Kristina Ranta

Developing Quotation Process through Extension of ERP

Acquiring Quotation Module

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Tämän kehittämishankkeen päämääränä on kehittää tarjousprosessi varaosamyyntitiimille. Prosessin kehittämistä on tarkoitus viedä läpi toiminnanohjausjärjestelmän laajennuksen kautta, jolloin laajennuksella tarkoitetaan tarjousmoduulin käyttöönottoa. Tähän asti varaosatiimillä on ollut käytössä ainoastaan tilauskäsittelymoduuli toiminnanohjausjärjestelmässä.

Tavoitteena on aloittaa toiminnanohjausjärjestelmän tarjousmoduulin käyttö, jolloin tarjoukset aina tehdään samalle pohjalle ja tarjouksiin tulee sama viitenumero kuin kaikissa muissa varaosamyynnin dokumenteissa, joita on tulostettu toiminnanohjausjärjestelmästä tähän asti.

Varaosamyynnin tarjousprosessin nykytila on se että tarjouksia on tehty ja lähetetty sähköpostitse tai asiakkaiden omien Web-portaalien kautta. Tällainen tapa ei tarjonnut toimeksiantajayritykselle mahdollisuutta seurata koko toimitusketjua, alkaen tarjouksesta toimitukseen asti koska toisin kuin tilaukset, joita on syötetty toiminnanohjausjärjestelmään, tarjouksia ei ole tehty toiminnanohjausjärjestelmässä vaan lähetetty sähköpostitse ja sitten tallennettu verkkolevylle. Tämä tapa tehdä ei antanut mahdollisuutta kerätä tarjouskantatietoa, jota olisi voinut käyttää raportoinnissa.

Tämän tutkimuksen tulos on se, että toimeksiantajayritys sai tarjousprosessille läpinäkyvyyden ja selkeyden sekä nykyisille että tuleville uusille työntekijöille. Tarjoukset voi nykyään hakea suoraan toiminnanohjausjärjestelmästä ja tarvittaessa rakentaa olemassa olevasta tarjouskannasta raportit, joita voi käyttää ennusteena tuleville tilauksille.

Keywords	toiminnanohjausjärjestelmä, tarjous, prosessikehitys, Kaizen, standardisointi, seuranta, toimitusketju

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The objective of this Master's thesis was to develop the quotation process for the spare parts sales team. The development is implemented through an extension of the Enterprise Resource Planning (ERP) System that means acquiring a quotation module to complement order management module that had been in use so far.

Current state of spare parts quotation process was that quotations had no standard template because they have been not submitted in ERP-system as same as spare part orders. Quotations have been done whether through e-mail or customers' own Web-portals. Such manner did not allow case company to monitor whole supply chain from quotations to delivery because quotations are not stored in a system but are saved on PC drive that does not allow to have a consolidated material to be used for reporting needs.

The desired outcome of this research is to start using quotation module and submit quotations in ERP-system. Thus quotations will obtain professional looking format and a reference number that is seen in all spare part sales documents, printed out from ERP.

The outcome of this research is expected to help case company to have a transparent spare parts quotation process. This Master's thesis is also intended to make quotation more clear and easier to follow up not only for the existing employees but also for new team members. Along this Master's thesis work the instructions will be issued and they will be used for training new employees.

The implementation of this change in quotation process was done in Kaizen-event format.

Keywords	ERP, quotation, process development, Kaizen, standardizing, monitoring, supply chain

Contents

1 Introduction

The topic of this research is developing quotation process for spare part sales team. This research is conducted for company that is operating in fire technology business by offering protection solutions for land and marine applications around the globe. Along way of this research there have happened major changes in company's operation processes and also in my own career. These changes have affected the research schedule as well as the research outcome. The aim of this research was to develop spare part quotation process by shifting from Excel-sheet quotations to ones that would have been submitted in Enterprise Resource Planning -system (ERP) that has so far been used for order management. This new way of quotation through ERP was planned not only to unite quotations and orders in one system but also to improve spare part quotations' visibility as being submitted in ERP, quotations can be then traced unlike quotations sent in Outlook-format and then saved in project folders on computer drive.

1.1 Research Scope and Limitations

First step of this research was extending ERP -system. By acquiring quotation module to complement already used ERP order module. Main idea behind this research was to consolidate quotations and orders in one system and compare original quotations with new ones submitted in ERP. It was thought that through this change in quotation process spare part sales team will establish leaner quotation-order-process as well as an opportunity to monitor and analyze the whole spare part sales supply chain.

This research will study development of performance measurement system through ERP extension in aftersales division, mainly for spare part sales team's needs. Case company's business areas are divided into marine and land applications. All along company's existence, business had been run predominantly for marine applications. Naturally marine department has bigger volumes also in aftersales activities compared to land. Until 2014 year, marine had handled spare part sales for both marine and land applications. The intention is to start making spare parts quotations for both, land and marine applications. There is only one person handling spare part sales for land applications and five persons responsible for spare part sales in marine. Land and marine departments have different business models but using same internal processes and tools. To set a better focus, in this research reader will get acquainted with case company's an organization

only in regards of marine business and further spare part sales for marine applications. Chapter 1.3.1. discusses case company more in details. This research work is conducted for case company aftersales that cover for spare part sales, maintenance and technical support services in company's marine department. Research topic is embracing only spare part sales team's performance, excluding maintenance and technical support teams.

1.2 Own Role in Organization and Research

I am performing as a spare part sales coordinator in a spare part sales team that consists of 6 persons, including myself and my supervisor. My main responsibility is quotation-to-delivery process of spare parts for marine applications. Main tool, which I use in my daily work, is ERP-system. Until the beginning of this research case company has used ERP for entering project material and spare part orders as well as for production and invoicing activities. This research is mainly aimed at trying to make sales processes in case company leaner by adding also ERP quotation module into use. I would like to study the possibility of acquiring a quotation module in ERP and thus standardize the quotation process and link it to the order processing in this same ERP-system. As a searcher I am going to find out if this change in quotation process will enable to make my team's daily performance easier to monitor measure and analyze. Conducting an action research always involves engaging people from an inside of the organization (Somekh 2005, 6-7). As researcher my responsibility is to engage other stakeholders, who's participation is truly relevant for this research project. Further chapter will discuss Case company as a company.

1.3 Case Company

Case company is performing in fire protection technology business and offers fire suppression solutions for marine and land applications. There is a wide variety of services, offered to customers all over the world: service contracts and packages, spare parts (aftersales), upgrades and 24h emergency service. Case company employs 400 people, has its headquarters and factory located in Finland. Case company also owns subsidiaries in Europe and has a distribution network around the globe.

Customers of case company can be divided into three segments: marine and offshore, building and constructions, industry and energy. As previously mentioned case company is offering firefighting solutions for marine and land applications. Marine department is

mostly selling directly to customers and manage their sales from headquarters in Finland. Land department has more complicated business model because it is divided in separate business units in different countries and also has global distribution network. However, both departments are following almost same internal processes and both use same tools. (www.casecompany.fi.)

Further there will be described marine department's work divisions.

1.3.1 Case Company Marine

Case company's marine customers are different types of vessels (luxury yachts, passenger cruise vessels, supply vessels, navy vessels etc.) and offshore platforms. Case company marine consists of following divisions: new build sales, project management, upgrade sales, warranty and aftersales & services. Supply chain of case company marine is described in Figure 1.

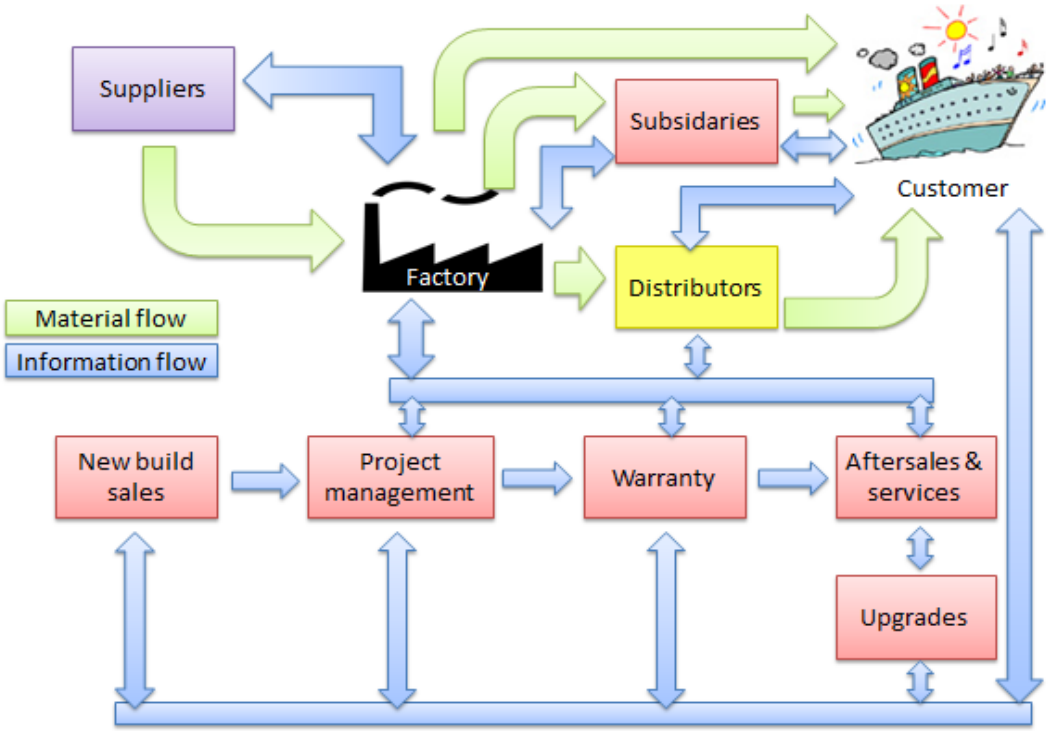


Figure 1. Case Company Supply Chain

Marine business strategy is based on three pillars:

1. Creating enhanced safety to customers by providing globally competitive, reliable and technology-edge system solutions.

2. Maintaining system lifecycle by providing project execution, expert services, system upgrades and spare parts efficiently over whole system lifecycle.
3. Improving customer satisfaction through streamlined processes with positive and proactive customer care. (www.casecompany.fi.)

In next section case company's aftersales department will be briefly gone through and this is the department, where this research is planned to take place.

1.3.2 Case Company's Marine Aftersales Department

Marine aftersales include several subdivisions, illustrated in below figure 2. Each of them plays an important role in aftersales supply chain.

Figure 2. Marine Aftersales Department

Sales team is responsible for periodical different service package sales. Service team is responsible for arranging the schedule and service engineers for the service. Spare parts team is selling spare parts upon the request, supplying spares, offered in service proposals and making spare part package offers for customer's stock. Technical support is providing their expertise internally as well as communicating directly to customers.

Maintaining system lifecycle is one of the strategic objectives in case company. However, it has been often noticed that when project is handed over to Aftersales division, there is

no opportunity to monitor all customers' touch points. Case company's aftersales has a great potential as demand for spare parts and system maintenance is continuous. It is relevant that case company would start to monitor and measure aftersales processes more effectively to generate more profit.

Aftersales services usually generate higher profit margins than those ones obtained with the product sales. Turnover generated from aftersales services may considerably exceed one of the original purchase during a given product lifecycle. Offering customers aftersales services is also a powerful marketing force for establishing a durable customer loyalty and promoting the company's brand. Being main strategic driver for ensuring long-term revenues, customer satisfaction and retention, aftersales services require close monitoring and measuring of its activities along the services chain, thus ensuring a proper balance between business and operational objectives and their assessment. (Cavalieri & Gaiardelli & Ierace 2007, 436.)

Aftersales business in case company generates stable sales because system has to be maintained according to system maintenance manuals and safety regulations of different classification societies.

Customers trust in case company's strong technical expertise. Aftersales' main weakness is that there is no integrated system to manage all processes and thus enable effective performance monitoring and analysis. Each process requires using multiple sources, which are not communicating with each other.

Being one of the companies leading the market and possessing strong technical knowledge, case company aftersales has a great potential to extend sales and ensure customer retention by establishing more effective performance monitoring and measuring system. At the moment there is no effective measurement, which would provide an overall picture of performance of aftersales department nor there such one for any of the team within the department. Further chapter will discuss the problem this research is intended to solve.

It has been discussed in scope and limitations section that this research is aimed at improving performance of spare parts sales in marine division. Main task of spare part sales team is spare parts quotation-, order- and delivery monitoring processes, where

correct spare parts have to be identified, quoted and delivered to customer. This research is aimed at developing spare part quotation process, which is one of the core processes. Next chapter will discuss current state of spare part quotation process.

2 Research Problem

Research problem is development of quotation process through extending ERP system. Extending ERP would mean acquiring additional modules, which in this case would have been acquiring quotation module. So far case company have used ERP-system for order processing, logistics and invoicing. All these three activities are processed through ERP modules, for example sales order module for order processing. There is a quotation module as well existing in ERP. However, quotation module was never taken into use. Spare part quotations are made via e-mail with copy-pasted Excel-rows with item description and prices and then saved in Outlook-format. This means that there is no traceability or transparency of the quotation process system wise. One can easily trace sales order but there is no such opportunity for quotations. Whenever, there is a need for summary or analysis of number of sent out quotations, this would create huge manual work as all spare part quotations are saved in different project folders and there are hundreds of them.

This thesis work is aimed to take ERP quotation module into use and study its impact on aftersales activities in comparison with current state of quotation process, where, quotation are not made in ERP as same as sales orders. Submitting spare part quotations in ERP would first of all create a clear standard process, where all quotations will be sent on same template that is almost identical to sales order template and has same reference number. ERP-quotations will link quotations and orders in ERP and thus make whole spare parts supply chain visible and whole spare part sales pipeline leaner. This in turn would enable Case company aftersales to measure and analyze their spare parts business more effectively and even make demand forecasts. In next section there will be discussed the benefits, which can be generated from ERP-system.

2.1 Enterprise Resource Planning (ERP) and its Benefits

Enterprise Resource Planning (ERP) is core software, which companies use for integrating and sharing the information in every business area. ERP enables companies to

manage their processes through common database and reporting. ERP provides integration of functions across whole enterprise as well as makes possible for companies to connect their process with ones of their customers and suppliers. (Monk & Wagner 2013, 2.)

