5, waste can be found from 6 categories out of the 7 service waste categories. In total 50/106 process tasks were recorded as non-value adding activities. This is waste, that can be eliminated from the process. The process includes 25 process tasks that can be classified as necessary nonvalue adding activities. These are mostly related to reporting of working hours, expenses and taking care of invoices in and out of the company. Three main waste categories are delays inside the process, duplication, and unnecessary movement.

Service process chart simplification conclusion

The simplified process flow chart is created by leaving the value adding process task and eliminating non-value adding tasks, that are classified as waste. The waste analysis of the process revealed three main categories where the process can be streamlined the most. Duplication of process tasks and unnecessary movement inside the process covers 38 % of the total waste that has been recorded. The starting point of the improved service process flow chart is in these two areas. To avoid duplication and unnecessary movement, the service process is divided into seven main task sections, where 6+1 stakeholders are carrying out process tasks as shown in the figure 16 below.

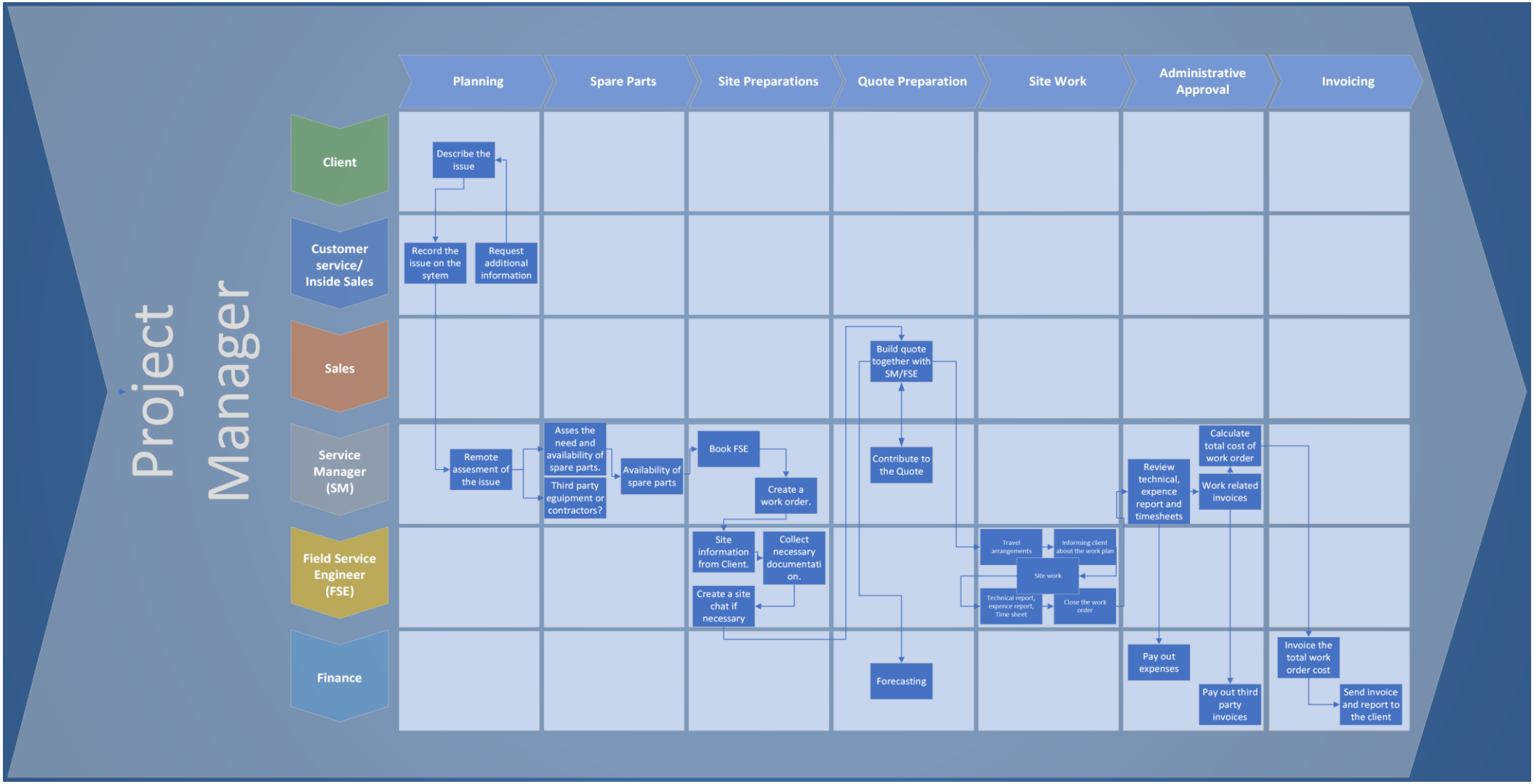


Figure 16: Initial proposal for improved service process flow chart

As seen in the figure 16, seven process categories can be found on the top horizontal axis. On a vertical axis on the left of the map, six process stakeholders can be found. Behind everything there is project manager in opaque background. The process manager is only included in the process for large newbuild projects and large overhaul projects. In these situations, the project manager is on the background and involved to every step of the project, which is why it is represented in the background of the process flow map. The blue boxes in the process flow represent separate process tasks that are carried out as the process flow map implies. The statistics behind the initial improved service process flow chart are as follows:

1. Number of stakeholders are reduced from 12 to 6+1

2. Process categories are reduced from 10 to 7

3. Process tasks have been reduced from 106 to 27

As can be seen from the numbers above, the process has been simplified which is the target of this thesis study.

