

Improving general efficiency of a company

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| Abstract <p>The subject of the study was improvement of the general efficiency in the company that is specialized in underwater ship maintenance, repair and inspections. The objective of the study was to find out the weak spots and existing problems in the company and suggest ways to remove them.</p> <p>The study was conducted using qualitative and quantitative analysis. The material was collected during the internship from interviews with the employees, own observations and measurements that were done to test the hypotheses.</p> <p>As a result, the weak spots were found and the main one was the wasted time on preparations for the job. Other issues such as proper planning of the layout of the warehouse and poor communication between workers were found.</p> <p>Based on the discovered problems, a few suggestions were proposed. 5S implementation is among the proposed solutions and an instruction on implementation was presented in the study.</p> | | |
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| Miscellaneous | | |

Contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 5 |
| 1.1 | Background | 5 |
| 1.2 | Research limitations..... | 6 |
| 2 | Company information | 6 |
| 2.1 | Maintenance and repair provider | 6 |
| 2.2 | Current situation in the company | 7 |
| 3 | Methodology | 7 |
| 3.1 | Quantitative method..... | 8 |
| 3.2 | Qualitative method | 8 |
| 3.3 | SWOT-analysis..... | 9 |
| 4 | Theoretical Basis | 10 |
| 4.1 | Service industry..... | 10 |
| 4.2 | Service Operations Management | 11 |
| 4.3 | Strategies to improve services | 13 |
| 5 | Research | 17 |
| 5.1 | Observations | 17 |
| 5.1.1 | Research..... | 17 |
| 5.1.2 | Analysis | 20 |
| 5.2 | Lean Six Sigma..... | 20 |
| 5.2.1 | Research..... | 20 |
| 5.2.2 | Analysis | 26 |
| 5.3 | Service operations management | 27 |
| 5.3.1 | Research..... | 27 |
| 5.3.2 | Analysis | 31 |

| | | |
|----------|---|-----------|
| 6 | Suggestions for development..... | 36 |
| 6.1 | 5S implementation..... | 36 |
| 6.1.1 | Implementation steps..... | 37 |
| 6.1.2 | Risks | 42 |
| 6.1.3 | Further suggestions | 43 |
| 6.2 | Ways of communication | 43 |
| 6.3 | Tools for managing customer satisfaction | 44 |
| 7 | Conclusion | 45 |
| | References..... | 46 |
| | Figure 1. Influence of service sector in GDP | 10 |
| | Figure 2. Checklist for assessment of workplace organization..... | 15 |
| | Figure 3. Google calendar with the job description..... | 19 |
| | Figure 4. Questionnaire presented to the employees..... | 21 |
| | Figure 5. The flowchart of operations. | 22 |
| | Figure 6. The schematic division of job into three parts. | 23 |
| | Figure 7. The main ports in Europe where the company operates. Adapted from Google Maps..... | 33 |
| | Figure 8. Qualitative analysis of the interview. | 35 |
| | Figure 9. The example on sorting equipment..... | 38 |
| | Figure 10. The layout of the compound. | 39 |
| | Figure 11. The layout of the storage container (warehouse). | 40 |
| | Figure 12. Suggestion for placing the equipment..... | 41 |
| | Figure 13. Screenshot from Evernote. Plan for maintenance of the area. | 42 |
| | Figure 14. Screenshot from Evernote..... | 44 |

| | |
|--|----|
| Table 1. Measurements. | 24 |
| Table 2. Average cost of working hour. | 25 |
| Table 3. Measurements. | 25 |
| Table 4. Average amount of orders per year. | 26 |
| Table 5. Total money saved per year. | 26 |
| Table 6. The company's plan in the following years. | 27 |
| Table 7. Total hours saved in 2019 and 2021. | 27 |
| Table 8. SWOT-analysis based on the interview. | 32 |

Abbreviations

CCTV – Closed-circuit Television

ERP – Enterprise Resource Planning

KPI – Key Performance Indicators

NDT – Non-destructive Testing

ROV – Remotely Operated Underwater Vehicle

R&D – Research and Development

TQM – Total Quality Management

1 Introduction

1.1 Background

The company A is specialized in underwater ship maintenance, repair and inspections. Underwater maintenance means that repair operations are performed by a group of divers underwater. Such kind of maintenance is easier for a vessel than regular dry-docking maintenance, since it allows a vessel to save lots of time and costs as loading and unloading of a vessel can be done simultaneously with repair operations underwater.

1.2 Research objectives and questions

The aim of the thesis is to show the importance of management processes in small businesses and help to improve efficiency of the company A in order to stay competitive and demanding in the harsh business environment nowadays. Continuous improvement is crucial if the company wants to deliver the best quality services for their customers.

The research is unique in a way that the business in underwater maintenance is quite a new and developing field and there is not that much information on how common tools for services can be applied to it. This is the reason why the basic topics such as service operations management, customer relationship management and strategies for improving service businesses are covered in the thesis.

The thesis has the following objectives:

- Give an overview of the current weak spots in the company
- Suggest solutions to discovered problems and research possible outcomes from implementation
- Show the importance of management operations in a company which provides maintenance and repair services in shipping

1.3 Research limitations

The research carried out mainly focused on the visible operations within a company. The main limitation is that operations underwater themselves are not covered in the research, since permissions to the port are available only for a team of divers and the company's representatives. More than that, the information about customers and suppliers is confidential.

In that way, the areas such as the company's warehouse and the office were main subjects to conduct a study. Nevertheless, any photos of the warehouse and the office were not allowed to be published in the paper due to a non-closure agreement.

2 Company information

2.1 Maintenance and repair provider

The company A is a Dutch company based in Rotterdam. The company provides various services related to underwater ship maintenance and inspections.

The list of provided services:

Underwater ship repair:

- Underwater propeller repair
- Underwater propeller blade straightening
- Hull insert plate repairs
- Underwater cutting & welding

Underwater inspection:

- Class approved underwater CCTV inspections
- Underwater ROV inspections
- Underwater NDT inspections

Underwater maintenance:

- Emergency oil response
- Propeller cleaning/polishing
- Ship hull cleaning

The job is performed in various countries and locations such as:

- Port of Rotterdam
- Port of Amsterdam
- Port of Antwerp
- Port of Hamburg
- Port of Le Havre

2.2 Current situation in the company

The company has an office in Rotterdam with a small warehouse and a garage for the vans needed for jobs. When the call is received and the team of divers knows where and what kind of a job has to be performed, they pick up the necessary equipment from the warehouse and go for a job.