As it was discussed in previous section, the problem to be solved is current quotation process, which is not visible in system and thus is difficult to monitor. Submitting quotations in ERP would make spare part sales process leaner as whole spare part supply chain would be in one system. Further few sections will discuss some of numerous benefits of ERP.

2.1.1 ERP: Information Flow

From an overall business standpoint, there are numerous objectives, which can be achieved with ERP system. These objectives include maximizing the information flow, reducing response time to customers and enabling efficient decision making through timely and important information. Moreover, ERP is making whole supply chain efficient by supporting it with real-time information flow. In sales, gaining efficiency through ERP can reduce lead times and improve overall responsiveness to customers' needs. ERP provides widely available information enabling company to get cross-functional access to the same data for planning and control. (Sumner 2004, 4-5.)

Sharing data across the enterprise provides many benefits like automation of the processes, access to the relevant information for better decision-making and better response time. Enterprise Resource Planning (ERP) is divided into three important factors. ERP is software, which helps organization to share the information across all functions and thus keep business processes effectively managed and organized. ERP systems enable control over information and make business transactions standardized. Standardization and data sharing makes organizations perform more efficiently and creatively (Aswathappa & Shridharabhat 2009, 620-622.)

There would be an access to information on how many quotations are submitted and to which customers in certain period of time as well as how many quotations are still open. Further, waste work can be analyzed for reasons on which spare part quotations haven't led to purchase orders. Additionally, time stamps on quotation response time could be made directly in ERP, not in separate system as it was mentioned previously. ERP quotations set an opportunity to set more effective spare part sales demand forecast for

factory as in the long run Case company aftersales can gather the data on customers' whose requests mostly lead to purchase orders.

ERP creates the connection between interrelated processes, which provides every employee with quick and convenient access to the important information. Access to relevant information creates an opportunity to analyze the performance and make business decisions accordingly. (Aswathappa & Shridharabhat 2009, 624.)

2.1.2 ERP: Performance Measurement and Reporting

To make analysis one has to create efficient measurement reports. Forslund found that to produce valuable performance reports, many companies have to first transfer the data from ERP to another tool for further processing. However, it is not necessary to move the data and reports can be produced in directly in ERP. (Forslund 2010, 356.)

Table 1 shows typical metrics and reports, which can be derived from ERP-system.

Table 1. Summary of Performance Measurement Tools (Hamilton 2002, 348).

AREA	PERFORMANCE MEASUREMENT	
	TYPICAL METRIC	TYPICAL REPORT
Procurement	Quality, Delivery, Price	Vendor Performance, Subcontractor PO Variances
Production	Quality, Delivery, Costs	Actual vs Estimated Costs, Efficiency Reports
Shipping	On-Time Shipping %	Shipping Performance
Inventory	Inventory Accuracy %	Cycle Count Report
Field Service	On-Time Delivery % Customer Satisfaction	Delivery Performance Actual vs Estimated Costs Efficiency Reports Cutomer Survey Results
Customer Service	Valid Delivery Promises Customer Satisfaction Returned Goods	Customer Survey Results
Engineering	Bill Accuracy % Routing Accuracy %	MO Variances Manual Audits

Report generator tools like QlikView or Excel are effective in combination with ERP as more customized reports can be made. It has been also found out that by using automatic report generation, companies have better performance compare to those companies, which use other system than ERP to create their reports. Forslund assumed that companies, which make performance management as their priority, are usually willing to invest in automatic report generation. Companies have to possess effective reporting capabilities to effectively measure their performance. (Forslund 2010, 356.)

Performance metrics is one aspect of quality management. Performance metrics as well as reports typically vary by functional area such as procurement, production, inventory, customer service and the like. An ERP-system enables summarizing detailed data across enterprise. (Hamilton 2002, 347-348.)

Extending ERP and adding a quotation module would enable generations of different reports, which are tailored for aftersales purposes. Lead time between quotations and orders as well as quantity of open quotations per certain period could be measured and analyzed. Thus workload could be spread in more efficient way.

Case company Aftersales could also measure the efficiency (heat) rate as well as the profitability of each customer by comparing number of requests against number of purchase orders. Submitting quotations in ERP can provide a certain standard for quotation process. At the moment most quotations are made in e-mail, therefore it is difficult to standardize them.

2.2 Research Objectives

Main objective of this research is to standardize current spare parts quotation process by starting to submit quotations in ERP-system. Spare parts quotation process will gain visibility in a system as same as spare part sales orders. Another objective is to start measuring the performance in regards of quotation process, which has been so far measured quite insufficiently. Submitting quotations in ERP would enable workload tracking, making sales forecasts and even calculating sales heat rate. By calculating heat rate case company could define their efficiency, meaning that number of quotations could be compared with actual sales. There is also an intention to monitor quotation response time straight from ERP and stop using current response time-system, mentioned in chapter 2.

2.3 Research Questions

Below I am asking the questions, which I hope this research will help me to answer.

1. Will acquiring of quotation module add a real value to the spare part team's work and make it leaner?

This research is conducted to study if submitting quotations in ERP is a better way of managing a quotation process.

2. Does it require any additional resources to adapt the quotation module accordingly the spare parts team's requirements?

Quotation module already available in ERP and there will be no cost inquired to get the license. So far, acquiring the module requires rights, which can be issued by ERP key user. However, there might be particular modification needs as well as combining ERP with another program (e.g. QlikView) to derive best possible reports.

3. To which extent can quotation module improve reporting and measurement of spare part team's performance?

To answer this question, spare part sales team and its supervisor first have to map their needs. List of needs will be then presented to ERP key user for review and possible implementation. Case company Marine Sales Head will also review the list and make his comments on the sales reporting needs. There might be a need to combine ERP quotation module together with another tool such as QlikView, which requires license.

3 Conceptual Framework

There are numerous theories, which discuss the business performance, business monitoring and measurement as well as efficiency improvement. Theories that have been chosen for this conceptual framework are Business Performance Measurement and Lean Management. In this chapter there will be the definition of each theory and also the benefits that organizations could get in their businesses by applying the fundamentals of these theories.

3.1 Business Performance Measurement

Andersen defines measurement as an important part of improvement of business processes, because it provides information about process structure and results this particular process delivers. Andresen states that to assess the performance measurement in an organization one has to know the current state of the process, which is meant to be measured and improved. (Andersen 1999, 31.)

Meaning of metrics is often misunderstood as there are many different terms related to metrics such as key performance indicators (KPIs), process outcomes and results. KPIs are outcome metrics used on higher level of the organization. Often metrics are confused with objectives. However, objectives mean something, which company is striving to achieve and metrics are used to check whether these objectives are achieved. (Okes 2013, 19.)

Okes has described metrics, which can be used for various needs:

1. Monitoring outputs of process, organization or system.
2. Monitoring inputs of process.
3. Controlling the process in order to ensure the desired outcome.

Organization has always different objectives and metrics are derived to ensure that these objectives are achieved. Performance of a process or entire organization can be monitored by metrics on strategic or operational level. Strategic level metrics cover for market place performance, financial performance and innovation or agility. Operational level metrics are responsible for monitoring quality, cost of resources, operational cycle time. (Okes 2013, 20.)

Below figure 3 illustrates steps of designing performance measurement process, offered by Bjorn Andersen.

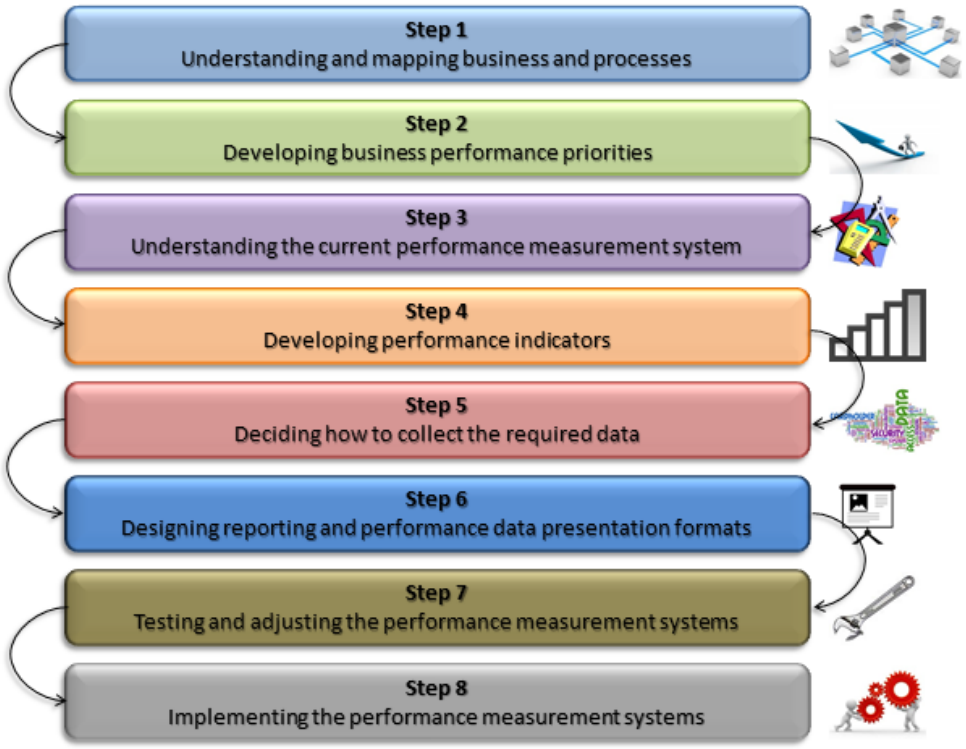


Figure 3. Performance Measurement Design Process (Andersen 2007, 69).

According to Okes, it is important to establish metrics in order to ensure that organization's processes are aligned with its strategy. Okes also states that managing an organization is equivalent to managing a system and each system is consisting of components. When it comes to an organization, the components are processes. Plan-Do-Check-Act (PDCA) cycle can be used for managing whole organization or just some single process. Plan stage might be strategic or departmental plan, managing detailed activity or preparing an instructions list. Then follows an implementation or Do phase. Check phase is measuring certain activity(s) to know whether all is working according to what has been planned. By collecting the data on the progress of planned activity(s), one can take an action(s) and that would be an Act phase. (Okes 2013, 1-3.)

Similar to previously offered Okes's theory, Wouters and Sportel state that there are at least three phases, in which development of performance measurement system can be divided: design, implementation and use. Key objectives and designing measures are identified in design phase. In the implementation phase, systems and procedures are

put in place to collect and process the data that enable the measurements to be made regularly. In the use phase, measurements are reviewed to make sure that whether operations are performed in a manner, which support the purpose of the project. (Wouters & Sportel 2005, 4-5.)

Andersen has outlined typical dipole characteristics of performance indicators. He compares hard versus soft indicators. Typical hard indicators are time and cost spent on some process. These indicators are easily measurable. Quality and customer satisfaction are considered as soft indicators, the measurement of which is indirect compared to hard indicators.

Performance measurement can be done by using financial or nonfinancial indicators. Financial indicators are focused on monetary value; typical examples are profit margin or capital turnover. Nonfinancial indicators have such measurement units as number of complaints or innovation rate. Additionally, there are leading and lagging indicators. These two indicators are mostly used to show the difference between Western and Japanese management. Western management is focused on results and their measurement, when Japanese managers value sound processes, which they believe will give desired results.

Andersen points out that using only one performance measurement dimension can result in inadequate measurement results. Balancing different measurements will enable to get more precise performance picture of an organization. (Andersen 2007, 70-74.)

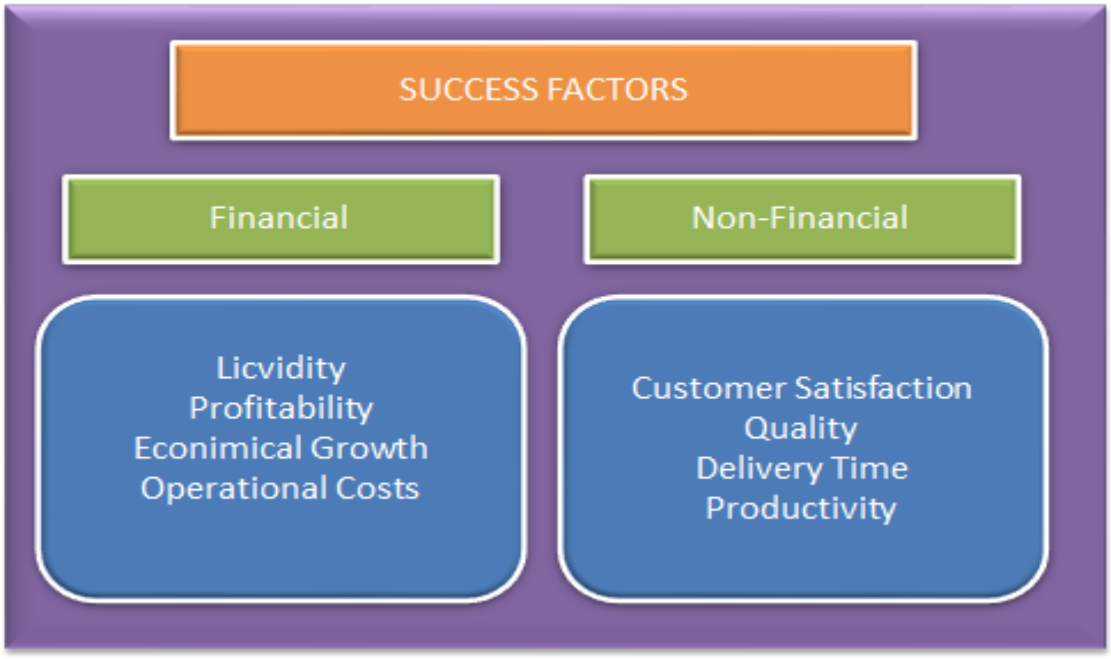


Figure 4. Success Factors for Performance Measurement (Lönnqvist & Kujansuu & Antikainen, 22).

Lönnqvist, Kujansuu and Antikainen describe business performance as an ability of an organization to gain its objectives. Having many dimensions, when measuring business performance one has to take into account all organization's stakeholders and their needs. Business performance is measured by success factors, which are divided into financial and non-financial. Below is the chart, where examples of such success factors are presented in figure 4. This model has similar base as one, presented by Bjorn Andersen on page 12.