5.2.2 Defining roles and responsibilities in the service process

The definition of the roles and responsibilities for the improved service process flow chart started by making a table with all involved persons and process actions. A RACI chart was created with the process actions on the horizontal axis, and responsible persons on the vertical axis. As a preparation for the workshops with the external experts this initial RACI chart was populated, according to the RACI system. First responsible (R) roles were defined in the chart, which was followed by accountable (A), and then consulted (C) and finally informed (I). This initial RACI chart was populated with the roles that match the CSA process map that was created before. This was then further improved by

creating an improved version, of the CSA RACI chart. These two templates, and an empty RACI canvas, were the starting point that was introduced to the external experts in the workshops.

Workshops started by examining the empty RACI canvas and placing the R, A, C and I to it together with the expert. The result was then compared to the two RACI charts that was made before the workshops. At this stage a discussion took place where the pros and cons of different set ups were discussed. At the same time with the discussion a fourth, and final co-created RACI chart, was created. In both workshops the process started by identifying roles that had little or no accountability and responsibility in the process. These roles were then deleted from the chart, and their tasks moved for other suitable roles. After the number of roles were cut down to a minimum practical amount, the complexity of the different tasks was examined in more detail. The total amount of process steps in the process flow chart was 106 in the CSA stage. Due to duplication of several of these process steps, the RACI chart had only 50 defined actions. In both workshops this was regarded as too high number, which is unnecessarily complicating the process flow. In both workshops the result was to cut down the amount of RACI actions. The base line for the actions was taken from the improved process flow chart, which was done just before the RACI chart. This chart contained 27 process steps, which were laid on the vertical axis of the RACI chart as can be seen from the table 6 below.

Table 6: Initial RACI chart for improved process flow

Process step							
Stakeholder	**Planning**	**Spare parts**	**Site preparation**	**Quote preparation**	**Site work**	**Administrative Approval**	**Invoicing**
Client	C	C	C		I		I
Customer service	AR						
Sales	I	I		AR		I	I
Service manager	R	AR	AC	C	I	AR	I
Field Service Engineer		C	R	C	AR	CI	
Finance				I		CI	AR
Project Manager*	(AR)	(AR)	(A)	(C)	(I)	(I)	(I)

* Project manager is only involved in large new build projects and large overhaul projects

As can be seen from the table 6, utilising the initial version of the improved service process flow chart, all the RACI actions were gathered under a certain category. The result was similar in both workshops with the external experts. Some RACI actions were placed on different categories, as well as some responsibilities were under different roles. As a result, from both workshops a simplified RACI chart was created. After the workshops the RACI charts were reviewed against the initial improved process flow charts. These were unified in a way that the RACI chart can be laid over the initial improved process flow chart. Resulting in a single final initial service process flow chart, as well as single initial RACI chart.

According to the lean philosophy a continuous improvement effort is required to complete any lean process. This can also be seen from the results of the CSA with interviewed informants described how the organisation changed, but the original service process flow chart did not evolve with it. This was mainly due to lack of continuous improvement plan. At the end of each RACI workshop a dedicated time slot was reserved for discussion about continuous improvement, with the goal to have a continuous improvement plan, in operational level. To guide the discussion a short introduction to lean philosophy was given to each of the external experts. In these continuous improvement discussions, two distinct approaches were established. Expert “M” was basing his proposal to close line management and regular employee satisfaction surveys, when expert “K” based his views on IT-platforms, user data collection as well as best practices vault. These two proposals were used to create a final version of the initial continuous improvement plan for roles and responsibilities development. Due to the scattered structure of the line organisation of the case company, difficulties with close cooperation with line management would be evident. Continuous improvement plan would therefore be based on the IT-platform approach, where background statistics would be gathered from users, to determine their workload. In addition to the raw data, employee satisfaction surveys would be introduced, as well as mandatory biyearly discussion

sessions with the line management. The line management discussions would be mandatory to keep face to face.

5.2.3 Improved information flow through the service process

In the CSA interviews information flow between stakeholders in the process was found to be one of the key issues that increased the process time or even stop it all together. To improve the information flow through the service process, the conceptual framework introduced sender-message-channel-receiver (SMCR) communication model. The SMCR model was introduced to the experts in the workshops. Different communicational attributes of the service process stakeholders were discussed, as well as the communication channels that can be used. The skill and cultural differences on the organisation at the CSA level was noted to be spread on a wide spectrum, with highly technical personnel as well as non-technical personnel all working in similar roles. The first improvement to this situation was noted to become straight from the initial versions of the improved process flow chart and RACI chart. By reducing the number of roles, and simplifying the process structure, it was easier for the participants to speak the "same language". The CF section of this thesis states that the communication platform should be simplified. In the workshops this was agreed to be accomplished with the highest efficiency by reducing the communication channels. In the table 7 below this is shown in as a chart

Table 7: SMCR utilized for the case company communication.

Sender-Message-Channel-Receiver (SMCR)			
Sender	**Message**	**Channel**	**Receiver**
Internal	Work order related	CRM	Internal
Internal	Work order related	E-mail	External
External	Work order related	E-mail	Internal
Internal	Non work order related	MS Teams	Internal

As seen from the table 7 above, only three main communication channels remain in use. The main software platform already had a social media type of wall's where messages can be written, and people can be tagged. This was agreed to be the simplest platform to communicate intercompany communication. Communication towards customers would be handled through the same platform, but converted in e-mail from, by the platform before sending to clients. Microsoft teams was agreed to be the main platform in intercompany communication, for matters that are not related to a specific work number. In the CF section the main topic to improve communication is continuous improvement plan for improving communication. The workshop discussion took this into account by noting that the SMCR model should be reviewed periodically, to improve the communication skills of the process stakeholders, with communication campaigns that would focus on detected problem areas. As a starting point for this continuous improvement journey a schedule table 8 was created.