The jobs are divided into urgent jobs and planned jobs. The urgent jobs can be related to oil leakage, entanglement of rope in the propeller, grounding, water ingress. Usually standard equipment is used for this kind of jobs. There is a list of basic equipment and before going for a job the team checks if they have everything they need with the help of this list.

Sometimes bigger jobs like maintenance and repair require more preparation and additional equipment. In that case specific equipment can be ordered or rented for a particular job. Most of the planned jobs are quite unique and there is no point in having some of the equipment in the storage, since it can be used only once or twice a year. That is why renting is the preferable choice for this case.

Planned jobs can be divided into inspections, maintenance and repairs. There are various lists of basic facilities needed for every type of a job. Though the check lists still can vary due to specifications of every job.

3 Methodology

The thesis will include various research methods to find more accurate information and to develop practical solutions for the company. The information will be gathered

and analyzed with the help of those methods to achieve the most efficient outcome and suggest the most suitable solutions.

The combination of methods in this research is applicable, since both quantitative and qualitative data create a basis for deeper understanding of existing challenges in the company.

3.1 Quantitative method

Quantitative method means to gather information using quantity. Usually it includes questionnaires, surveys and any other kind of information which can be analyzed with statistics and graphs.

According to Muijs, Daniel Dr. (2004), quantitative method is about collecting numerical data to explain a phenomenon. In other words, huge amount of data with numerical values is retrieved and analyzed statistically.

Quantitative method is mostly used in this paper to collect information on various costs and the amount of working hours. The reason for choosing quantitative method is to test the hypotheses on how much time is consumed and check if the costs can be reduced. The data collected is presented in MS Excel graphs.

3.2 Qualitative method

In contrast with quantitative method, qualitative data cannot always be measured and analyzed statistically. Qualitative method can rely on observations, interviews, case studies and group discussions.

The qualitative method plays a huge role in this research paper, since lots of interviews and observations were conducted during the working process. The qualitative data gathered is analyzed with the help of graphs.

The interview is a very powerful tool. It can be used at any stage of a research and it helps to find the areas for more thorough research and generation of the hypotheses, as a tool for data collection and its validation (Brewerton and Millward 2001, 77). One of the interviews' purposes is to obtain a lot of information from a small amount of people. In this research the interviewees are the staff working for the

company from its foundation, meaning they are aware of all the processes and are able to explain the working principles in the company from the bottom.

3.3 SWOT-analysis

SWOT – analysis is a tool used by businesses to get an idea of what requires development and what business areas should be improved. More than that, it gives a better understanding of a company's strengths and when analysis is performed, it is easier to find areas to focus on for further improvement (Cadle, Paul and Turner, 2010).

SWOT – analysis has a substantial strategic value for a company, as it brings together the factors of the internal and external environment, defining new resources and opportunities. The SWOT analysis provides the answers to the following questions:

- What are the strengths of the company and does the company take the advantage of them?
- What are the weaknesses and vulnerabilities of the company?
- What circumstances and actions are able to contribute to the success of the company?
- What threats have to be considered first?

SWOT-analysis is chosen for this research, since it covers the relevant issues and gives an insight on various areas of the company. Thus, it helps to estimate how competitive the company is, what the weak spots are and what areas of development to concentrate on in the future considering external and internal factors. (Maysak, 2013).

The other techniques for business analysis such as SMART-analysis and PEST-analysis were considered and studied as well. PEST (Political, Economic, Social, Technological) - analysis is used to determine external factors, which influence businesses, and SMART (Specific, Measurable, Assignable, Realistic, Time-related) –analysis is helpful for setting new objectives in a company. In this case the SWOT-analysis was chosen due to its generality, since it supports the objectives of the study.

4 Theoretical Basis

4.1 Service industry

Service industries have been playing an important role in the world economy for a few decades already. According to several researches, the service sector has a huge influence on GDP of most highly developed countries. Depending on the country the percentage varies from 50% to 80% of GDP.