Previously in this chapter different authors have discussed the meaning of performance measurement and principals, which organization should use to choose the right metrics. Further we will discuss different measurement models, developed based on these similar principals, discussed previously.

3.1.1 Balanced Scorecard

Performance measurement theory discusses a lot the balanced measurement, which means that organizations should review their competitiveness and success from different angles. Following this balanced measurement theory; organization should perceive customer satisfaction, employees' dedication and internal productivity equally with financial results. There are financial and non-financial, as well as hard and soft metrics, which are

equally used in balanced measurement model. The most known balanced measurement model is Balanced Scorecard (BSC), created by Robert Kaplan and David Norton in 1992 (Lönnqvist & Kujansuu & Antikainen 2007, 34).

BSC is suitable not only for management control system but should be used also for communicating the strategy and objectives to the employees. BSC metrics are derived from vision and strategy of an organization. Usually metrics are reviewed from four different aspects: finance, customers, processes as well as learning and development. Financial indicators tell about past, customer and process indicators discuss present and learning and development are concentrated on the future. (Lönnqvist & Kujansuu & Antikainen 2007, 35-36).

3.1.2 Navigator

Navigator-model was created by Edvinsson and Malone in Swedish Scandia in 1997. This model is created for management but Navigator is also good model to control and combine metrics as well as tell about status, direction and agility of an organization. Navigator has similar feature as BSC. One of such difference is that Navigator is measuring immaterial capital or intangible assets. Intangible assets are those non-physical things, which organization is benefiting from in the future. Intangible assets are related to organization's resources, practices, stakeholder relationships, and employees' professional knowledge. Navigator's meters model is based on five points. First four are the same as in BSC (financial, processes, customers, development) but the fifth one is considering people. People-dimension is one of the centric points in Navigator model and has an impact on the rest four. This dimension includes professional knowledge, experience and creativity of the employees. (Lönnqvist & Kujansuu & Antikainen 2007, 37-38.)

3.1.3 Meritum

In Meritum-project there have been created own measurement model that is used for controlling different intangible factors of the organization. Basic idea of this model is that first organization has to recognize and measure its intangible assets, after which a course of actions is created to develop these assets. After certain period, same measurement is repeated. Thus model consists of three phases. First phase is recognizing the intangible assets of an organization through defining related strategic objectives. Second phase is defining the performance, which is related to intangible assets. Last

phase is planning supportive actions to monitor the performance, related to intangible assets. (Lönnqvist & Kujansuu & Antikainen 2007, 38-39.)

3.2 Lean

In today's business world, every manager has at least a basic understanding of lean. However, only few organizations have really achieved lean in their business. Lean is not a tool but the way of thinking, used to review your business, whether it is manufacturing, service or any other field, where the supplier and customer (receiver) are involved. The duty of lean thinking is identifying waste from customer's point of view and then creating the actions to eliminate it. (Trent 2007, 3-4.)

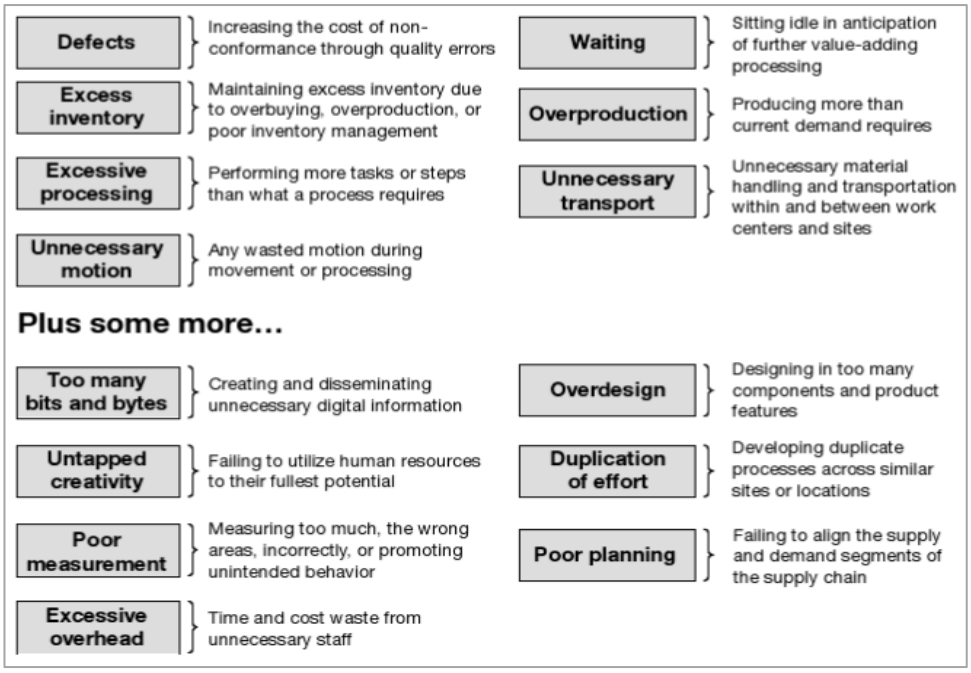


Figure 5. Sources of Supply Chain Waste (Trent 2007, 13).

Flow means organizing work, which would flow in an uninterrupted manner, which is at the same time adds value to the customer. Unlike in push system, where actions are taken based on the anticipation of request, pull means that there should be a real signal from downstream entity to upstream operations that action is needed. The evidence is however that only few organizations are able to operate in a completely pull environment, because most organizations are not able to build the operations effectively and establish pull signals across whole supply chain. Striving for excellence means that lean's intention is to achieve zero defects. (Trent 2007, 6-8.)

3.2.1 Value Stream Mapping

Value stream management (VSM) is responsible for planning and linking improvement ideas by systematically collecting and analyzing data.

VSM's structure consists of eight steps:

1. Commit to Lean.
2. Choose to Value Stream.
3. 3. Learn About Lean.
4. Map the Current State.
5. Identify Lean Metrics.
6. Map the Future State.
7. Create Kaizen Plans.
8. Implement Kaizen Plans.

The main duty of VSM is to help organization to achieve lean. VSM is about planning the improvements for processes in the organizations by involving people, who are relevant stakeholders in these processes. Additionally successful VSM requires careful collection of information related to the processes that are going to be improved. Collection of information might involve different forms, worksheets, templates, checklists.

VSM applies storyboard tool that is a poster-sized framework that is used to show all information relevant to plan a lean implementation. Storyboard should cover for eight VSM's steps, their goals and progress. Participants of VSM adds information to storyboard during each of eight above mentioned steps in order to build up a shared document of what has been done and is planned to be done. (Tapping & Shuker, 8-9.)

3.2.2 Six Sigma

Six Sigma is a new name for old vision, the purpose of which was to deliver to customer services and products that are close to perfect. Six Sigma means statistically zero defects and at the same time vision and strategy for achieving this zero defect situation. Six Sigma puts customer first and uses only facts and information that help to drive the organization towards better decisions. The idea behind Six Sigma is to improve organization's all areas so that customers', markets' and technologies' needs are fulfilled in such manner that employees, customers and shareholders also benefit from it.

Six sigma's results are affected by factor that can be divided into four areas:

1. Improved customer satisfaction.
2. Shortened lead time.
3. Minimized biases.
4. Minimized no-value-adding work.

Improvements in these four areas usually bring dramatic cost savings and opportunities gain new customers, win new markets and revenue growth. There is often a correlation between these improvements and measurement tool called sigma.
Sigma (σ) is Greek letter that is used in statistical mathematics to show standard deviation. Standard deviation is measuring how far measurement results are from mean. Sigma or standard deviation tells how much there is a variation in among the results. Using statistical terminology Six Sigma's duty is to minimize the variation in order to achieve smallest possible standard deviation. Small standard deviation in turn would help to provide customers with products and services that fulfill their needs in best possible way.

Six Sigma is not just statistical term but also benchmark dimension and philosophy. This dimension is measuring how much not-allowed deviation can occur in allowed deviation intervals. Six Sigma is dynamic and evolving system that can have a considerable impact on organization's business activities.

3.2.3 Performance Benchmarking

Benchmarking original definition is "predefined position, used as a reference point for taking measures against". However, in business world benchmarking means "a measure best-in-class achievement recognized as the standard of excellence for that business process." Simply saying benchmarking is learning from others. Benchmarking is applied as measurement of performance level against your competitors

3.2.4 Kaizen

Kaizen means continuous improvement. As an improvement Kaizen can be applied in personal life, social life, home life or work. Applying Kaizen at work means involving everyone, like managers and workers in continuous improvement. According to Imai's book, "Kaizen is everybody's business." Kaizen strategy comes from Japan, where it is

considered as the key to Japanese competitive success. Many Japanese companies have achieved success in design, manufacturing, marketing by using Kaizen strategy. If company is intended to keep the business and grow, both innovation and Kaizen are important. According to Imai, Kaizen starts when company recognizes that there is the problem to solve. (Imai 1986, xxix-xxxii.)

Kaizen is focused on processes, because improvement must start from process to get an improved outcome. Kaizen is also focusing on people by concentrating on their efforts to make an improvement. This is just the opposite of the way of thinking of Western managers, who are mostly result-oriented. (Imai 1986, 16.)

First principal of Kaizen suggests that management should concentrate on sound processes and on control of these processes. Getting good results means improved processes and improvement can only be done if processes are understood and controlled. Monitoring and controlling variables of processes requires active involvement of stakeholders. Second principal of Kaizen recommends to standards maintaining.

There are three characteristics, which follow with standardization of process:

1. Authorization and responsibility of individuals.
2. Learning opportunity, by transmitting, accumulating and deployment of experience from one employee to another.
3. Discipline.

Japanese Kaizen states that it is management's responsibility to motivate employees to follow the established standards in an organization. (Berger 1997, 110-111.)

Japanese executives reused the Deming wheel and called it the PDCA (Plan-Do-Check-Action) wheel to support Kaizen strategy. The PDCA starts with defining current state, during which data is collected and then used to plan a course of actions for improvement. Plan is implemented and then checked if there has occurred an improvement. If plan has been successfully accomplished, new methods are standardized and have to be practiced to ensure continuous improvement. According to Imai, through PDCA new standards are chosen and then challenged, modified and changed for better standards. (Imai 1986, 61-63.)

PDCA-cycle is used to standardize the process of visible and measurable improvement, which is linking improvements and standardized daily work. Employees' ideas are tested and results are evaluated by line management. If results are satisfactory, organization's standards are changed accordingly and PDCA-loop is closed. (Berger 1997, 111.)

Kaizen is meant to gradually, incrementally and continuously improve activities to create more value and minimize non-value-adding waste. The success of Kaizen requires complete workforce's commitment. Kaizen event or Kaizen blitz is an event, which has certain plan and structure. Kaizen event is created for solving an organization's problem, which has to be clearly defined prior to Kaizen event. In addition, before arranging the event, teams and leaders should be chosen, targeted improvement and measurements have to be defined and deadlines for actions have to be set. The benefits of Kaizen are not only continuous improvement but also its low cost and low risk. (Burton & Boeder 2014, 72-75.)

4 Research Approach, Methodology and Metrics

This section will discuss research approach and the theory that has been chosen as a base for this research work. In previous section 3 I have presented theories, Business Performance Measurement and Lean as well as tools that can be used in order to apply these theories in business environment. Both, Lean and Business Performance Measurement have similarities in their content. Main purpose behind these theories is gaining efficiency of processes for being able to provide value to organization's shareholders (customers) and thus achieving desirable financial results. For example, following balanced measurement theory; organization should perceive customer satisfaction, employees' dedication and internal productivity equally with financial results (Lönnqvist & Kujansuu & Antikainen 2007, 34). This can only be possible if organization is building up their business processes from the customer's point of view and at the same time making processes standardized, straightforward and easily measurable. Another purpose of applying these theories is developing business processes by eliminating waste in such manner that processes and their meaning in terms of organization's strategy are understood by employees. Thus, these theories not only speak for performance efficiency but also serve organization in creating the meaningful working environment for its stakeholders (employees) that are engaged in processes that are standardized, easily measured and controlled. Because both theories, Business Process Measurement and

Lean stand for continuity and repetitive actions that make it easier for organization to establish transparent processes with clear metrics that are aligned with the business strategy.

For this research work, where one of the key business processes is to be developed, I have decided to take an improvement initiative, where spare part quotation process will be developed by following Kaizen-event steps. In conceptual framework, there were listed tools that are applied in Lean for improving business processes.

First principal of Kaizen suggests that management should concentrate on clear processes and on control of these processes. Getting good results means improved processes and improvement can only be done if processes are understood and controlled. (Berger 1997, 110-111).

I have chosen Kaizen that is directly applicable for my research work, where business process has to be developed through standardizing that in turn reduces variation and thus provides an opportunity for effective measurement and monitoring. Since there were no any additional recourses given for implementation of this project, Kaizen is also good choice in terms of implementation costs as it has been discussed by Burton and Boeder, Kaizen does not involve high costs or risks.

Another reason of choosing Kaizen as a means for this research work is that Case company is applying own operating system, called ACE (Achieving Competitive Excellence) that has been built up from Lean philosophy and based on same principals of continuous improvement. Our owner company, and also we, case company are experienced in organizing Kaizen-events for developing business processes. In this research, I have built up the same structure of proceeding as it would have been in Kaizen-event, where all starts with planning and pre-work, current state, implementation, outcome follow-up and final conclusions. This structure also very well supports the structure of the thesis work. Further, in next chapter I will open up the definition of ACE operating system's elements, including tools that are used for developing the business processes and thus moving towards continuous improvement.

4.1 Achieving Competitive Excellence (ACE)

Achieving Competitive Excellence (ACE) is used throughout the case company's owner company. ACE operating system is aiming at building the bridge between actual results

and goals. ACE's content is very much equal to Lean philosophy. As same as Lean, ACE is a methodology that is focused on customer through its processes. ACE is aimed to achieve higher levels of customer satisfaction and business performance. ACE was first introduced to our owner company in 90's as a fusion of two philosophies and tool sets: "Quality First" from Yuzuru Ito, owner company's Quality Consultant during 1990's and "Flow (Productivity) First" from Taichi Ohno, the developer of Toyota Production System. ACE also uses process certification, the origins of which come from the teaching of W. Edwards Deming and Genichi Taguchi, who has created "on target with minimal variation" that became new definition for quality. (Case company intranet.)