Table 8: Continuous improvement plan for improving information flow.

	Sender/Receiver	**Message**	**Channel**
Q1	Communication skills	Content	E-mail
Q2	Attitudes	Treatment	Video conference vs. face-to-face meeting
Q3	Knowledge	Elements	CRM/Teams chat
Q4	Social-cultural system	Structure	Phone call

As seen in the table 8 above, the SMCR model has been opened and divided under three main categories, Sender/Receiver, Message and Channel. Each category contains four main topics that are then promoted in the case company organisation during one quartal.

5.3 Initial proposal for improved service process flow chart

The initial proposal for improved service process flow consists of three parts. First is the simplified process flow chart which can be seen in illustration 17. It is followed by table 9, where the roles and responsibilities can be seen in a RACI matrix. To supplement these two a rotational communication campaigns are introduced to continuously improve communication skills, attitudes, knowledge and social-cultural system awareness. A campaign schedule template is introduced in the table 10.

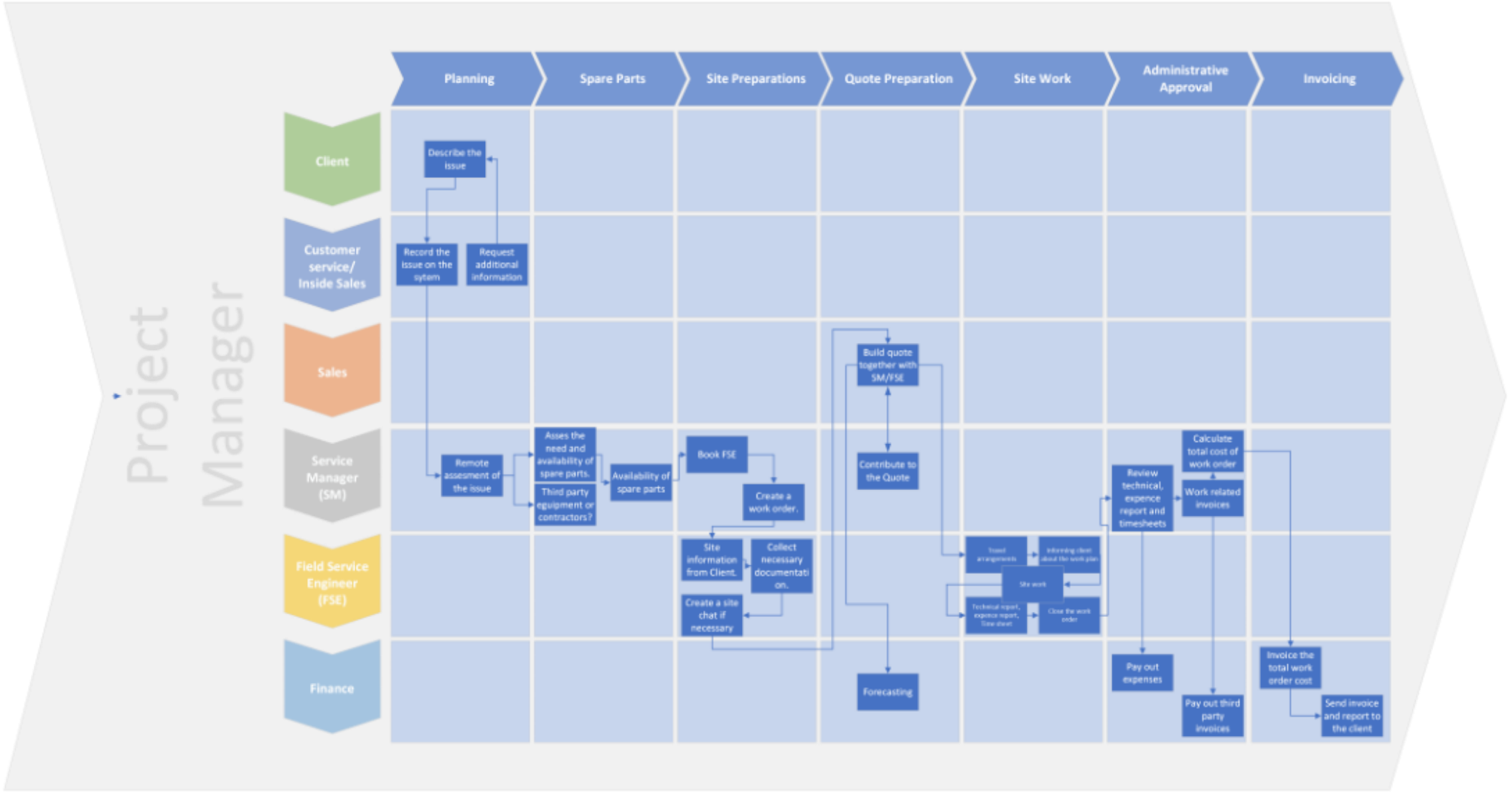


Figure 17: Initial proposal for service process flow

Table 9: RACI chart for improved service process flow

Process step							
Stakeholder	**Planning**	**Spare parts**	**Site preparation**	**Quote preparation**	**Site work**	**Administrative Approval**	**Invoicing**
Client	C	C	C		I		I
Customer service	AR						
Sales	I	I		AR		I	I
Service manager	R	AR	AC	C	I	AR	I
Field Service Engineer		C	R	C	AR	CI	
Finance				I		CI	AR
Project Manager*	(AR)	(AR)	(A)	(C)	(I)	(I)	(I)