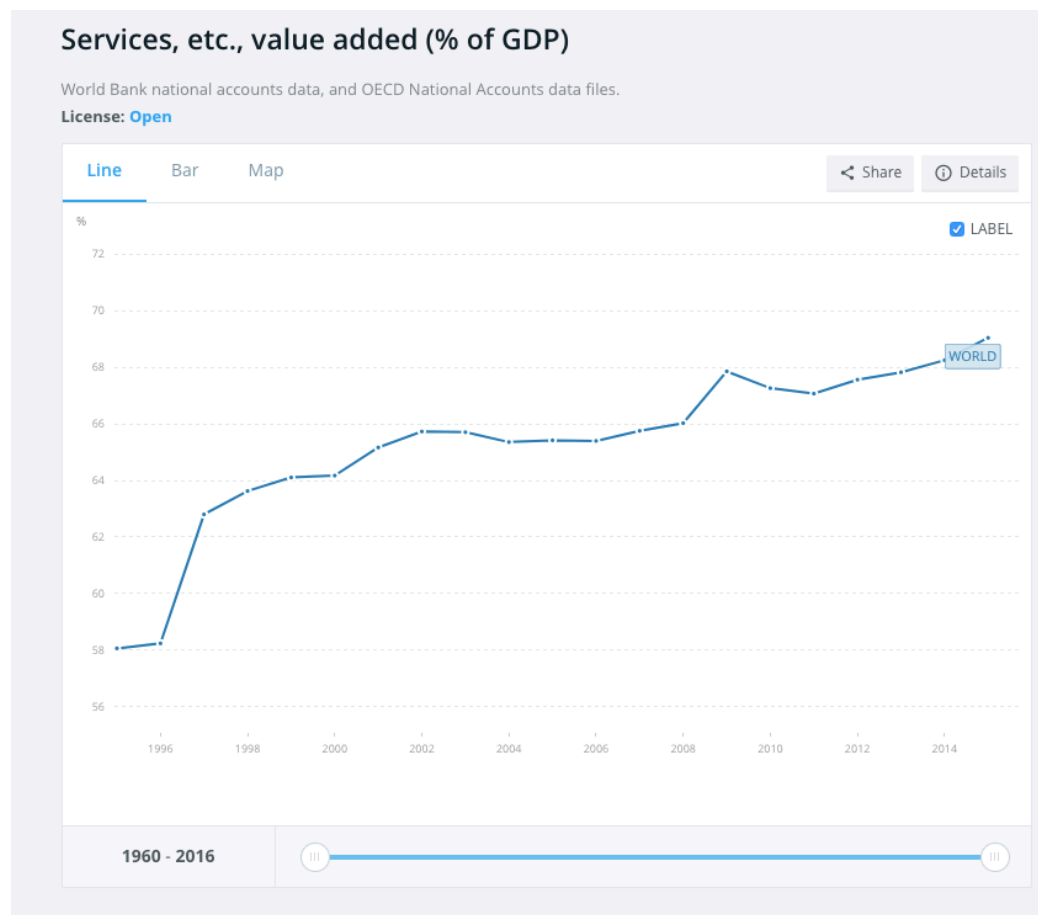


Figure 1. Influence of service sector in GDP. Source: <https://data.worldbank.org/indicator/NV.SRV.TETC.ZS?end=2016&start=1960>

Thus the service organizations are developing very fast and due to strong competitiveness they are aiming to provide customers with the best quality services. So it is necessary to develop services and working concepts all the time.

4.2 Service Operations Management

Service Operations Management

Operations management is related to manufacturing, but since service businesses are developing very fast, service operations management has become an important issue for service organizations as well. Understanding operations management improves customer relationships, helps to remove unnecessary work, and provides a company with the tools to evaluate performed work.

According to Johnston, Clark and Shulver (2011) service operations management is a set of activities, decisions and responsibilities aimed to improve services. Planning service operations involves understanding and development of a business concept, perception of customer needs, ensuring the objectives of the company are met and maintaining assets of the company.

Importance of service operations management within an organization

Properly planned service operations management has a lot of advantages. First of all, customers are satisfied with the services delivered. Customers' satisfaction helps to establish and maintain long-term stable relationships with an organization.

Furthermore, smooth processes in a company create a better working environment for employees. It is easier to work and deal with customers, since fewer mistakes occur (Johnston, Clark and Shulver 2011,15). In that way, employees feel satisfied with the work they perform and become more motivated, which is also valuable.

Service operations management when planned correctly contributes to a company. It helps to reach the best outcome and follow the goals and objectives of a company. Therefore, it aims to increase the revenue of the company.

Customer relationships management

A few decades ago the variety of products and services was not as huge as it is now, and the concept of customer satisfaction was not researched or taken into account

properly, since it was not actually needed. But today business services and products are becoming more customer-oriented and one of the reasons is high competitiveness of the market. Almost any organization realizes the importance of customer satisfaction and customer relationships.

According to Raab, Ajami, Gargeya, Goddard, (2008) customer orientation is one of the key factors for creating a successful business in high competitiveness. Customer orientation means the ability to be flexible and react accordingly to new trends and market opportunities, the ability to develop a business in a way that customer's preferences and desires are taken into consideration. Hence, the continuous research on customers' needs and expectations, market situation and competitors is needed. Its objective is to be updated to be able to adapt a business model to it in order to not lose existing customers and to obtain new ones.

Delivery of high quality services is an important step in creating a customer-oriented business and is tightly connected to customer satisfaction. In sum, both definitions are related to the customers' assessment of the service performed compared to what their expectations are (Johnston, Clark and Shulver 2011, 125). One of the unique features of a successful business is the ability to meet and exceed customer expectations (Roberts-Phelps 2001, 47).

Customer satisfaction also depends on the relationships with a company. Thus, maintaining good relationships with customers has a lot of benefits both for customers and a company who provides services. Obtaining valuable customers is important, because they tend to bring more customers with the help of the word of mouth, for example. In that way a company establishes a strong reputation and becomes more competitive at a market (Johnston, Clark and Shulver, 2011).

In other words, providing customers with high quality services, exceeding their expectations and establishing long-term trustworthy relationships with them are among the considerable factors in any kind of a business.

The main difficulty for a company is that all customers expect the best quality services, and for different customers it has a different meaning. That is why an organization has to make sure they understand customers' needs and expectations. So

providing best quality services requires a deep understanding of customers' needs as well as proper planning within a company.

Evaluation of service operations

Service operations management requires process evaluation in order to ensure that the company operates to its full potential. Evaluation is a powerful tool for establishing long-term perspectives for a company. It gives an overview of the current operations and ideas how to improve the processes. In addition, evaluation is supposed to implicate the outcomes of the design activities, and provide an understanding if the goals of a company have been fulfilled. (Hollins and Shinkins 2006, 236).

4.3 Strategies to improve services

Lean Six Sigma

Lean service is based on a principle of lean manufacturing applied to service industries. In order provide high quality services in the company, it is important to avoid customer complaints and investigations on poor quality. Lean services has approximately the same idea as lean manufacturing, even though it is based on a little bit different tools and exercises to be applied to service businesses.

The main idea of lean services is to make services more efficient and productive while using less labor, avoiding any kind of waste and developing continuous improvement in a company as well as standardized working processes (Goldsby and Martichenko, 2005). Not so long time ago lean concept has become an essential part of a few businesses, such as IT, banking services, health services. There is a great deal of examples about successful application of lean to almost any kind of services.

Total Quality Management

Total Quality Management is a business strategy aiming to improve the processes in an organization while increasing customer satisfaction. The main idea is that everyone participating in the development of products or services is responsible for the quality (Aized, 2012). The process improvement is very complicated, since it includes changes in all the existing areas in the company and requires commitment of all the

parties involved in the company and first of all it is not possible without commitment and involvement from top management in the company (Bhat 2010, 110).

Total Quality Management main principles are based on:

1. Top management involvement and commitment
2. Quality is defined with the help of customers
3. Quality conformance is the basis for designing a product or a service
4. Every employee is responsible for achieving good quality of a product or a service
5. Suppliers involvement

Whether TQM is going to bring a success to a company depends on the policies and organizational culture of the staff within it.

Choosing the strategy

Since TQM strategy mostly focuses on delivering higher quality standards on already existing processes it can reach a stage where the strategy becomes saturated and no further improvements can be made whereas the Six Sigma Strategy focuses on improving quality by reducing defects during the different processes and eventually bringing the respective processes to the next level.