According to ACE developing employee competency is to delight organization's customers, achieve business results and sustain organization's culture of continuous improvement. Competency consists of the essential ACE knowledge and skills. Employees get trained through ACP-ACE Training Tool and get themselves certified. There are three training levels in ACE certification program: ACE master, practitioner and associate. The latter one, associate is a basic level. There are also three ACE certification levels for an organization: bronze, silver and gold. Each ACE certification level whether it is an employee or whole organization requires fulfilling certain criteria of this level. ACE criteria are structured around 3 elements: organizational strategy, lean and robust processes and customer satisfaction and results. (Case company Intranet).

ACE assessment covers three general areas: metrics performance (scorecards), appropriate usage of the ACE tools and leadership commitment and employee engagement in the application of the ACE Operating System.

The ACE approach aligns decisions and recourse allocation with those activities that will generate the most impact on expectations defined by customer. ACE defines customers as all stakeholders in the business such as recipients of products and services (external customers), other groups within, who rely on the outputs (internal customers). ACE is applied in all site environments such as manufacturing, business process (including engineering and other functions) and field operations; however it is not "one size fits all". The core of ACE consists of three fully-integrated components: culture, tools and competency levels. (Case company intranet.)

4.1.1 ACE Culture

ACE culture is about engaging employees in process improvement with equal emphasis on quality and flow. ACE is encouraging to seek simple and visual approaches to process improvements. The core of ACE operating system is customer's feedback, by which the quality of organization is defined.

4.1.2 ACE Tools

The ultimate goal of our owner company is to strive for continuous improvement in order to deliver best in class products and services to its customers, while eliminating the waste and reducing the cost. Owner company is incorporating application of several ACE tools in order to improve the organization's processes and thus delivering best in class products and services.

Often these tools are complementing one another and thus are used two or more at a time. Further we will briefly go through all of the ACE tools that are presented on below figure.

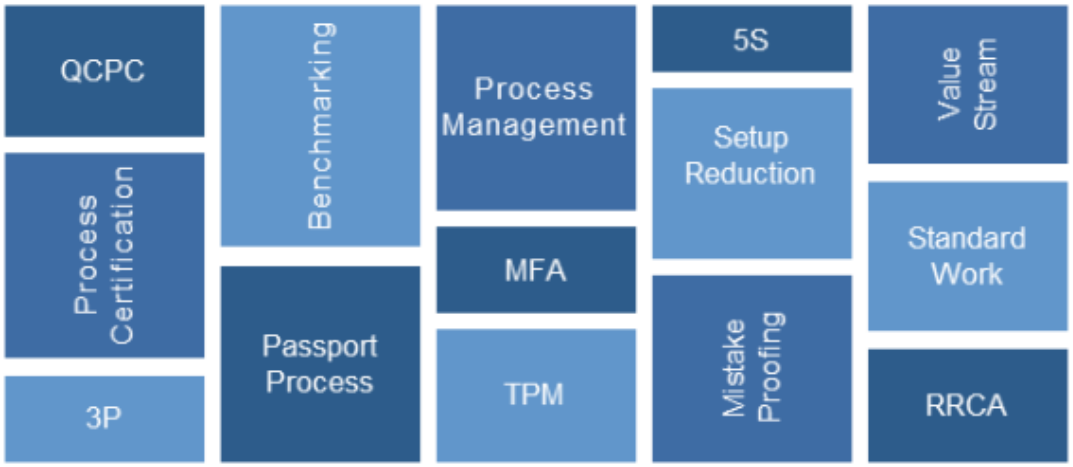


Figure 6.ACE Tools. (Case company Intranet)

QCPC – Quality Clinic Process Charts

This tool is created for recording the turnbacks that employees are facing in their daily work. A turnback is defined as anything that negatively affects quality of the process or creating a non-value added waste in the process. Collection and further analysis of turnbacks is helping to define process improvement process improvement priorities.

Benchmarking

Benchmarking is used to compare and measure organization's own processes, services and products against industry leaders to help the organization to become world class.

Process Management

Name of this tool is exactly describing its purpose. This tool is used for proactive improvement actions taken to make organization's processes effective and efficient. Process Management is used for elimination of non-value-adding activities, overburden and variation within organization's processes. Process management tool is created to maximize the utilization of organization's assets and reducing the cost of poor quality. This element of the ACE Operating System include such ACE tools as 5S; Value Stream (Process) Management; Value Stream (Process) Certification; Production Preparation Process (3P); Total Productive Maintenance; and Setup Reduction.

5S (Sort, Straighten, Shine, Standardize, Sustain)

This tool was originally created to ensure smooth efficient flow on the manufacturing floor but is nowadays also used in office area. This simple tool ensures the highest levels of employee engagement and customer satisfaction. Organization is applying 5S when there is a need for promotion of efficient workplace and favorable working environment to both employees and organization's visitors. Applying 5S-tool includes visual instructions posted in common working areas and this in turn enables easy access to information, parts, tools needed to get the job done.

Value Stream (VSM)

Organization is delivering value to its customers through creating a group of key processes that is called value stream. Value stream examples include order fulfillment (sales and installation), system/product development, information system management, product overhaul and repair, security service delivery, quarterly investor reporting, and personnel hiring. Value Stream Management is aimed at increasing customer satisfaction with the value of delivered products and services. Value Stream (Process) Management is a five-step procedure used for making organization's processes effective, efficient and agile through waste elimination and the standardization of work.

Value Stream Management is helping employees to distinguish relevant activities and opportunities across the organization. In a nutshell value stream management is mapping out the current group of key processes from start to finish and then plan future state with potential improvements through waste elimination.

Process Certification (Pro-Cert)

Process Certification (Pro-Cert) is applied when it is a need to reduce the variability in the organization's businesses activities and practices with suppliers. Process Certification is the method to measure the process performance through the application of statistical thinking so that organization is able, basing on the data collected to make rational decisions to improve and control the process. A certified process includes key process inputs (KPIs). KPIs are process factors that are related to the product or/and services (outputs) that are important to customer. Process Certification includes steps that have to be worked through in order to identify KPIs and output related key characteristics (KCs) together with issues that are critical-to quality (CTQ). Process certification is helping the reorganization to better satisfy customer needs through meeting product or process' standards or specifications.

Production Preparation Process (3P)

The Production Preparation Process (3P) is a simulation of new product's actual components, product and production line throughout its design and development cycle.

This tool is most valuable in project management activities as it is enables organization to eliminate waste in the project's earliest stage and thus reduce the cost that can be more considerable in the final phase of the project. This tool is useful and effective in developing business activities such as for example production planning that has certain customer requirements that have to be met.

Passport Process

This tool is a phase-gated review process aimed at ensuring the success of for example new product or service development, product or system modification, mergers and acquisitions, relocation of work, and infrastructure. Passport process involves board management that has to review the progress and make a decision basing on data presented on whether initiative is passing the gate and moves forward to the next gate, has to be reworked or it is a no-go case.

Market Feedback Analysis (MFA)

This tool is used when organization needs an insight on customer's expectations towards the organization's performance. Market Feedback Analysis (MFA) can be implemented through customer satisfaction surveys, interviews, routine interactions and communications. MFA is a tool that enables to build customer's voice directly into processes. MFA enables case company's owner company to gauge customer needs and, using other ACE tools, improve our processes. MFA is a tool for collecting information needed to address issues that may affect customer expectations. MFA helps organizations to effectively cooperate with external and internal customers to achieve, and possibly exceed, goals by highlighting the following:

- Accurate identification of a customer's requirements
- Definition of quality and delivery metrics
- Opportunities to add value to a customer's businesses

MFA involves the development of a repeatable and reliable process to collect and analyze customer input. Using MFA organization can identify the root cause of problems as well as review customer feedback related to year-to-year variations.

Total productive Maintenance (TPM)

Total Productive Maintenance (TPM) is a method employees in order to achieve maximum equipment effectiveness. It can be applied to manufacturing, support equipment or any piece of office equipment without a backup.

Mistake Proofing

Method to make sure any process or product improvements or changes are "mistake proofed." Mistake Proofing provides employees with an ability to create solutions that allow organization to work 100 percent defect-free. It requires the full dedication and common mindset from all the organization's employees that zero defects are desirable and achievable. Mistake Proofing identifies and eliminates the root causes of customer dissatisfaction, process inefficiencies, quality and delivery issues, and overall business goal shortfalls.

Standard Work

Standard Work simplifies and structures processes for their highest quality, productivity and repeatability with minimal waste. Standard Work is typically a written work that is

normally accompanied by a detailed process map of work process steps. This tool helps organization to make every process clear and easy to follow, even for the new employee. Standard Work also provides management with the process map about the current state of a process.

Relentless Root Cause Analysis (RRCA)
Relentless Root Cause Analysis (RRCA) is continuous review of product and processes and identifying breakdowns, failures or conditions that cause customer dissatisfaction, process inefficiencies, supplier quality or delivery issues or overall business goal shortfalls. RRCA finds encourage organization and its employees to ask why something happened more than once and helps to investigate the root cause.

4.2 ACE Kaizen

Improving processes by using Kaizen strategy is one part of ACE likewise in Lean. For documenting the research action points, progress as well as the actual outcome I was following same structure as it is for Kaizen-event (Kaizen blitz), which has to be in accordance with ACE operating system. Steps of ACE Kaizen event are described below in figure 8. It is allowed to deviate from the basic event content and steps might differ from the below described structure, depending on the type and scope of the event.

4.2.1 ACE Definition for Kaizen

ACE is defining Kaizen as taking organization's processes apart to understand then improving people's (customers') lives by putting these processes back together. As same as it was defined in chapter for conceptual framework, Kaizen is a philosophy, used in business for continuous improvement. Kaizen is focusing on quick and simple results through an application of intelligence and ingenuity. (Case company ACE, training material).

4.2.2 ACE Kaizen-Event

Case company already has an experience in arranging Kaizen-events to developing processes and thus further improving services for customers. However, it is the first time, when Kaizen will be applied for aftersales purposes.

ACE Kaizen-event is arranged mostly in the same way as it was described by Burton and Boeder in chapter 3.2. According ACE operation system's guidelines, prior to actual

event a need for Kaizen as well as Kaizen type has to be identified by choosing ACE tool(s). In this research work, it is a business process improvement through implementation of standard work and ensuring the validity of results by assessing MFA-questionnaires in the beginning and the end of this research work. (Case company ACE, training material).

In figure 7 there is an example of Kaizen-event steps, where prior to actual event there is a planning and pre-work phases that take actually longest period of time from the whole event scope.

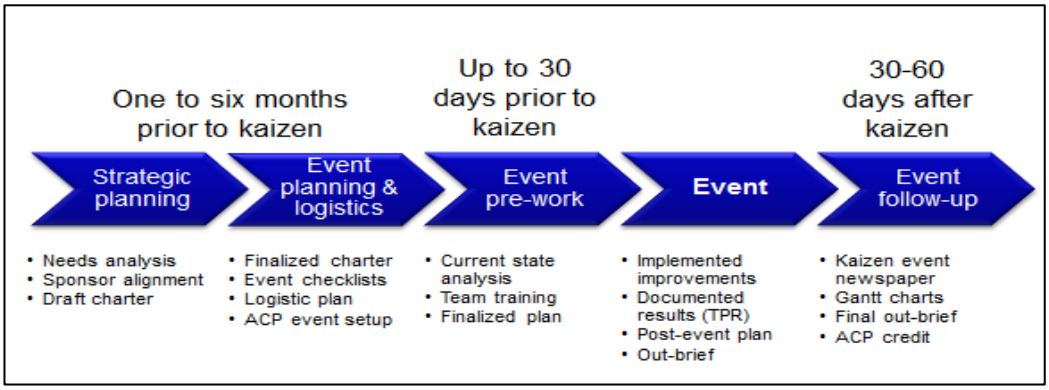


Figure 7.Kaizen Steps. (Case company intranet)

Event checklist covers all the necessary steps to get Kaizen event set up for success. Problem statement, objectives and measurements have to be defined. Further, event pre-work has to be done. Timing and duration of this stage depends upon the type of the event. In event pre-work stage participants have to formulate current state and challenges. Then the event stage follows, where mapping of future state happens. Additionally, action plan for improvement with schedule is done and responsible persons are named. Last stage is event follow-up stage, where results are checked and documented against the set objectives. The results must be repeatable and sustainable.

4.3 Research Metrics

It has been discussed briefly that one of ACE tools, Market Feedback Analysis (MFA) will be used as in this research. MFA will be assessed in form of a questionnaire that will be used first to map the current state and after actual job is completed as a measurement for the outcome. Therefore, it is planned to conduct a questionnaire in the beginning and end of the project.

Case company is using Webropol-survey tool to assess for example feedback surveys for its customers as well as for surveys inside the company for employees. Webropol will be also used in assessing questionnaires for this research. Seven scale selection questions as well as two open questions will be prepared to evaluate current situation of quotation process. After the quotation module has been in use and users have gathered an experience of new quotation system, same questionnaire will be repeated to make the conclusions on the result of this research. Questionnaire's answers will be gathered and presented in statistical reports, where one can see the score for each question as well as graphical comparison between previous and last questionnaire.

In this chapter I have presented ACE –operating system, used by my employer company as a base of all our business activities. There are clear similarities between Lean and ACE philosophies. As has been explained earlier in this chapter this research work will be implemented by going through Kaizen-event steps. ACE operating system includes 14 tools that are driving the same purpose as in Lean - continuous improvement and waste elimination. Since there can be several tools applied at once, I have chosen to use two: Standard Work and Market Feedback Analysis (MFA). Standard work for this research means that quotation process has to be reviewed in its current state along with its turnbacks and then future state has to be mapped together with a plan of actions. MFA is a second tool to be used in this research as it is stated in this chapter in MFA definition that it is useful to include the voice of employees in order to collect the information needed to address issues that may impact customer expectations. MFA is a good tool to collect and analyze internal data to build up a root cause for possible issues in spare parts quotation process that is repeatable and therefore has to have standard instructions list that is clear even for new employees that have to be trained.

Additionally, in chapter 2.3 I have defined questions that this research work is aimed to answer.