*The project manager is only involved in large new builds and large overhaul projects

Table 10: Continuous improvement plan for improved information flow

Time	Sender/Receiver	Message	Channel
Q1	Communication skills	Content	E-mail
Q2	Attitudes	Treatment	Video conference vs. face-to-face meeting
Q3	Knowledge	Elements	CRM/Teams chat
Q4	Social-cultural system	Structure	Phone call

The initial proposal to improve the service process flow chart of the case company, was co-created together with external experts. The external experts gave their input in separate workshops, from which individual workshop proposals were drafted. After the workshop stage, both workshop proposals were joined together with authors initial proposal, to create the initial proposal seen in the figure 17, and tables 9 and 10. This initial proposal is used in the next chapter of this thesis, where it is validated by the external experts K and M. This is done to gain the best joined outcome by triangulating the issue and best practices to solve it within the limitations of the conceptual framework.

6 Validation of the improved service process flow chart

Chapter six of this thesis is about validation of the initial proposal that was completed in the previous chapter. Validating the initial proposal was carried out to refine the outcome and make perfect it to the real-world application. In the chapter 6 improvements of the initial proposal are explained as well as reasoning behind them. The chapter will end with summary of the final proposal for improved process flow chart, together with improved RACI chart and plan for improved information flow.

6.1 Overview of the validation process

The validation process followed the same structure as initial proposal building in the chapter five. Due to the missing resources, that are caused by the change in the employment of the author, the validation was not carried out in the case company. The validation process was based on two workshops, with the external expert's “K” and “M”. The workshops were based open discussion, strengths and weaknesses of the initial proposal were listed, and compared to the strengths and weaknesses that were found in the CSA section of the thesis. The discussions were held online and recorded for documentation purposes. After the co-creation process in the workshops, the feedback was used to form the final proposal for the improved service process flow chart, RACI chart and plan for improved information flow. Due to the time limitations on the thesis process, and the change of the employment of the author, the improved service process flow chart could not be tested in piloting project. To support the objective validation that is based on the expert statements, statistical validation methods are used. The statistical validation is conducted by comparing numeric values of the process flow map that was created during the CSA to the final proposal that was co-created with the external experts.

6.2 Adjustments to the initial proposal

The initial proposal was validated in three sections, first comes the process simplification subchapter, after which comes the RACI chart, and information flow improvement plan validation as can be seen in the table 11 below.

Table 11: Overview of the creation of the improved service process flow chart.

Issue recognized at CSA	Tools found in the CF	Co-created solution	Improvement suggestions
Too complicated process	Value stream mapping, and removal of non-value adding activities	Finding value adding activities from the customer point of view. Recognizing necessary waste from non necessary waste and removing the non necessary waste from the process.	Fine tuning the improved service process flow chart to work better with the RACI chart
Unclear roles and responsibilities	RACI charting, and continuous improvement plan	Defining RACI for the mapped process. Reducing the amount of process tasks and number of stakeholders, to match the pre-created flow chart, then reducing the number of roles to the minimum.	Fine tuning the RACI chart to match its qualities to the improved service process flow chart.
Problems in information flow	Continuous improvement plan with the help of SMCR communication model	Plan for future development to improve the information flow with the improved process flow chart. Defining a schedule for themed quarters in the context of SMCR	No changes

As can be seen from the table 11, the process simplification had to be fine-tuned and compared to the RACI chart. But the continuous improvement plan for the information flow was not altered in the validation phase. The validation process is described in more detail in the following three subchapters.

6.2.1 Validation of the process simplification

The general feedback from the initial proposal for improved flow chart, was positive. Validation discussion was mostly concentrating on streamlining the initial proposal by further decreasing the different process tasks in the flow chart. This was mainly cosmetical process as the tasks remained the same but were placed under a single process action. At the same time the process was placed again side by side with the RACI chart for comparison. Few process tasks were noted to be missing from the process flow chart that were included in the RACI chart. As a result of these actions the number of process tasks was changed from 27 in the initial proposal to 20 in the final proposal. Due to the changes the process still functions the same as before, but it is cleaner, and easier to follow. There were no changes made for the number of stakeholders or process categories, despite some discussion about the necessity of Spare parts as its own process column. However, in the CSA section spare parts were noted to be one of the most critical points for success or failure of a service visit, that it was agreed to stay as separate section. The final version of the improved process flow chart can be seen in the figure 18 below.