More than that, TQM is not applicable in this case since the variety of services provided by the company is very wide and it requires a great deal of changes to be made almost from the scratch and as a consequence can slow down the current operations in the company. The customers from all over the world expect different attitude, and kind of services depends on a type of a vessel as well. Hence, it is not reasonable to implement TQM in such a small company which provides more than 100 different services to different nationalities.

The Six Sigma Strategy reduces the operational costs by focusing on time efficiency, reducing defects and cost reducing measurements; improving all operations in a single business process gradually.

5S for organizations and offices

5S system is a part of lean services needed for creating a better working environment with the help of a strategy and special thinking. Implementing a 5S system in working

place improves workers' productivity thus helps to provide best quality services while reducing time spent on looking for needed equipment, details. Once the system is properly implemented and workers are taught how to maintain it this way, a lot of time is saved.

5S system requires employees to work hard to change their way of thinking and keep it that way. The best results and outcomes can be achieved only when every member takes part in changing the working environment and his/her own attitude.

The book 5S for Service Organizations and Offices by Sarkar, Debashis (2005) is a useful manual and a basis for a company who wants to implement the 5S system in its way of working. First, it is necessary to find out if a company needs this system at all. For this the figure below can be used:

| Question | Yes/No |
|--|--------|
| Do people in your workplace struggle to locate pens, paper, files, keys, and so forth? | |
| Are there items in your workplace such as files, documents, and equipment that do not have an owner? | |
| Do you or your colleagues hoard things such as pens, staplers, and old magazines? | |
| Are there old magazines or telephone directories in your workplace that are not used and are gathering dust? | |
| Is there any safety equipment, such as fire extinguishers, lying around that is past its expiration date? | |
| Are there loose hanging naked electrical wires in the workplace? | |
| Are there files in the workplace that are old, unlabeled, and torn? | |
| Do visitors and customers struggle to reach the right person or workstation in your organization? | |
| Do you observe overflowing wastepaper baskets in workstations? | |
| Are there instances of running out of stationery, consumables, and other items? | |
| Do you observe clutter in your office or workplace? | |
| Do you observe valuable space being occupied by useless and unwanted items? | |
| Do you observe documents, files, papers, brochures, and so forth getting mixed up? | |
| Do you find dust, dirt, and cobwebs in nooks and corners in your workplace? | |

Figure 2. Checklist for assessment of workplace organization (adapted from Sarkar 2005, 3)

The figure 4 is a good basis for understanding how efficiency can be significantly reduced by small useless tasks. If most of the questions are answered with "Yes", then the 5S system may be applicable to a company.

According to Sarkar (2005) implementing a 5S system will create benefits for a company, there are a few of them:

- Reduce waste
- Increase efficiency and productivity
- Get rid of unnecessary items on a workplace to make it organized
- Reduce time on addressing questions
- Improve customer service

5S implementation involves 5 steps:

1. Sorting

It means all the items at a workplace should be sorted according to the “needs and wants”. Sometimes workplaces are full of items which do not belong there and not used for a long time, in that way it is necessary to remove them to make more free space. The author of the book recommends to make tags for all of the items at a workplace depending on frequency of use (daily, weekly, semiannually) and the need of use (items wanted, but not needed).

2. Systematic Arrangement

The second step is about finding a place for each item at work. It is suggested to make a layout for a workplace and decide where to place items with the help of several techniques.

3. Spick-and-Span

The next step describes regular cleaning and inspection once the 5S is implemented. It is extremely important to make sure that a workplace stays tidy and all the items are placed according to the system implemented. It helps workers to find needed tools quickly.

4. Standardization

The standardization step is aiming to create rules, policies and procedures to be followed by workers after the system is implemented. Following regulations make workers more disciplined as well as motivated. More than that, it gives a support in building a team spirit within an organization.

5. Self-discipline

The last step but not the least is about forming habits. In order to help workers to form a habit, leaders have to participate in it and help their teams to adopt it.

According to numerous reviews from companies who implemented the system, the working environment has become safer, the space at a workplace is used wisely and it all lead to increased customer satisfaction (Chourasia and Nema, 2016).

Obstacles in implementing 5S system

First of all, it requires a huge change in a company and a strong desire to start almost everything from the scratch. Even though, there are lots of tools and pieces of advice on how to implement the system, they are still not applicable to any kind of situation, because every organization is unique and people are different. So to make use out of the 5S system it is necessary to assess workers and find motivation tools for every person in a company.

5 Research

5.1 Observations

First of all, it was decided to look at the various areas in the company, so it would be seen what should be done in a more efficient way. The warehouse and the methods of communication were the subject to observe to find out how these areas influence the overall performance of the company.

5.1.1 Research

The warehouse

The equipment and consumables/spare parts are located in the warehouse. The basic equipment used for every job includes cameras, dry suits, helmets, and straps. Other equipment and spare parts are chosen depending on what kind of job to be performed.

Suggestion for improvement: create various checklists for different types of work to reduce time while choosing and looking for appropriate equipment. To put all the basic equipment in the closest shelves to save time. Though it is hard to locate the other equipment according to the frequency of usage, since the type of work is impossible to predict. When the company receives calls, they never know what kind of job vessels want them to do.

Communication between workers

An efficient communication between workers is one of the keys to successful operations within a company. Everyone should receive relevant information about different jobs, projects, appointments and know when, how and what they are supposed to do. All the workers are provided with the newest iPhones from the company and the company also pays for the mobile and the Internet.

There are 4 main ways of communication between workers in the company:

1. Google Calendar
2. WhatsApp group
3. Whiteboards in the office
4. Dropbox

A shared Google calendar is created to see all the details about the upcoming jobs and general idea of future projects. In fact, it is very convenient since it has the information about time job starts, location, deadlines and a few details of what kind of a job has to be performed. The main purpose is not to overload it with a lot of information and keep it simple so everyone has a basic overview of the time, place and a type of a job. The Google calendar is linked with a calendar on iPhone.