1. *Will acquiring of quotation module add a real value to the spare part team's work and make it leaner?*
2. *Does it require any additional resources to adapt the quotation module accordingly the spare parts team's requirements?*
3. *To which extent can quotation module improve reporting and measurement of spare part team's performance?*

The success of this research is measured also by how complete the research outcome is able to cover for the answers to the above questions.

4.4 Research Methodology: Action Research

Approach to solve the research problem is an action research. Nature of action research is that there is an integration of research and action, which undergo a cyclical process. Action research requires collaboration of stakeholders, whose knowledge and experience can contribute in conducting the research. These stakeholders as the researcher himself are from inside of an organization, whose process is a topic of investigation. Researcher together with other stakeholders collects the data on study subject from their day-to-day routines in order to develop working processes. Cyclical process of action research is ongoing because it engages cycles of collecting, analyzing and interpreting the data; planning a course of actions to achieve a desired change; evaluating the outcomes of taken actions and then further data collection until the desired outcome is achieved. (Somekh 2005, 6-7.)

In this research there is an intention to Standard Work method to make current quotation process simplified and structured to ensure the quality, productivity and repeatability of quotation process in the long run.

The intention of this research is to start using the quotation module and issue spare part quotations in ERP, while collecting the data from users prior to using quotation module by assessing MFA questionnaire. It is described in chapter 4.1.2. that MFA involves the development of a repeatable and reliable process to collect and analyze customer input. Case company is using MFA for external customers but also for its employees to get a feedback that may eventually affect customer satisfaction. Users of ERP quotation module will also provide their feedback until the next MFA questionnaire that is meant to finalize the results of this research work.

5 Kaizen – Spare Part Quotation Process Improvement

In previous chapter 4 we discussed general ACE Kaizen Event process and its phases. Further I will proceed by using Kaizen-event steps. However, the content of this research work has been slightly simplified versus of what is shown in Figure 8, page 30.

5.1 Planning and Pre-Work

Prior to taking any research actions, idea was discussed with marine spare part sales team and then presented to marine senior manager by using Power Point presentation, where current state and future state were presented. At that time, in 2016 marine department's senior manager has approved the idea and it was decided to proceed with this research project. Project participants were defined and the main participants were spare part coordinators including team supervisor as well ERP key user together with Lean transformation manager.

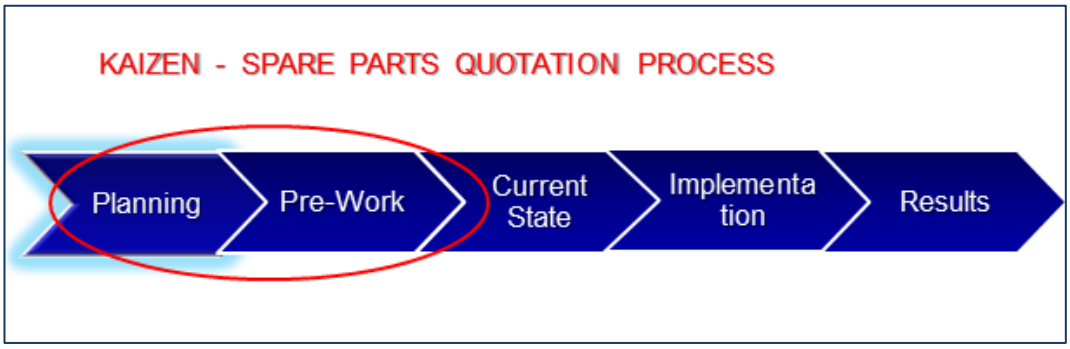


Figure 8. KAIZEN, Planning and Pre-Work Phase

Action list has been formed and responsibilities divided. List of actions can be seen on the table 2 below.

Table 2. Kaizen Spare Parts Quotation Process, Action List

Action Plan	Spare Part Quotation process	Current date:	1.1.2016	Legenda evaluatie	
Location:		Name:	Kristina Ranta	= Not yet started	= Ongoing, completed
Department:		Tel.:		= Ongoing, completed 25%	= Done
		E-mail:	kristina.ranta@casecompany.fi		

Action number	Date	Kaizen event	Action	Responsible person	Due before date	Status
1	1.1.2016	Spare Part Quotation Process Improvement	ERP Quotation Module - testing and costomization needs mapping	Kristina Ranta	April, 2016	
2	1.1.2016	Spare Part Quotation Process Improvement	First questionnaire to Marine and land spare part coordinators to define Current State	Kristina Ranta	May, 2016	
3	1.1.2016	Spare Part Quotation Process Improvement	Making Quotation Module Instructions	Kristina Ranta	May, 2016	
4	1.1.2016	Spare Part Quotation Process Improvement	Training and starting to use Quotation module and gathering feedback from users	Spare Part Coordinators(land and marine)	May-June, 2016	
5	1.1.2016	Spare Part Quotation Process Improvement	Building Sales Reporting System	ERP Key User/Kristina Ranta	Sep-Nov, 2016	
6	1.1.2016	Spare Part Quotation Process Improvement	Final questionnaire to get the feedback from users and to finalize the outcome	Kristina Ranta	May, 2017	
7	1.1.2016	Spare Part Quotation Process Improvement	Conclusions	Kristina Ranta		

The colors of on the right hand side indicate the status of progress in given list of research actions. The only action that has remained undone is implementing of sales reporting system. Conclusions of this research and in the same time Kaizen-event can be seen in section 7.

In planning phase of this research, ERP quotation module has been tested in a testing environment prior to making the instructions and training in order to take quotation module in official use.

First tests in January 2016 showed that ERP-quotations are visible to the production and warehouse and since they are almost identical to ERP-orders, it might have caused problems in distinguishing quotations and orders system wise. Therefore, there has been made a decision to keep ERP-quotations visible only to those, who use the quotation module - spare parts team. After first meeting, it was agreed to go through few more tests to check how the process goes in the stage of conversion of quotation into order. Conversion from quotation to order was tested by simulating different situations, like entering text in quotation phase and deleting this text before and also after conversion. At testing phase, it has been decided that sales terms and other important default text that was usually copy-pasted to the e-mail offers from Excel can be saved in ERP and then just added to the quotation template.

In next chapter we will go through current state of spare part quotation process as well as plan the future state by assessing a SWOT –analysis.

5.2 Current State Analysis

Further we will proceed with reviewing the current way of making spare part quotation.

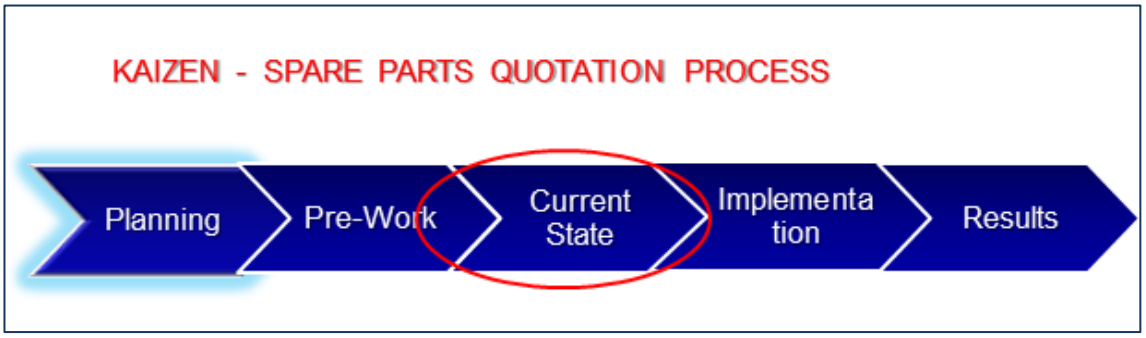


Figure 9. Kaizen: Defining Current State

Current process of spare part quotation is that quotations are not submitted in a system but are mostly done via Outlook or customers' own portals leaving no chance to trace them automatically through Case company' systems. Spare part sales team does have a step-by-step process of when quoting spare parts. Quotation steps are summed up in Excel sheet that has been created in order to train new employees. These Excel instructions cannot be included into this research as they include pricing information and also other details that are irrelevant for this research. Therefore, I have built up own process flow chart that is described in figure 10 on next page.

Each spare part sales coordinator has own named customers. Therefore process starts with request for quotation received whether directly to spare parts coordinator's own inbox or to aftersales general inbox, from which it is sent to the coordinator. In order to proceed with the quotation, coordinator has to check whether customer has an account in ERP and if there are no unpaid invoices or prepayment term, then quotation can be done. If customer does not exist, there is a need for new account opening. Practically, spare part quotation itself does not require customer account in ERP, because quotation is not submitted in ERP. Account check is done in order to trace customer's payment history as well as if the customer is an entity, whom case company, owned by USA-based company is allowed to sell their products. However, system wise this checking process can be skipped, because quotations are not entered in ERP, where customer accounts are issued.

After making that customer is existing in ERP and all terms are fine, there might be a need of spare part identification. This might be a case if customer is not familiar with Case company's item codes and has placed request with no item code (s).

There are two ways of submitting spare part quotation to customer, one is customer's own web-based portal and another way is to send the price via e-mail. Spare part prices are saved in yearly updated Excel macro sheet, which spare part coordinators use to submit their quotations.

There is a minor part of customers who use their own web-based portals and send their RFQ in hyperlink via Outlook. Web-based quotations are fast to submit by just adding the prices and other needed information to portal fields. Having web-based portal, cus-

tomers have identical reference number for their requests for quotation (RFQ) and following purchase order (PO). Submitted web-based portal quotations are then saved in PDF-format on case company's network drive in named folder.

It is shown in Figure 10 that last step of quotation process is entering quotation response time to separate system.

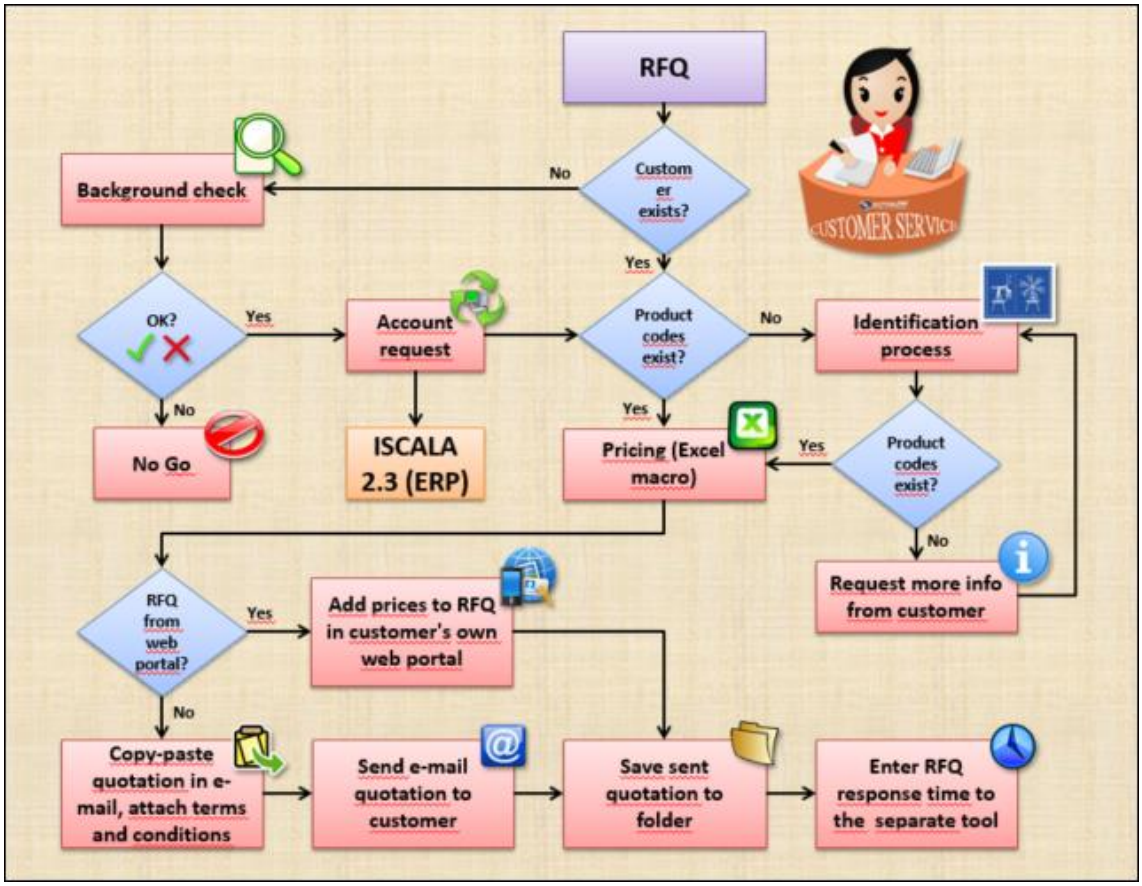
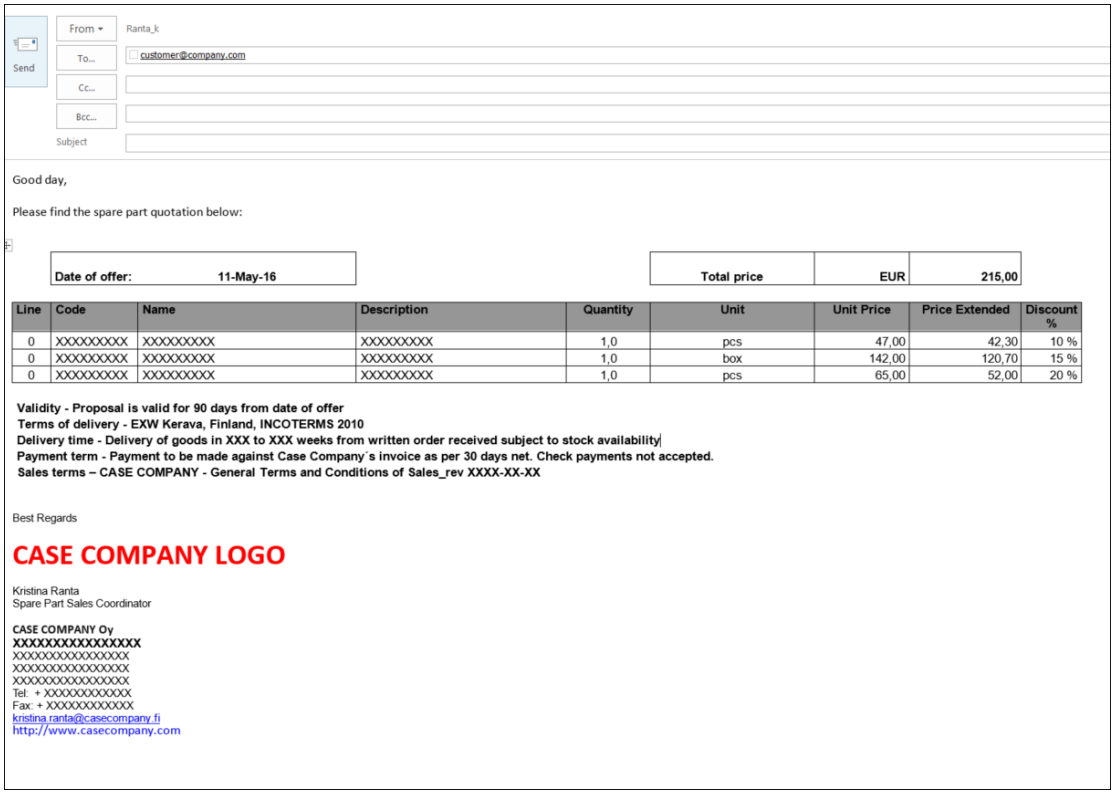


Figure 10. Case company Spare Part Quotation Process before change

Case company aftersales customers are divided into key and other customers. Quotation response time for key customers should be within one day and the rest customers should receive their quotation within maximum three days. Response time is entered in separate system basing only on whether it is key customer or other customer, meaning that there is no customer account information.