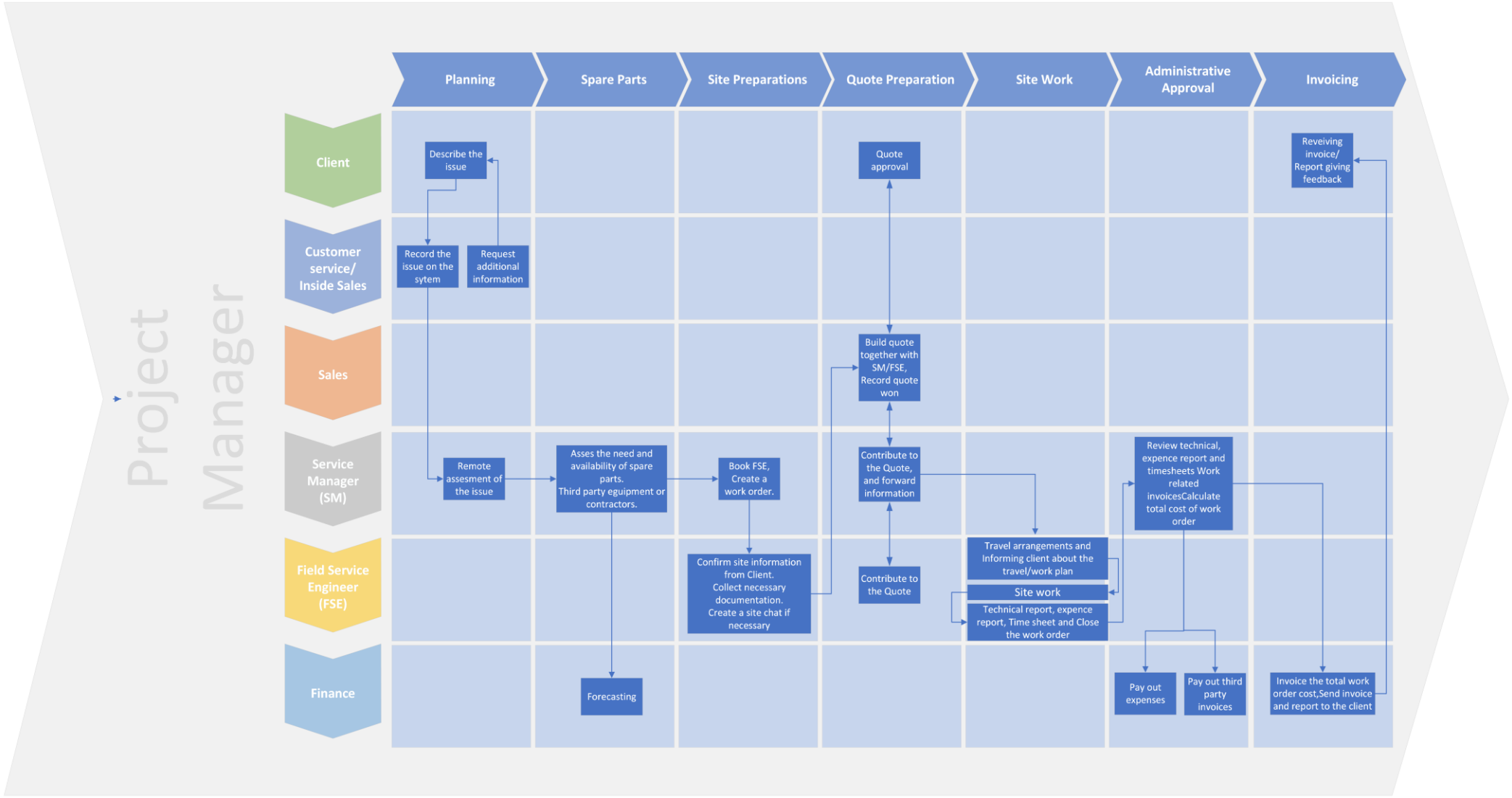


Figure 18: Improved service process flow chart after validation workshops

As seen in the figure 18 the base of the service process flow chart is unchanged from the version in the initial proposal. The amount of process tasks has been reduced. Only process category where is more than one process task is the site work category. Ideally a single person manages the process tasks under each phase, and due to that it is not necessary to have more than a single process task. Comment from external expert “M”:

“Let’s not add unnecessary complexity into a simple process.”

The process that was described in the CSA section was a good example of adding complexity to the process. When the process was struggling, more personnel and steps were added to make it work. In this thesis the goal is the opposite. As example the site work category had 11 process tasks at the CSA section. This has been reduced to three process tasks instead of one. The reason for this is that each phase happens in different location and distinct time frame. Site preparations like making the travel arrangements and informing the travel and work plan to the client, happens at the office well before the actual site visit. The site work then happens in the work location, after which the reporting and closing the work order happens at the office environment.

6.2.2 Validating the RACI chart

The RACI chart was validated in conjunction with the service process simplification. When the simplified service process chart was compared to the RACI chart, few inconsistencies were noted by the external experts. These can be seen in the validated RACI chart in the table 12 below.

Table 12: RACI chart after the validation workshops

Process step							
Stakeholder	**Planning**	**Spare parts**	**Site preparation**	**Quote preparation**	**Site work**	**Administrative Approval**	**Invoicing**
Client	C	C	C	I	I		I
Customer service/inside sales	AR						
Sales	I	I		AR		I	I
Service manager	R	AR	AC	CI	I	AR	I
Field Service Engineer		C	R	C	AR	I	
Finance		I				I	AR
Project Manager*	(AR)	(AR)	(A)	(C)	(I)	(I)	(I)

*The project manager is only involved in large new builds and large overhaul projects

As in the table 12 the changes were done in “informed” fields on some of the participants, as well as consulted role for other tasks. As an example, in the quote preparation phase the client needs to be informed about the quote. All consultation roles were taken away from the administrative approval sections. This was done due to believing in the process, and that all necessary information needs to be at the disposal of the service manager. Both external experts were like minded of the responsibility and accountability sections in the chart, and those remained untouched.

6.2.3 Validating the continuous plan for information flow

At the end of the validation workshops the plan for continuous improvement for improved information flow, was in the focus of discussion. In both workshops the external experts agreed that a pilot test for the improved process flow chart and the RACI chart should be carried out before detailed plan for improving the information flow could be created. Therefore, a preliminary schedule for communication campaigns remained mainly without alteration as seen in the table 13 below.