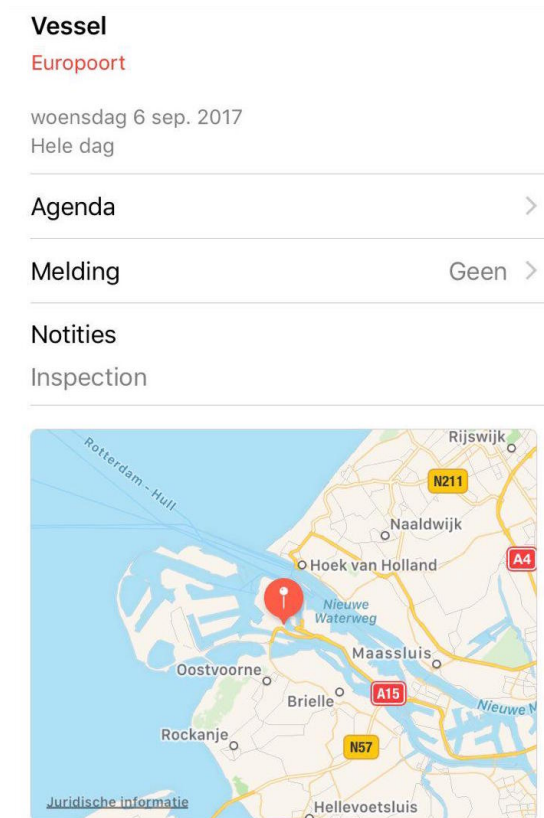


Figure 3. Google calendar with the job description.

The WhatsApp group is mainly used for instant short messages to keep updated and informed about ongoing projects. The problem with the Internet connection almost does not exist nowadays, so it is simple to be updated via WhatsApp.

The Dropbox has a purpose of storing the reports from the jobs, different kinds of agreements and the receipts. To make sure the information is not lost in the Internet, a few backup folders were created. Since each vessel has its own system and formats for agreements and documents, it is hard to come up with a different way for storing this information.

Whiteboards are located in the office with a purpose of making various sketches during the meetings and plans for upcoming jobs. There are 3 whiteboards installed in the office.

Even though it might seem that there are too many ways of communication and some information is likely to get lost, it is necessary to understand that each applica-

tion and a way of communication has its own purpose and it is difficult to put everything in one place.

5.1.2 Analysis

Weak spots found in the company based on own observations

The warehouse is messy and it takes time to find appropriate equipment before the particular job.

- Not all the items have their own places
- The equipment is not sorted properly
- The workplace is messy
- The items in the warehouse are not sorted according to any kind of a system
- Poor communication between workers
- Tools for performance evaluation should be improved

The spare parts and consumables are not tracked in a proper way, which makes operations less efficient. Spare parts ordering process is done via the Internet or calls from different companies.

5.2 Lean Six Sigma

5.2.1 Research

Introduction

Lean thinking has been known for many years as one of the most powerful tools to increase operations efficiency in various businesses, from services to manufacturing it can be applied to almost any kind of a business. There is a great deal of researches about lean concept in banking services, manufacturing plants, IT industries. Though due to variety of business fields, not every field has been tested yet and in a few industries it is still not clear if the lean concept is going to be useful.

So the purpose is to find out if the lean thinking is going to help to increase the efficiency of the company that is specialized in underwater maintenance and repair and to find areas in this business where it can be applied to achieve the best outcome.

Methods

There are a few methods that are going to be used in this case. First, it is necessary to collect data and then analyze it. In order to figure out if the 5S methodology of the lean concept can be applied in this case, a small questionnaire was given to the employees, and own observations were taken into account.

There were 11 workers who took part in the questionnaire, so on the table below it is seen how many workers replied “yes” and “no” to the given questions:

| QUESTIONS | YES | NO |
|---|-----|----|
| Do you always find the right equipment/spare parts/tools right away? | 4 | 7 |
| Do you have any old equipment you don't use anymore? | 6 | 5 |
| Do you find dust, dirt in corners of your warehouse? | 7 | 4 |
| Do you observe valuable space being occupied by useless and unwanted items? | 6 | 5 |
| Do you notice that you miss needed items sometimes? | 8 | 4 |
| Do you observe that you're having too many items you don't use? (quantity is big) | 7 | 4 |
| Do you find that some space is taken by useless items? | 6 | 5 |

Figure 4. Questionnaire presented to the employees.

Based on the employees' replies the following conclusion was made:

- Not all the items have their own place
- Some workers lose time on looking for needed tools
- The items are located in the warehouse which are not needed

It was also noticed that due expansion of the company and renovation of the office and warehouse, misunderstandings occur. Before the expansion of the company, it was relatively easy to keep track of the inventory and ensure every item has its own spot. Though company is growing and expanding fast in the competitive environment today, the need of improving the way of its work has increased. Furthermore, implementation of 5S system can be also a useful tool for improving communication between workers.

To decide what areas should be improved to achieve the most outcomes, it was decided to take a look at the processes in the company. The following diagram was created:

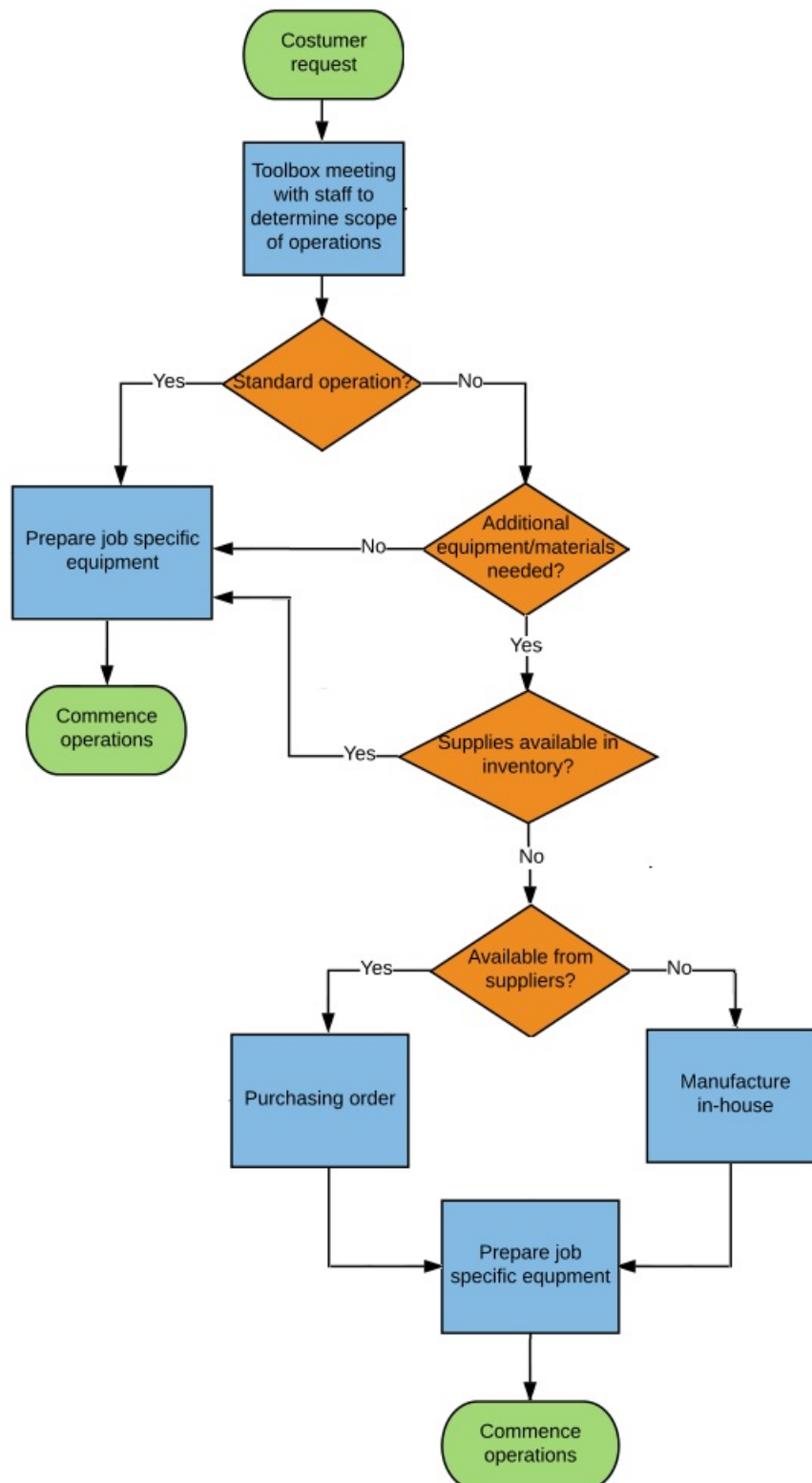


Figure 5. The flowchart of operations.

Due to limitations and regulations, only divers and technicians are allowed to be present during underwater operations, that is why it was decided to take a look at what happens before and after operations and what and how the processes can be changed.

Equipment needed for observations: stopwatch, pen, and notebook.

Every order the workers receive can be divided into three parts:

- Preparation for the job (picking up equipment, ordering parts..)
- Performance of the job
- Unpacking of equipment, cleaning.

| Preparation time | Actual job | Unpacking time |
|------------------|------------|----------------|
| | | |

Figure 6. The schematic division of job into three parts.

The actual job is the time when workers get paid, so these are the services they provide and what customers actually see and evaluate. In every kind of a job there is a lot of job to be done and this is not going to be noticed by customers.

In order to conduct research, time for every step was measured during the internship at the company. Since the paid hours are calculated being rounded up to the whole number, I also put it in a table as a whole number. The rest of the time was measured with a timer.

Results

I was measuring time and writing down notes on what workers spend their time during preparation and during the time after job and that's the results:

Table 1. Measurements.

| Number of measurements | Preparation time | Paid time | Unpacking time |
|------------------------|------------------|------------|----------------|
| | t1, min | t2, min | t3, min |
| 1 | 138 | 1080 | 110 |
| 2 | 95 | 600 | 90 |
| 3 | 190 | 1260 | 115 |
| 4 | 100 | 360 | 93 |
| 5 | 298 | 2940 | 77 |
| 6 | 179 | 420 | 81 |
| 7 | 91 | 240 | 67 |
| 8 | 121 | 720 | 74 |
| 9 | 124 | 600 | 82 |
| 10 | 135 | 480 | 96 |
| 11 | 90 | 240 | 120 |
| 12 | 188 | 1740 | 106 |
| 13 | 106 | 300 | 89 |
| 14 | 186 | 960 | 73 |
| 15 | 210 | 1680 | 61 |
| 16 | 141 | 480 | 100 |
| 17 | 84 | 300 | 65 |
| 18 | 104 | 660 | 60 |
| 19 | 134 | 840 | 96 |
| 20 | 103 | 480 | 82 |
| Average | 140,85 | 819 | 86,85 |
| Total average | 1067,7 | | |

Remark: the workers get paid for an every working hours and at least for 4 hours, meaning if they performed job for 2 hours, they get paid for 4 hours, and if they are able to finish job for 4 hours and 20 minutes, they get paid for 5 hours of working time, so the numbers for working time were rounded.

The average working time is 819 minutes and it is rounded to 14 hours.

Total average is preparation time + paid time (14 hr) + unpacking time.

From here it is possible to calculate actual cost/hour.

Table 2. Average cost of working hour.

| Average cost of working hour | |
|------------------------------|---------|
| Paid time | 14 hr |
| 1 hour | 50 \$ |
| Average cost/job | 700 \$ |
| Actual time | 17,8 hr |
| Actual cost/hr | 40 \$ |

It was also noticed that during preparation a lot of time wasted:

1. 24 minutes were spent to make a few calls and find where the last time some equipment was placed.
2. 65 minutes were spent to find out that there are some consumables missing and a worker had to order the new ones and go to pick them up
3. 60 minutes were spent to refill the gas balloon, because it wasn't refilled after the use

The table on time wasted during the preparation is below:

Table 3. Measurements.

| # | t, mins | # | t, mins |
|----|---------|----|---------|
| 1 | 24 | 11 | 24 |
| 2 | 65 | 12 | 47 |
| 3 | 60 | 13 | 8 |
| 4 | 43 | 14 | 50 |
| 5 | 22 | 15 | 21 |
| 6 | 16 | 16 | 15 |
| 7 | 18 | 17 | 20 |
| 8 | 70 | 18 | 17 |
| 9 | 10 | 19 | 28 |
| 10 | 56 | 20 | 31 |

| | |
|----------------|--------------|
| Average | 32,25 |
|----------------|--------------|

As we can see from the graph, the average wasted time in each preparation is around 32,25 minutes.

On the table below the average amount of orders per year can be seen.