Processing requests for quotation, which customers send via e-mail is more time-consuming and is difficult to standardize. Pricing is first done in previously mentioned Excel macro-sheet and then copy-pasted in e-mail letter.

After quotation is submitted and sent to customer, it is then saved in e-mail format to folder in a network drive. Example of such quotation can be seen in below figure 11.



From ▾ Ranta_k
Send
To... customer@company.com
Cc...
Bcc...
Subject

Good day,

Please find the spare part quotation below:

Date of offer:	11-May-16				Total price	EUR	215,00	
Line	Code	Name	Description	Quantity	Unit	Unit Price	Price Extended	Discount %
0	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	1,0	pcs	47,00	42,30	10 %
0	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	1,0	box	142,00	120,70	15 %
0	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	1,0	pcs	65,00	52,00	20 %

Validity - Proposal is valid for 90 days from date of offer
Terms of delivery - EXW Kerava, Finland, INCOTERMS 2010
Delivery time - Delivery of goods in XXX to XXX weeks from written order received subject to stock availability
Payment term - Payment to be made against Case Company´s invoice as per 30 days net. Check payments not accepted.
Sales terms – CASE COMPANY - General Terms and Conditions of Sales_rev XXXX-XX-XX

Best Regards

CASE COMPANY LOGO

Kristina Ranta
Spare Part Sales Coordinator

CASE COMPANY Oy
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
Tel + XXXXXXXXXX
Fax: + XXXXXXXXXX
kristina.ranta@casecompany.fi
http://www.casecompany.com

Figure 11. Spare Part Quotation copy-pasted from Excel-sheet to E-mail

Spare part orders are entered in ERP and thus order management process can be easily tracked. There is no link between quotations and orders in ERP, because quotations are done separately. Spare part team is continuously monitoring order amount, entered in ERP. However quotation intake is not clear, because nobody is tracking quotations after they have been made. Concluding this chapter, current way of making the spare quotations does not allow establishing any metrics for this process. Checking quotation history per certain period or estimating efficiency rate, where number of quotations would be compared to number of orders is also impossible. In next chapter there we will discuss results of first MFA-questionnaire, where spare part coordinators are asked to give their opinions on current spare part quotation process.

5.3 First Questionnaire: Current State

In chapter 4 that cover for research methodology and measurement it have been already explained that for measuring the result of this research there will be organized two questionnaires. First questionnaire had to be assessed in the current state before the change of the quotation process and final questionnaire had to be almost the year after for drawing the conclusions of whether there has happened an improvement in the quotation process.

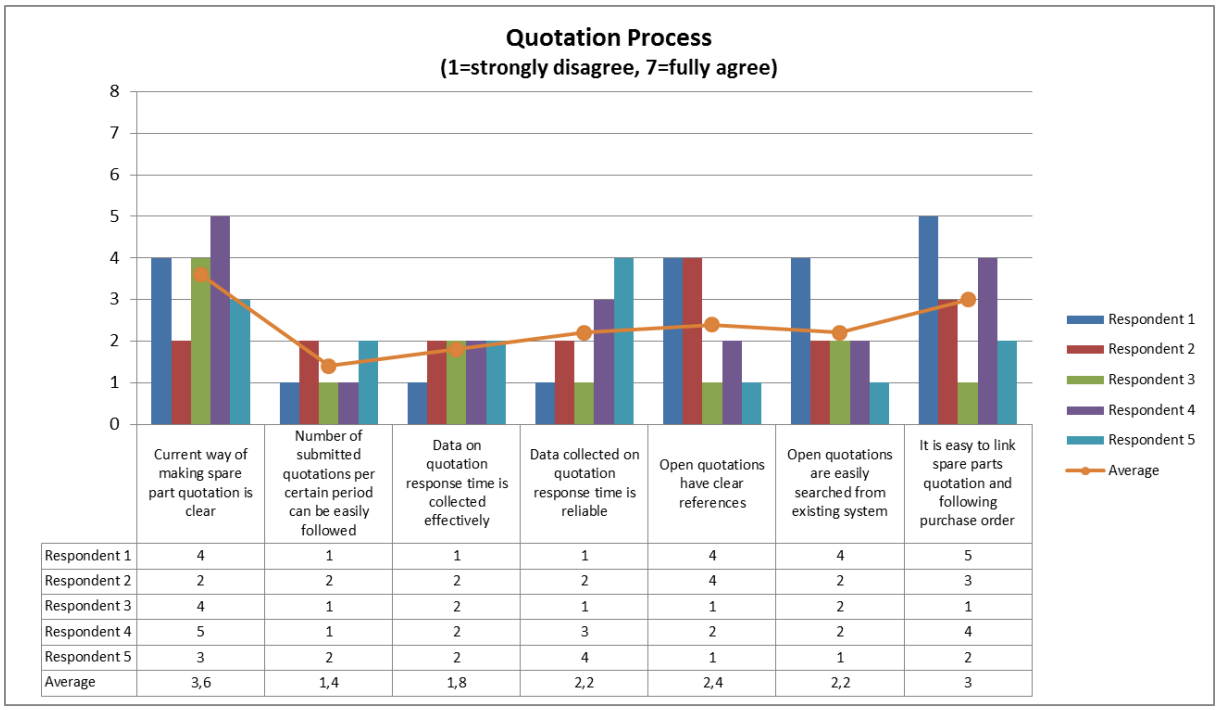
Questionnaire template can be seen in Appendix 12. Below is a list of statements, which could be used as measurement dimension for this research. Same list will be used before using ERP quotation module and after module has been in use. Respondents will be asked to rank each statement from 1 to 7, where 1 mean strongly disagree and 7 fully agree. Additionally, questionnaire has two open questions, where respondents are asked to list pros and cons of current quotation process as well as make their improvement suggestions. Questionnaire is sent as a public link via e-mail, so each respondent can participate in questionnaire anonymously.

1. Current way of making spare part quotation is clear.
2. Number of submitted quotations per certain period can be easily followed.
3. Data on quotation response time is collected effectively.
4. Data collected on quotation response time is reliable.
5. Open quotations have clear reference.
6. Open quotations are easily searched from existing system.
7. It is easy to link spare parts quotation and following purchase order.
8. Pros and Cons of current quotation process.
9. Open comments and improvement suggestions.

In first questionnaire spare part team members are asked to provide their feedback on old quotation process, where quotations have been sent as an e-mail message and have not been entered in a system but just saved in a folder in Outlook format. First questionnaire is supporting the current state analysis, discussed in chapter 5.2, where current quotation process is illustrated in Figure 10.

5.3.1 Answers to Scale-Questions

Below Figure 12 shows the answers to 7 scale-questions, where respondents give their feedback on old way of submitting quotations.



	Current way of making spare part quotation is clear	Number of submitted quotations per certain period can be easily followed	Data on quotation response time is collected effectively	Data collected on quotation response time is reliable	Open quotations have clear references	Open quotations are easily searched from existing system	It is easy to link spare parts quotation and following purchase order
Respondent 1	4	1	1	1	4	4	5
Respondent 2	2	2	2	2	4	2	3
Respondent 3	4	1	2	1	1	2	1
Respondent 4	5	1	2	3	2	2	4
Respondent 5	3	2	2	4	1	1	2
Average	3,6	1,4	1,8	2,2	2,4	2,2	3

Figure 12. Quotation Process, MFA 1.

Five members of spare part sales team have participated in first questionnaire and gave their opinion on how it works. The highest average score, 3,6 points from 7 received was given in question one, where respondents had to evaluate the clarity of current way of submitting the quotations. Chapter 5.2 discusses the original way of submitting the spare parts quotations, where quotations have been copy-pasted into Outlook e-mail message from Excel-sheet. The lowest average score, only 1,4 points received in the following question, where respondents had to give their opinions on how traceable current spare part quotations are. As it has been discussed previously in chapter 5.2, since quotations are only saved in Outlook-format, it is very difficult to search them afterwards or make any statistical reports using this kind of meta-data. Low scores were also given in questions 3 and 4 that covered for response time. More positive score 3 from 7 was given in last scale question that covered for ability to link quotations and following orders. As we know from chapter 2 unlike spare part orders, quotations were not submitted in a same way and did not have same reference number or format as orders.

5.3.2 Open Questions

Further I will discuss pros and cons of original quotation process given in open comments of the questionnaire in question 8. Results are gathered in Table 4.

Table 3. Questionnaire 1, Question 8: Pros and cons of current quotation process.

CURRENT QUOTATION PROCESS	
PROS	**CONS**
It is a process and it gets the job done regardless of efficiency.	It is slow and has many different phases which are just for database reasons. If the process is possible to make straightforward that would be huge advantage and would make our life easier.
Allows multiple ways of doing it. Quite easy to do when one has understood how the process flows.	Confusing, too many ways to do it Heavy folder organization Traceability is difficult without arranging own Excel-table for this purpose. Analyzing data (e.g. Quotation vs. Ordered) is difficult No standard quotation form/ Land vs Marine
When everybody save the quotations as we have agreed to be done it is basically easy to find them, but sometimes this is forgotten and causes some extra work specially when backing up somebody.	Following response times to quotations is not reliable, when it's done through separate system, because info inserted there is not always reliable, if inserted at all.
When data is available and project clear, it's pretty straightforward process.	Complex, unclear, not easy to follow-up

Table 3 shows that non-standard way of submitting a quotation is considered as pros as well as con. This means that non-standard process allows one to choose his/her own way of doing but in the same time multiple way of doing makes traceability and straightforwardness poor. This in many cases causes extra work as it is mentioned in one of the answers, especially if person have to be backed up during his/her absence. It was discussed in chapter 5.2 that response time had to be entered in separate system.

One respondent has mentioned response time entering method as not reliable one because it allows user to enter his/her response time basing on his/her own interpretation of time spent on quotation. Neither this method force one to enter response time at all because submitted quotations and response time reports are not linked to each other in

a system. Question 9 covered for improvement suggestions and only one comment was received that submitting quotations as well as orders in ERP would make quotation process clearer and more professional.

5.4 SWOT-Analysis and Future State

Basing on the results from first questionnaire in previous chapter and current state analysis discussed in chapter 5.2 we can summarize strengths and weaknesses in SWOT-analysis. It is now shown in Figure 13 below.

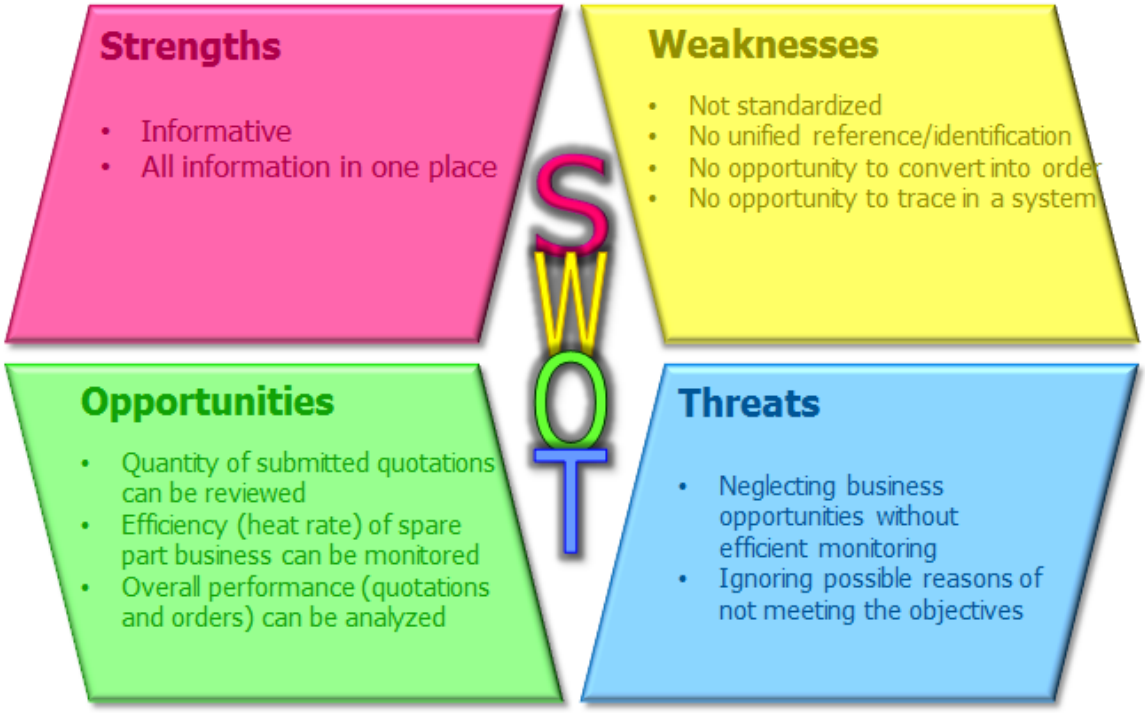


Figure 13. SWOT Spare Parts Quotation Process

Strength of current quotation process is that it is considered as a straightforward and clear according to the respondents' replies to questionnaire. Main weakness is that there is no opportunity for follow-up the quotations afterwards. Concluding the results of questionnaire and seeing the weaknesses of current quotation process, threats of such process are a lack of overall picture of spare part business. Quotations cannot be monitored as they are not entered into ERP, where spare part orders are processed and thus this process

There are quite many opportunities to improve spare part quotation process and thus tackle the threats. If both quotations and orders would be seen in the same system, efficiency rate could be monitored and overall performance can be analyzed.