Table 13: Continuous improvement plan for information flow, after validation workshops.

	Sender/Receiver	Message	Channel
Q1	Communication skills	Content	E-mail
Q2	Attitudes	Treatment	Video conference vs. face-to-face meeting
Q3	Knowledge	Elements	CRM/Teams chat
Q4	Social-cultural system	Structure	Phone call

As seen in the table 13 above, there are wide tittles under each category for each quarter of the year. Both external experts agreed that a theme for each quarter makes sense instead of courses and lessons, which could be forgotten

easily. Critique against the table was mainly towards the very open headings under each category. These would need to be refined after the process has gone through a pilot phase.

6.3 Final proposal for improved service process flow chart.

The final proposal for improved service process flow chart consists of three separate sections. First is the simplified service process flow chart, seen in figure 19, second is the RACI chart seen in table 14, and the third is the plan for improving the information flow seen in table 15.

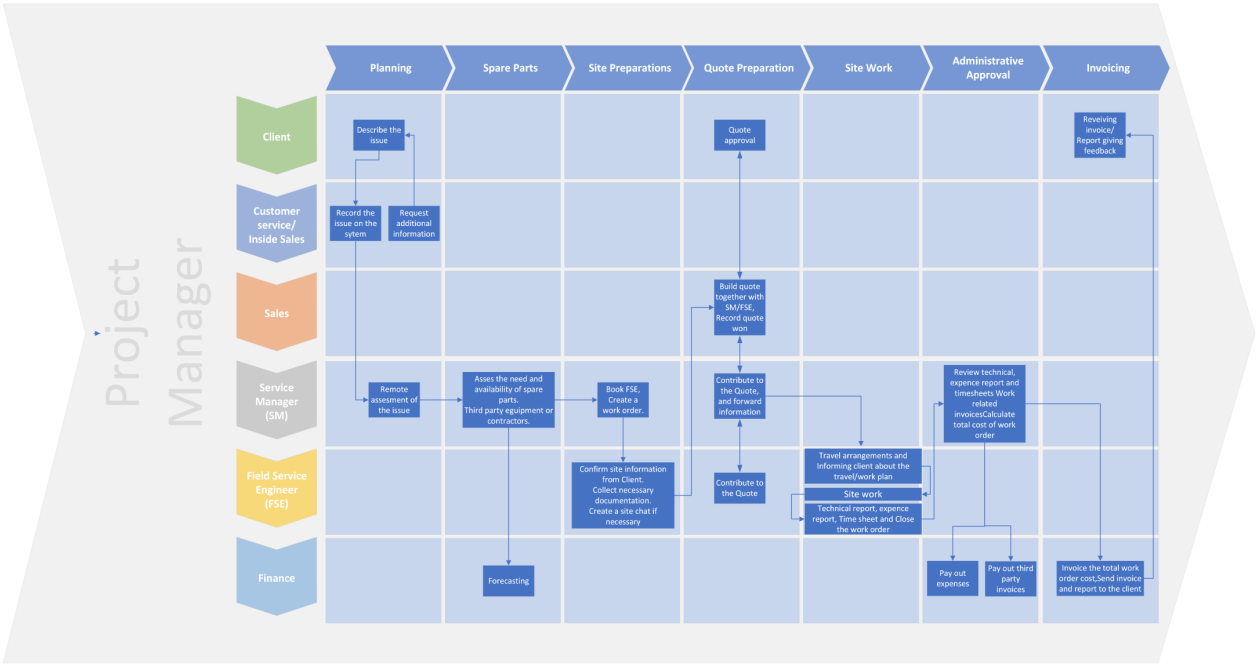


Figure 19: Final version of service process flow chart.

Table 14: Final RACI chart for improved service process flow

	Process step						
Stakeholder	**Planning**	**Spare parts**	**Site preparation**	**Quote preparation**	**Site work**	**Administrative Approval**	**Invoicing**
Client	C	C	C	I	I		I
Customer service/inside sales	AR						
Sales	I	I		AR		I	I
Service manager	R	AR	AC	CI	I	AR	I
Field Service Engineer		C	R	C	AR	I	
Finance		I				I	AR
Project Manager*	(AR)	(AR)	(A)	(C)	(I)	(I)	(I)

* The project manager is only involved in large new builds and large overhaul projects

Table 15: Final continuous improvement plan for improving information flow.

	Sender/Receiver	**Message**	**Channel**
Q1	Communication skills	Content	E-mail
Q2	Attitudes	Treatment	Video conference vs. face-to-face meeting
Q3	Knowledge	Elements	CRM/Teams chat
Q4	Social-cultural system	Structure	Phone call

As seen from the figure 19 and tables 14 and 15 the simplified service process flow chart and the RACI chart are working by contributing to each other. The table 15 is then contributing to the application of the new process in the

background. As the result of the improved service flow chart, the statistical attributes of the process are as follows:

1. Number of stakeholders are reduced from 12 to 6+1

2. Process categories are reduced from 10 to 7

3. Process tasks have been reduced from 106 to 20

As seen from the statistical values above the number of process stakeholders is reduced from 12 to 6+1 which is 50-41,7 % decrease. The variation depends on the presence of the project manager. Process categories have been reduced from 10 to 7 which is 30 % reduction. Process tasks were eventually decreased from 106 to 20 which is whopping 81 % decrease in the amount of process tasks.

The validation of the thesis study was conducted in chapter 6 to show that the results of the study are answering to the original business challenge that was presented in the first chapter of this thesis. In the next chapter the conclusions of this thesis are presented together with self-evaluation.