Table 4. Average amount of orders per year.

| Year | Orders |
|----------------|-----------|
| 2016 | 78 |
| 2017 | 112 |
| Average | 95 |

The ideal result is to avoid wasting 32,25 minutes on average on every job, then the costs would look like that:

Table 5. Total money saved per year.

| | | |
|------------------------------------|---------------|-----------------------|
| Average hours paid | 1330 | *=14 hr*95 |
| Average hours worked | 1691 | *=17,8 hr*95 |
| Total paid (\$) | 66650 | *=1330 hr*50 \$ |
| Average hours worked | 1640,65 | *=17,27*95 hr |
| Total hours saved | 50,35 | *=1691-1640,65 |
| Total money saved (\$/year) | 2517,5 | *=50,35*50\$ |

5.2.2 Analysis

The hypothesis on the time efficiency was tested during the experiments and it was found out that implementation of the 5S methodology has a potential and could result in the development of the company and tends to save time and costs.

The company started operating a couple of years ago, and it can be seen that it has developed its network and has obtained new customers within the last year.

The measured figures and calculations are not totally precise since it is hard to find an average for the amount of working hours and the amount of jobs. That is why the results do not seem very impressive. Theoretically the amount of orders is going to increase. The reason is that the company is becoming more and more competitive and recognizable on the market. It is expanding and growing rapidly, opening new offices in different locations, and having plans to hire more divers.

The current model suggests that time is going to be saved during each job, meaning if implemented properly is going to save more and more money later on when the amount of orders is increasing.

The company's plan is to increase amount of orders in 2018 and 2019 by 30%, and in 2020 and 2021 by 15%.

Table 6. The company's plan in the following years.

| Year | Orders | |
|------|--------|---------------|
| 2019 | 145,6 | *=112*1,3 |
| 2021 | 167,44 | *=167,44*1,15 |

If the model is implemented properly, then the results are the following as shown on the table below.

Table 7. Total hours saved in 2019 and 2021.

| | Without 5S | With 5S | Hours saved |
|------|------------|---------|-------------|
| 2019 | 2591,7 | 2514,5 | 77,2 |
| 2021 | 2980,4 | 2891,7 | 88,7 |

As it can be seen, if the amount of orders is growing, the amount of hours saved after the implementation is growing as well. As a conclusion the implementation of a model can be considered a success.

5.3 Service operations management

5.3.1 Research

Introduction

In order to get an overview of the management operations in the company, a few interviews were conducted. The objective is to get an idea of what kind of role operations management play in the specific company and how they influence the functionality and efficiency of the company.

The chief operations officer was chosen as an interviewee because she is responsible for the operations within an organization and the technical supervisor is a responsible person for operations during the jobs underwater, in this way the key informants of the company were interviewed, giving different perceptions of the company itself and the high quality data was retrieved from the interviews.

Methods

One of the interviews was analyzed with the help of SWOT-analysis to highlight the areas where the company is better than its competitors and what areas should be improved. The other interview's objective was to find out about operations management considering customers' satisfaction.

The interviews were recorded on the tape and replayed a few times and written down afterwards, so written transcripts from a word-for-word replica of the conversations were generated.

Interview with a technical supervisor

What advantages does your organization have?

We're a small company with a highly specialized, professional and international team of technicians from different places and backgrounds.

Thanks to our team of different nationalities we can communicate and offer sustainable and long lasting solutions to our customers in several languages such as: English, Dutch, German, Russian, Chinese, Japanese, Norwegian.

Since we provide services for the Shipping Industry, language and communications are an important factor.

What do you do better than anyone else?

We are available 24/7, worldwide. Our main work area is the port of Rotterdam where we have our own dive support vessels which covers the full port of Rotterdam. We also have an additional support vessel in the port of Amsterdam and just

recently opened an office in Algeciras, Spain. We also have an extensive network of support technicians and suppliers if needed during our operations.

We are approved by all major certification agencies, therefore, we can provide approved and high standard solution to our customers.

What unique or lowest-cost resources can you draw upon that others can't?

In both Rotterdam and Amsterdam we provide our own dive support vessels, which most of our competitors cannot provide. Therefore, we can work during vessel cargo operations and on locations which are otherwise prohibited for diving operations. We provide our services, without the vessels being forced to stop their daily cargo or other operations and without causing any delays, this saves our costumers precious time and money.

What do people in the market see as your strengths?

We have a highly flexible, talented and experienced team, with a "hands-on" mentality. We have our own dive support vessels and in that way we can provide cheaper and faster services without delaying the vessel.

What could you improve?

Since we are a small company, we sometimes miss the manpower to take on large projects.

We have to make sure we steadily grow without losing our high standard services and without losing sight of what makes our company unique, this requires the right-minded people and a tremendous amount effort from our own staff to properly integrate them into our organization.

What should you avoid?

We should avoid becoming “comfortable” with our current position and keep looking for new opportunities in order to improve, both technological and economical.

Due to the continuous changes in the market, it is important to constantly keep an eye on new developments in the market and assure to stay ahead.

What are people in your market likely to see as your weaknesses?

As said before, we currently have a small amount of staff working for us, in that way we sometimes miss the manpower to take on larger projects.

What good opportunities can you spot?

We are currently researching and developing a new system which is unavailable on the current market, due to confidentiality reasons, I cannot expand on this question any further.

What interesting trends are you aware of?

As in a lot of markets, more work is being done by ROV's (Remotely Operated Vehicles, Robots), this might provide additional support for our technicians.

What obstacles do you face?

The shipping economy faced a few hard years since the economic crisis and is slowly recovering, this obviously has a big impact on all companies that provide services for the shipping industry.

What are your competitors doing?

A lot of our competitors heavily invested in the offshore industry prior to the economic crisis and are still recovering from the impact they faced during and after the crisis.

Are quality standards or specifications for your job, products or services changing?

We have to keep an eye on the constant changes in certification standards and local and international laws when it comes to the diving & shipping industry and labour in general. Getting all the right permits and certificates for our operations, both local and international, consumes a lot of time and effort.

Is changing technology threatening your position?

Even though I already stated that the ROV market can provide new opportunities, it can also threaten certain of our objectives, therefore, it is important to constantly follow the current market and technological advances.

Do you have bad debt or cash flow problems?

No.

Could any of your weaknesses seriously threaten your business?