5.5 Implementation

In implementation phase all spare part coordinators had to start using ERP quotation module and give up old way of submitting quotations in Excel. Prior to starting to use a new module, there have been done instruction to give the training to users and further to use this same instruction to train new employees. Instruction for using quotation module can be found in Appendix section.

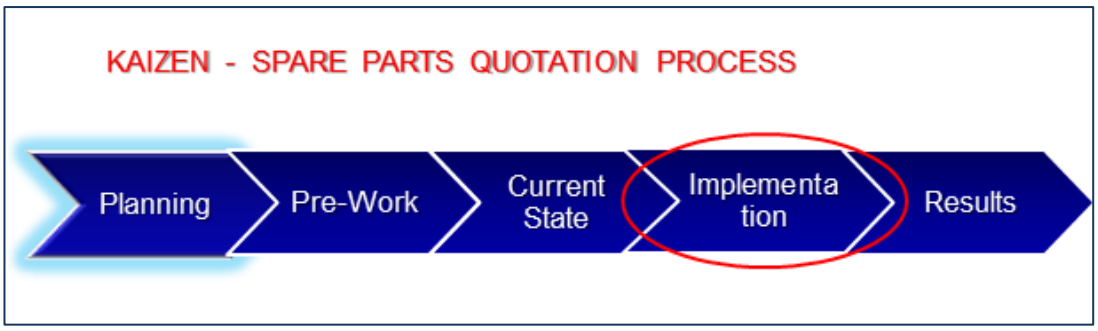


Figure 14. Kaizen: Implementation Phase

Prices had to be downloaded directly to ERP, so there wouldn't be a need to check prices from Excel-pricelist but to use prices from ERP directly. Terms and conditions have been also entered as a ready text and could be added each time the quotation is issued. Spare Part team has started to use quotation module in June 2016.

6 Research Results

In this section we will discuss the outcome of the research work. Final questionnaire was performed in the end of March, 2017 that was a little bit ahead of schedule. Questionnaire included same scale questions and offered same opportunity to give open comments.

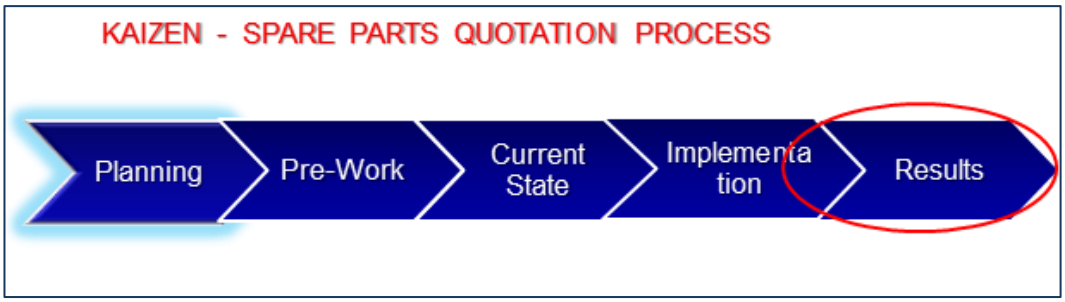


Figure 15. Kaizen: Results Follow-up

It is said in section 4.1.2 that Standard Work tool offers organization a work flow map of working process steps. Below in Figure 16 there is a new Quotation Process flow, where new phases are circled.

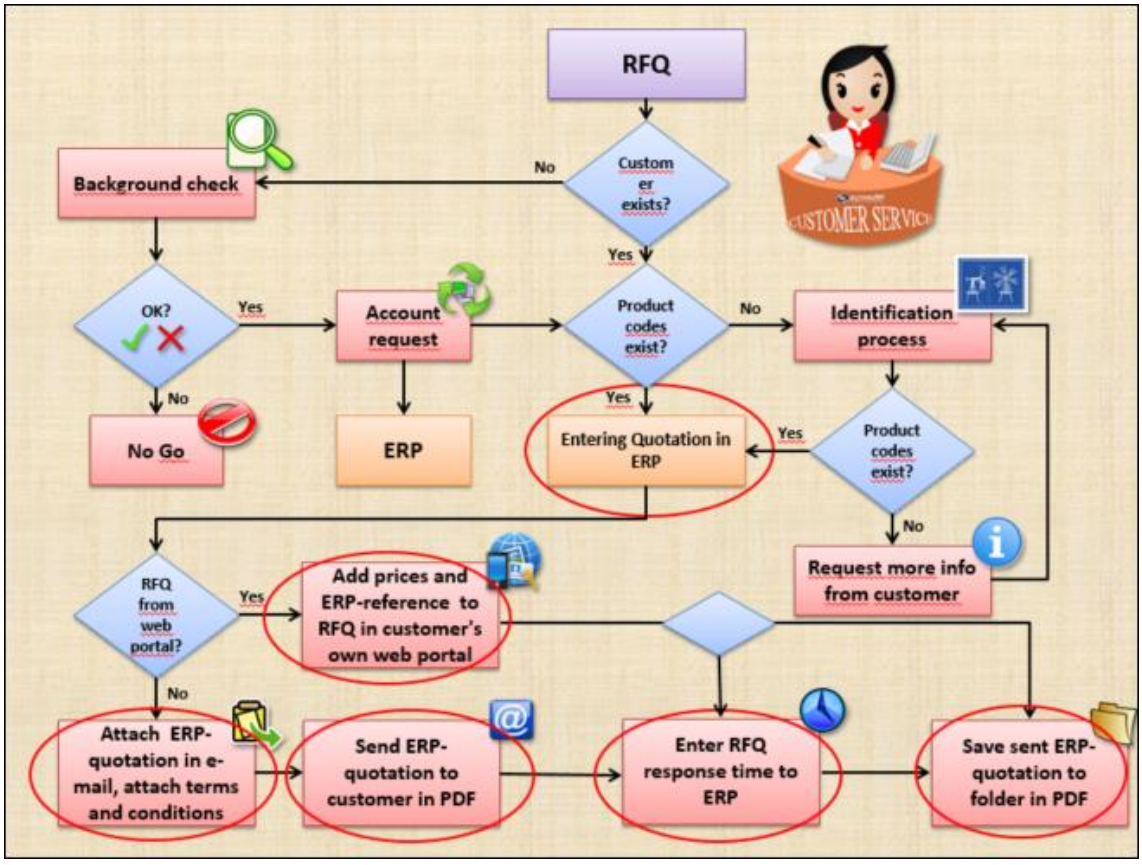


Figure 16. Case company Spare Part Quotation Process after change

After change in Quotation Process, there is a clear link not only between quotation and order in ERP system but also in case of quoting in customer's own portal same ERP-reference is added also in portal. Thus quotations are very easy to trace in ERP, even

they are not saved anywhere on disk drive. In case of sending ERP-quotation via e-mail in PDF, not all but many customers add case company's ERP-reference in their following purchase orders.

What comes to response time, formerly used system for entering response time is no longer in use for entering quotation response time but response time is entered directly in ERP. At the response times are not followed by spare part team due to lack of a process for response times follow-up. This has been left out from this research due to lack of the resources for implementation as this requires involvement of IT department and possibly external recourses involvement.

Figure 17 shows the difference between former quotation and the one after change has been implemented.

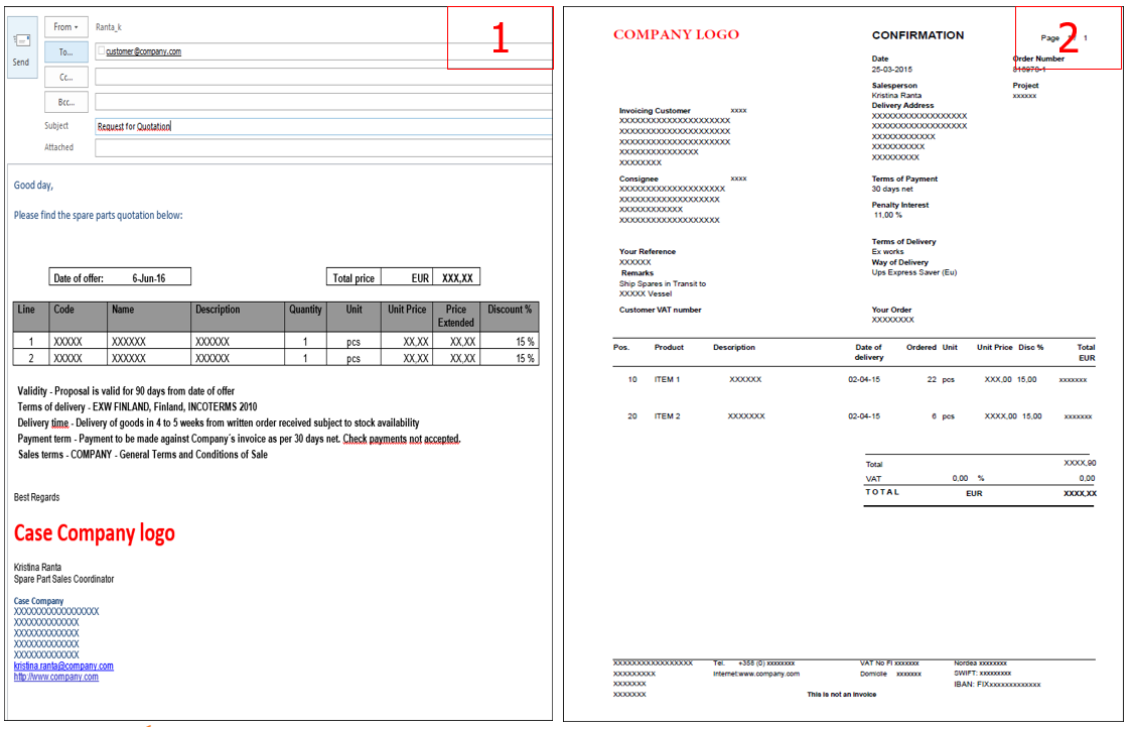
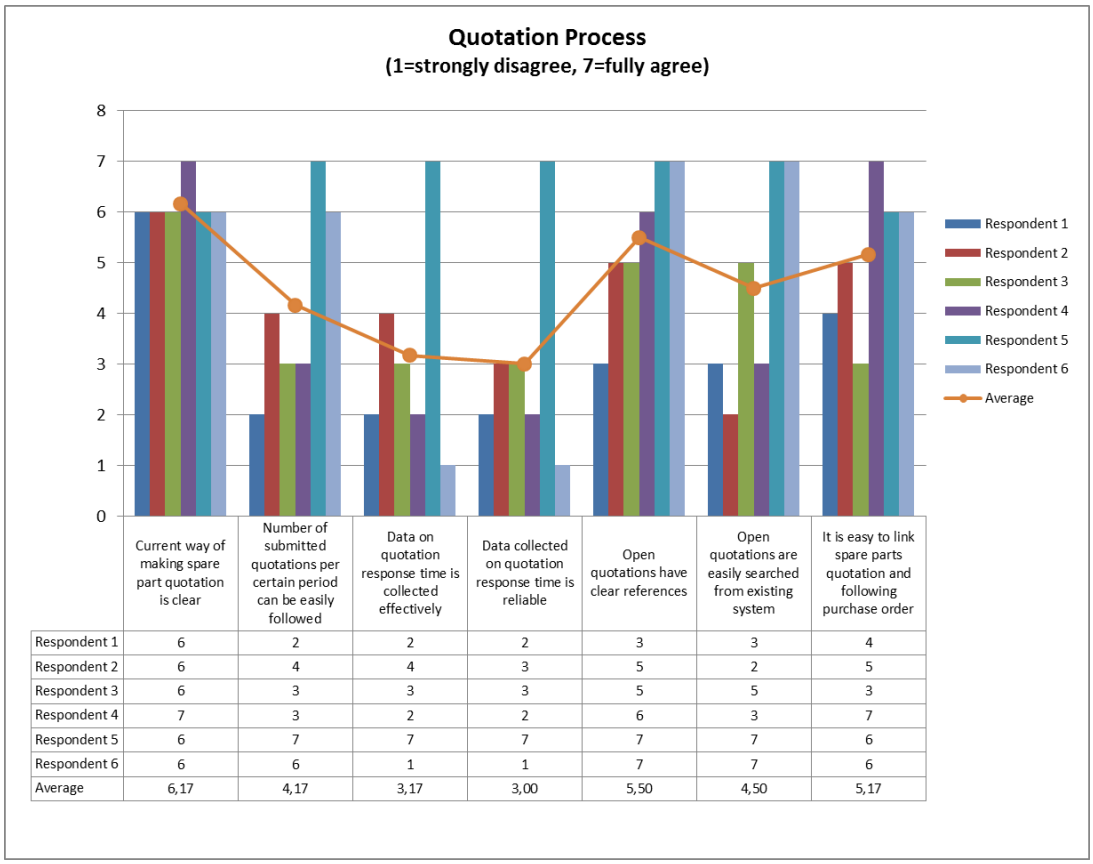


Figure 17. Quotation templates: 1. Former and 2. Current

Clear difference between original spare part quotations and new ones is that ERP-quotations can be traced through Qlikview and there is a possibility to build up different kinds of reports.

6.1 Final MFA – Questionnaire

In this section we will review results of final questionnaire that had exactly the same structure and questions as the first questionnaire, discussed in previous section.



	Current way of making spare part quotation is clear	Number of submitted quotations per certain period can be easily followed	Data on quotation response time is collected effectively	Data collected on quotation response time is reliable	Open quotations have clear references	Open quotations are easily searched from existing system	It is easy to link spare parts quotation and following purchase order
Respondent 1	6	2	2	2	3	3	4
Respondent 2	6	4	4	3	5	2	5
Respondent 3	6	3	3	3	5	5	3
Respondent 4	7	3	2	2	6	3	7
Respondent 5	6	7	7	7	7	7	6
Respondent 6	6	6	1	1	7	7	6
Average	6,17	4,17	3,17	3,00	5,50	4,50	5,17

Figure 18. Final Questionnaire 2. Concluding the results.