7 Discussion and Conclusions

In chapter seven of this thesis the study process is subjected under critique, and the conclusions of the result are scrutinised. The first subchapter summarizes the whole thesis project. This is followed by recommendations for practical next steps for the case company, to take the project through successfully. The chapter ends in self-evaluation and closing words. In self-evaluation the whole thesis is put under critical examination, to confirm the reliability as well as seek points of improvement.

7.1 Executive Summary

The executive summary is comprised of two subchapters, first one explains the background for the thesis, and the second the progress and results of the study.

7.1.1 Background

This thesis was conducted due to acknowledged issues with the service process of the case company. The case company had established service department only six years before the writing of this thesis. Before the establishment of the service organisation, service business was not invoiced at all, and all service was included into the price of the products. The new service organisation had gone through several change programs during the six years it has been operative. As a result, different business units, and country organisations did the service business with their own way. This resulted in problems with process flow. Some service requests were carried out with exceptional speed and quality, while others were completely ignored. Also, some service work was carried out, but not invoiced. Due to the issues related to the service process flow, a decision was made to create an improved service process flow chart.

7.1.2 Progress of the study

The thesis study started by defining the business challenge, objective, and outcome of the study. Next step in the study was current state analysis (CSA), which was followed by literature review and conceptual framework. After the conceptual framework was ready the improved service process flow chart was created within two stages. In the first stage initial proposal was made, after which it was validated.

The CSA section of the study was carried out by interviewing all stakeholders in the case company that had a role in the original service process. The structured interviews were conducted face to face or through video conference and recorded. Based on the interview material and written legacy documentation of the case company, a process flow map was formed. During the interviews the informants were asked to list strengths and weaknesses in the current way of doing service business. From these answers complex structure of the service process, unclear responsibilities and problems in information flow, were chosen as the key weaknesses which were the focus when literature study was conducted.

The literature review was conducted by researching academic papers about the key weaknesses. The result of the research was the CF which was based on lean philosophy. Value stream mapping was chosen as the main tool to solve the complexity issue of the service process flow chart. RACI charting was applied to solve issues with roles and responsibilities, while a plan for continuous improvement was created to improve information flow through the process.

During the time of the literature review the author of this thesis, resigned from the case company. Due to the change in the employer, the case company resources were not available anymore for the remainder of the study. Instead of process stakeholders two external service experts were used to co-create the improved service process flow chart.

The improvements for the service process flow chart, started by utilising the tools that were found in the CF stage, to build templates for improved service process flow chart, RACI chart, and continuous improvement plan for information flow. These templates were then used in co-creative process together with external experts to create initial proposals for the improved service process flow chart, one from each expert. These proposals were then studied, and best practices were taken to create a single initial proposal.

The initial proposal was validated by the same external experts. Minor changes were made to the service process flow chart, and RACI chart, but the continuous improvement plan for information flow was left untouched. The changes for the flow chart and RACI chart were concentrated in further simplifying the process chart, and making sure that the RACI chart matches the flow chart perfectly.

The outcome of the thesis is a heavily modified service process flow chart, which uses less resources while having shorter lead time throughout the process. This has been achieved mainly with streamlining the process and eliminating waste. Customer focus has been listed as a main focus area in the case company strategy, the new service process flow chart contributes to this goal, by being more accurate and faster than the old practice. For the process stakeholders, the new service process flow chart provides wider scope of work with their own distinct business area. Keeping the stakeholders more motivated and increasing their possibilities to collaborate with other functions.

7.2 Practical Next Step Recommendations

As a next step the improved service process flow chart should go through pilot tests. The test program would be consisted out of five stages as seen in the table 16 below.

Table 16: Implementation plan

Stage	**Pilot phase**	**Duration in weeks**
1	Simulation with imaginary data inputs	1
2	Pilot with live service project	2
3	Pilot Period within one service centre (small local services)	12
4	Pilot within EMEA organization	52
5	Global launch of Improved service process flow chart	

As seen in the table 16, the implementation program would start without organisational changes by simulating the process in the current software environment. This pilot phase can be done with real data from past service projects and should consist of different types of service work. Stages two and three are recommended to be carried out inside a local service organisation, with smaller service projects. Due to the smaller size of stakeholders training, cost can be kept in minimum, and improvements to the service process can be easily applied. The stage four would consist of full-scale pilot projects within the Europe Middle East and Asia organization (EMEA). In this pilot only the top contributors from each process stage should be included. Similar to stage one

these projects should cover different types of service projects. During this stage a plan for necessary organizational changes need to be created. The top contributors of the pilot are needed to be heavily involved in the re-organization process. As a final step the new improved service process and service process flow chart would be implemented within the EMEA organisation. This stage would need its own planning and change management, as it is business critical for the service organisation. As the whole improvement process is based on lean philosophy the improved service process flow chart that has been created, should not be considered as final or perfect version. Rather it is the starting point for a continuous improvement journey, which will be refined during the implementation stages.

The implementation process should be carried out according to the principles of Process and Enterprise Maturity Modell (PEMM) (Hammer, 2007) with the support of the top management through the whole organisation.

7.3 Self-Evaluation of Thesis Project Credibility

The thesis has been conducted in a well-organized manner, with throughout documentation of each work phase. The research method used in this thesis is applied action research (Kananen, 2013). The research design and data plan are explained in more detail in the chapter two of this thesis. Due to the well-structured and proven work method, the result of the thesis can be considered as credible and doable.

The author of the thesis has been working as a service manager for the case company during several years, prior which the author worked as a field service engineer at the case company. The starting point for the thesis was a practical need for improved service process flow chart, as the current method of working was causing issues in the organisation. The improvements to the service process flow chart were carried out in co-operation, with experienced service

experts, and multiple data sources were in use. Including practical experiences of the author.

The major issue with the credibility of this study is the fact that the improvement suggestions and validation was carried out without the case company resources and participation. This can create a situation where the result conflicts with the management of the case company. Without management support, the failure of the whole improvement project would be imminent. If the case company management would not be committed to the goal of the thesis, the thesis can be still used as theoretical study, on how and which tools can be used to simplify a service process.

7.4 Closing Words

The work put into this thesis has been a great journey through the practices of the case company, as well as the best practices on process improvement area, and especially service process improvement. As a result, a way to improve the service business has been created, which can reduce the resources that are needed to run a word class service organisation. This information is now written on paper, and publicly available for the case company if they choose to utilize it.

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8 Appendix

CSA Interview layout

Go through the current process map.

Build the current process map to be more accurate.

Ask questions about the current process map.

1. **What is your role in the service process?**
    a. Invoicing to customers, and looking after expenses in office, paying travel claims, Heros invoices.
    b. Promote case company services, sale of new products together with commissioning and critical spares.
    c. Service work and flow business sales and SFDC work.
    d. Internal and external technical support, throughout the process. Technical warranty approvals. Helping to identify required spare parts on site, for repairs etc.
    e. New sales of products and SLA. Frame agreements to be negotiated with end clients like ABB, together with service VP and Management
    f. Internal Customer for service organization, and coordinator. Ordering service to do the site work.
    g. Warranty case follow-up, Site work, site support, Trainings, parts hunting, service manuals writing.
    h. Coordinating the service activities and support service functions.
    i. Warranty claim handling for all products, spares etc., not working hours (no authorization)
    j. Purchase goods from case company COE's.
        i. Follow up together with service manager 1/month.
        ii. Receive reports, expenses, work cost (hours)
        iii. Prepare delivery note, and SO ready for invoicing.
    k. Service center manager in the region.

2. **What is good about the current process?**
    a. Nicely organized and it works in a step-by-step manner.

b. The local service team is responsive and answers questions promptly. Direct answers without hesitation
c. The way system works in Norway is good. There is a good workflow.
d. Absolutely Nothing, issues of the process are mitigated by the good will of the involved people.
e. More shape than before. Local service team supporting sales.
f. Process is integrated, personal communication is easy.
g. Process flow is good, but not enough capacity. And too rigid.
h. Work order and service appointments system, versatile.
i. Salesforce is a good tool to use in claims handling.
j. nothing
k. Flexible,

3. What is bad about the current process?

a. Missing opportunity info in Heeros
b. Information flow what should be sold to site, and to get products and prices Transfer price etc. products not available or know in the system.
c. Inconsistency of opportunity quality creates difficulties in the process, as well as prices and lead times from the factory.
d. Spare parts stock is not sensible.
e. Unclear role of inside sales, and missing communication towards sales (account owner) Port of Helsinki for an example has unclear understanding of the role of our inside sales. Knowhow/skills between service has a lot of variation. Makes it hard to plan/sell jobs.
f. Too unclear, No standard model for information request etc. Financial issues for line items and invoices, cost allocation
g. Too much bureaucracy
h. Complex and difficult to make changes before invoicing. Navision is not a good tool for service. Not good for selling labor (hours)
i. We do not follow the process, it is unclear.
j. Process exists but there is no willingness to follow it. (same process as parts sales) (same as Badulescu process)
    i. External sourcing and purchasing done outside of any system (ERP)
    ii. We are doing jobs but not collecting PO's (opty/case)
k. Too manual, no automation between systems and numbers or automatic control

4. What is the largest bottle neck on the current process?

a. Ontime time approvals
b. Too many steps and manual work/lists (entire process) Info directly to opty, no steps in email, or teams
c. Lack of information in the oppty, work done or not, delivery address
d. Lack of sensible spares stock, including long lead time items.
e. SLA Guillaume's team is too slow.
f. ERP software is not suitable, together with the rest of our tools (SFDC) relating to cost tracking and financial follow-up.
g. Availability of parts
h. SPE availability for spare parts support, validation of the reports
i. Not clear what has happened on site and what is the root cause. What parts are needed?
j. Process exists but there is no willingness to follow it. (same process as parts sales) (same as Badulescu process)
k. Manual collection of all costs

5. What is the second largest bottle neck?

a. –
b. Unclear responsibilities in the process, spare quotes can stay inside sales loop.
c. Waiting information from the factory, prices, and lead times
d. Software that is not talking to each other causes additional delays.
e. The purchasing process in service is missing.
f. Confidence of the build quality, and part availability during commissioning.
g. Bureaucracy to have the parts.
h. Local resource availability (local FST's)
i. Work order closure.
j. External sourcing and purchasing done outside of any system (ERP)
k. Late technical reports and hour checks.

6. What is the third largest bottle neck?

a. –

b. Uneven sales resource management. All sales should sell service products. High loads on individuals
c. Availability of colleagues/information
d. Roles and responsibilities are unclear in the flat organization.
e. Spare parts stock should be owned by service.
f. –
g. Lack of training for the FST, etc.
h. Availability of parts on site
i. Reporting writing and storing/sending it.
j. We are doing jobs but not collecting PO's (opty/case)
k. Quote preparation is too slow. Because of possible incorrect data input in SFDC