Figure 18 presents graphical summary of answers to 7 scale questions. This time there were 6 respondents instead of 5 because of small organizational changes in marine aftersales division. In this final questionnaire respondents were asked to evaluate quotation process, where quotation is no longer copy-pasted from Excel –sheet into Outlook e-mail message but entered into ERP and then attached to e-mail message as a PDF-file. As same as it was for spare part orders before the change, quotations have obtained ERP reference number that remains the same in all documents (quotation, order, confirmation, dispatch note and invoice) tha printed from ERP.

Looking at average scores for each of the scale question, one can see that if in first questionnaire the highest score was below 4, now in final MFA, the highest score is over

6. The highest score 6,17 from 7 was received as in previous MFA, for question one. All 6 respondents gave very positive feedback and agreed that current way of submitting quotations is clear. Secondly highest score was received in last question, where respondents had to give their scores on how easy it is to link quotations and orders. Least positive feedbacks received questions covered for response time topic. All 6 respondents gave very low scores on the effectiveness and reliability of collection of response time data. Quite positive feedback was received in question 5, where 2 respondents have fully agreed that quotations have clear reference and only one respondent gave 3 points in this question, while the rest three were also quite positive about clarity of quotation reference. Second question has received more or less positive feedback, 4,17 from 7.

6.1.1 Pros and Cons of New Quotation Process

In below table 4 we can see a lot of positive feedback from users.

Table 4. Final MFA: Pros and Cons

QUOTATION PROCESS AFTER CHANGE	
PROS	**CONS**
The outbound documentation to customer is clear and professional. Customer account has to be in system before quoting. Once order received, it is smooth and easy to convert order as the main work is already done. We do not use emails as quotations.	The fact that you have to enter the response time indicating dates to boxes without any marking. It is heavier than the previous model for quotations.
It is easy to change it to order, you can create offer/future order number right in the beginning, no need for additional offer templates	ERP as a tool is slow, estimated delivery date should be found from the item line, quotation follow up could be simplified and done more regularly (as part of the process)
Compared to old excel format new ERP quotations are more professional and easy to modify. Also tracking via QlikView is somewhat easy. For finance purposes it is easy to see what the quotation backlog is and which orders have already been accepted. Visibility to others is also better thanks to ERP and QlickView if compared to old email stuff.	ERP doesn't give you the delivery date automatically. This can slow down the process and giving feedback to customer inquiries can be tricky. And as we all know ERP is very slow system.
The sales process is more transparent than before. Monitoring and following order process is on a better basis. Increased properties in demand forecasts for production planning.	Pricing is tricky - not up up-to-date in the system. Sometimes ERP gives random errors and quotation is lost.

Clear quotation number, easy to identify when customer refers to it on purchase order. Significant improvement to the previously used method of Excel.	Quotation conversion takes more time now than before, because moved to CSC. This creates delay to end customers. Following open quotations in Qlikview is not so convenient.
It is much clearer than before, because they have clear reference and easy to be found (if saved to correct place).	

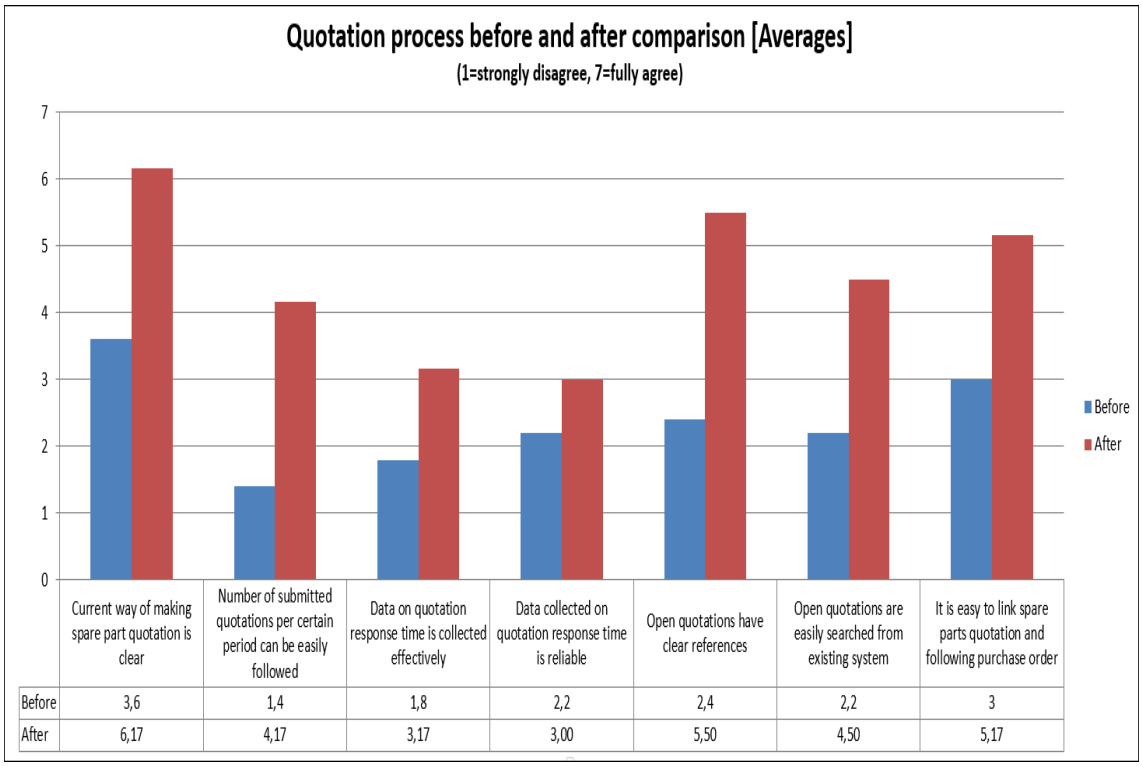
Majority has admitted that new process is clearer and looks more professional to customer. Clarity and transparency are both mentioned in positive feedbacks of respondents and this is corresponding with the purpose driven by Standard Work method. Same reference number of quotation and order as well as conversion of quotation into order has also collected a positive feedback. Also there was mentioning on possibility to build up forecasts for production planning that we will discuss later on. Negative feedback was given for ERP-system itself that is very slow that in turn makes quoting process slow as well. Additionally ERP is not giving the delivery date for item lines. Clearly in this questionnaire, positive feedback exceeds the negative one. In next chapter we will also compare the results form first and second questionnaire to the actual numbers. In second questionnaire, respondents have also given more open comments and suggestions for further improvements that we will list in next chapter.

6.1.2 Suggestions for Improvement

Final questionnaire has more open comments compared to the first one. Respondents mostly suggested developing further response time collecting process. Additionally, it was desired that there would be a possibility to check lead times for items directly from ERP while making the quotation. One comment was just to state that it has been a great improvement to start using the ERP quotation module. Some respondent found Qlikview as a complicated tool to be used for tracking because it hasn't been tailored enough for spare parts team needs. Qlickview dashboard can be seen in Appendix section.

6.2 Comparison of MFA 1 and Final MFA

In table 5 one can see a clear improvement in score for each question in final questionnaire that have been done after a change in quotation process.



	Current way of making spare part quotation is clear	Number of submitted quotations per certain period can be easily followed	Data on quotation response time is collected effectively	Data collected on quotation response time is reliable	Open quotations have clear references	Open quotations are easily searched from existing system	It is easy to link spare parts quotation and following purchase order
Before	3,6	1,4	1,8	2,2	2,4	2,2	3
After	6,17	4,17	3,17	3,00	5,50	4,50	5,17

Figure 19. Comparison of Current State and Outcome

The highest score was given to fist statement, where it was stated that current way of making spare part quotation is clear. Second highest score was given to statement about quotation reference. Respondents have given much higher score than in previous questionnaire. High score was also given for the last statement about linking quotations and orders. Lowest score have been given for response time collection. This was also mentioned in pros and cons that it is still requires manual entering of response time into ERP, even separate response time -tool is no longer needed.

7 Conclusions

7.1 Summary

Summarizing the outcome of this research, there is a clear improvement in quotation process itself. Results of final MFA in chapter 6.1. showed that change in quotation process, where quotations are submitted in ERP has brought clarity and consistency in the process. Standard Work tool's requirements described in chapter 4.1.2 have been met

and quotation had obtained a professional form by having always same template without variations with clear ERP-reference that is seen in all following documents, like order, order confirmation, dispatch note and invoice. Also clear instructions for using quotation module have been issued. Instructions can be found in Appendix section.

All in all this research was a success story in terms of making the process more clear not only for existing employees but also in terms of training new personnel. Quotation process is now visible in a system, can be tracked and analyzed if needed. However, it still requires work to take full advantage of the quotation data that is now available in ERP.

7.2 Research Schedule

Initially it was planned to finalize the research results in the beginning of 2017 at the latest. However, the module has been taken into use in summer 2016, even it was planned in spring of 2016. Majority of research activities has been postponed due to limited resources. Implementation of this change in quotation process required full dedication of researcher, spare parts team and their supervisor as well ERP key user. This has been very challenging to get support from research participants as spare parts team has very hectic nature of work. Also case company has only one ERP key users and recently company has faced numerous changes in operational processes and ERP is a key component in all of these changes. Thus the schedule of this research has been constantly changed. Additionally being an executor of this research, due to my last year position change, I could not fully concentrate on the research that has been initiated in my former team. Eventually instead of finalizing the results in 2017, results were presented in spring 2018.

7.3 Actual results versus objectives

In the beginning, there were defined three questions this research was aimed to answer. Further we will answer these questions basing on the results of this research work.

1. Will acquiring of quotation module add a real value to the spare part team's work and make it leaner?

According to MFA results, new quotation process got higher score in all statements of final MFA-questionnaire; quotation is more clear, professional, has a direct link to order

and can be tracked in a system. New quotation process has clear instructions that can be used to train new employees.

2. Does it require any additional resources/investments to adapt the quotation module accordingly the spare parts team's requirements?

Implementation did not require much of extra resources, except license for Qlikview and help of spare parts team as well as participating of ERP key user in adjusting the module. However building or tailoring reporting tools for spare part team's needs require more additional resources of ERP key user as well as IT department.

3. To which extent can quotation module can improve reporting and measurement of spare part team's performance?

There are no separate reporting and measurement tools implemented for spare part sales team. However, marine aftersales department have started to use quotation data to provide forecasts to factory for upcoming big orders that requires earlier preparation from factory and purchasing department. Quotation data in ERP is used in the forecasts.

As it has been planned in the beginning of the research quotations can now be tracked through Qlikview. Additionally one can build up different reports via Qlikview using quotation data (current or history data). Currently case company's department of operations planning have started to use quotation data to build up forecasts for coming orders to adjust stock and manufacturing.

The scope of this research had included such elements like improving response times reporting and this process remained incomplete. Response times can be entered directly to ERP, however data collection required separate tool for follow-up. Lack of resources did not allow implementing of such tool within this research scope. However, Case company is assessing external MFA-questionnaires for its customer and long response times are a constant issue. Response times reporting is included in improvement actions list for 2018.

Another objective that was in the scope of this research was possibility to check efficiency (heat) rate. This would mean that there would be a tool to compare sent out quotations to order intake. There is still no separate tool for this purpose. At the moment it is possible to track efficiency rate through Qlikview but this requires manual work and skills for Excel Pivot.

Case company is little by little trying to get rid of storing data in folders on computer drives but the intention is to migrate all the business data into M-files that had been acquired for about two years ago. Thus, spare part quotations are now in such format that it is easier to keep the interrelation between all ERP-documents in M-files.

7.4 Unexpected results

This research had been originally planned only for spare parts team's purposes. However during implementation, there had happened a surprising change initiated by Case company' Operations business unit. Case company Operations have decided to obtain order management process and leave quotation process to sales. Basically, after this change not only marine and land spare parts teams took quotation module into use but all sales business units, mainly new build projects team in marine had to shift from order management to quotation order management. Also service team has acquired quotation-module to some extent. Conversion of quotations into orders that had been taken into use and owned by spare parts team had been taken under operations' responsibility. This basically means that sales no longer can confirm the delivery to customers but has to wait for confirmation from operations planning department. The reason for that had been presented as that Operations have better visibility of stock situation versus capacity of the factory. Thus it is better that conversion from quotation into order and further confirmation of delivery happens in Operations department.

This change, where control over order management has been shifted from sales to operations has raised quite many questions in sales business units. This could also be a good topic for thesis to study the effect of this change, where order management has been changed after 30 years of same process, where order management was handled by sales business units.

However, very positive change is happening at this very moment due to quotation process change, where Case company's operation has started to build up forecasts basing on quotation data in ERP. This has been left out from the scope of this research and left for long-term plans. This is a huge step forward in terms of improving delivery times for components and also project sales with bigger orders.

7.5 Validity and Reliability

The validity of this research can be seen in ability of the research to address the research questions. Mainly objectives of the research have been met, quotation process became better and results of the research are reliable as quotation module actual users have evaluated the change through MFA-questionnaire. Final questionnaire has shown better score for all statements, spare parts team was satisfied with the change. Quotation process change has been also taken by other teams, like service coordinators' team that have their own way of making quotations and had the same problem of having no possibility to follow the quotation data in a system. This is means that research has brought benefits even outside of its original target group.

7.6 Recommendations for Future Development

It has been already discussed in this section for conclusions that even though quotation module has brought improvements, all benefits are still not utilized. First of all, there is a need for tool, where quotation response times would have been tracked. It was described in section 5.2 for current state that there was a tool to enter response times that did not allow following the response times effectively. At the moment there is no any tool in use.

Another recommendation is that ERP key user would have helped to build up more tailored reporting tool for spare part sales purposes in terms of measuring sales (quotations versus orders), using different criteria.

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MFA Questionnaire Template

REMOVED DUE TO CONFIDENTIALITY

Qlikview display for ERP-quotation orders

REMOVED DUE TO CONFIDENTIALITY

ERP Instructions for Quotation Process

REMOVED DUE TO CONFIDENTIALITY

ERP Instructions for Quotation Process

REMOVED DUE TO CONFIDENTIALITY