As long as we keep our high standards and adept to the current market and opportunities, improve our customer services and R&D, I don't see any serious threats in the coming years.

5.3.2 Analysis

Analysis of the interview

The interview was analyzed with the SWOT – analysis. The table can be seen below:

Table 8. SWOT-analysis based on the interview.

| Strengths | Weaknesses |
|--|---|
| International team, speaking different languages Availability 24/7 Own workboats Highly skilled divers Approved by major certification agencies Developed network of partners | Limited workforce |
| Opportunities | Threats |
| New shipping trends Development of new technologies Location near the largest ports in Europe (Rotterdam, Antwerp, Hamburg, Amsterdam, Bremen, Le Havre) | Harsh competition environment due to development of new technologies Shipping market instability Weather conditions |

For now the main weakness of the company is limited workforce. If the company is growing and expanding, whilst improving the existing processes and removing unnecessary work, it helps to save time, money and hire new people in the future.

The location near the largest ports in Europe provides the company with lots of opportunities to grow and strengthen the company's position on the market. Ports of Hamburg, Rotterdam and Antwerp are the largest ports in Europe and the amount of ships sailing to those ports is huge. The growth and expansion will help to become recognizable and react to more and more orders in the future.

From the figure below it can be seen that the main ports of Europe are easily reachable from the office by car.



Figure 7. The main ports in Europe where the company operates. Adapted from Google Maps.

More than that, the technology development has been an issue for a few years already. If the company is planning to grow, the investment in new equipment is going to be useful and will help to become more competitive. For example, there is a brand new equipment which can allow to perform work underwater with the low visibility, so the weather conditions should not become a threat anymore.

Conclusion

The SWOT-analysis based on the interview helped to recognize operational issues within the company, hence gave a better ideas on what areas to concentrate on to improve the company's efficiency.

Interview with a chief operations officer (COO)

What is the strategy of the company?

The company is there to provide high quality inspections, repairs and maintenance for vessels, during port calls.

What are the objectives of the company?

The objective is to perform inspections, repairs and maintenance on vessels, during port calls.

The operations are carried out during cargo operations, in that way the company provides a time and cost effective solution and avoids down time for the vessel.

How do you ensure customers get what they expect?

The customer contacts the company and requests which operations are to be undertaken, and provides additional information if necessary. After receiving the request, all necessary preparations are taken by the company. If the customer requires additional services or equipment during the operations, the company will react accordingly. The company has an extensive network of partners and suppliers, which are available 24/7.

How do you improve services?

Regular (toolbox) meetings are held before, during and after operations, in that way the company continuously improves its services.

And additional feedback is provided to the company staff.

How do you measure performance?

The company receives feedback from customers and all staff is evaluated on a regular basis.

Are some services delivered better than the others? Why?

The company always delivers high quality services, in order to improve our services a debriefing is held in case any inconsistencies have occurred.

The company continuously develops their procedures to guarantee top quality services.

How do you develop relationships with customers?

Good and transparent communications are the core of our strong relationships with customers. Our services (or advice) are available 24/7.

Analysis of the interview

The interview was analyzed and the main points can be seen on the figure below.

| Strategy and Objectives | Customer Relationships | Service Delivery |
|--|--|--|
| High quality services | Availability 24/7 for services or advice | Staff evaluation |
| Providing operations which save costs and time for vessels | Feedback from customers | Regural meetings are held within the company |
| | | Feedback from customers |

Figure 8. Qualitative analysis of the interview.

For every company providing services or manufacturing goods it is necessary not to forget about customers and ensure company's goals compromise with customers' needs.

The company concentrates on customer's feedback and makes a use out of it. It has been also mentioned that staff is evaluated and feedback from customers is taken into account.

Conclusion

The data retrieved from interview allowed to create an understanding of how processes are arranged from the operations management side and customers' satisfaction. With the help of the interview it is possible to develop ideas on improvement operations management while taking a customer into account.

6 Suggestions for development

6.1 5S implementation

Discussion

It is possible to find the instructions for deployment of the 5S methodology everywhere on the Internet, there were many articles written about it. But the uniqueness of this case is that the area of maintenance underwater has not been researched well yet. In that way the suggestion is to adapt existing strategies to our case to reach the most outcome.

Goals

Before the deployment of the system it is crucial to define goals and objectives which will meet the needs and requirements of the company to guarantee why and how it will be achieved. The warehouse was chosen as a place to start with. Its purpose is to store the equipment and tools and make sure everything is on the right place and in the correct amount.

With the help of the CEO and the technical supervisor, the following goals were defined:

- Provide better and more efficient services towards costumers
- Save money and time
- Better overview of the total stock
- More efficient use of the limited space available (to avoid high inventory costs)
- Improve way of communication with the full staff

6.1.1 Implementation steps

There are different guides and tools giving an advice on how to deploy the methodology, but it is quite hard to find the ready solution for the specific case. That is why after communicating with CEO and technical supervisor of the company, the solution was created, combining various ideas from the books, articles on the Internet and our own ideas.

The first step in implementation is to provide training for personnel about the lean thinking and 5S methodology. Every worker should be aware of what changes to expect, why the company wants to change the way of working and what the responsibilities of each worker are. Usually it is very complicated to explain for some employees why the way of working is going to be changed. So at this step the person responsible for the presentation of 5S methodology should be ready to accept criticism and objections. That is why the discussion should be arranged: each worker should make a list of advantages and disadvantages after the presentation and all of their points should be discussed during the presentation. Goals, objectives and risks also have to be discussed during the meeting.

Even though all the workers have to be informed about the upcoming changes in the company, not all of them are supposed to take part in the implementation. There is a reason for it: the warehouse is not that big and involving too many people could make it more complicated, that is why only a couple of volunteers and CEO would be enough for the chosen area.

After the team for implementation is chosen and approved by the CEO, the plan of communication has to be made. It is important to make sure that everyone who is involved is updated about every-day tasks. For example, evernote can be used for this. More than that, measures of performance have to be defined, so the current condition of the warehouse has to be fixed. Then the long-term goals have to be divided into short-term goals and be written down in Evernote. Every day workers who are involved in implementation have to update information about completed tasks and make a plan for the next days. Dividing the whole implementation into smaller steps will make it easier for everyone. In this way, workers will not have to spend

much time and make an effort to take part in implementation. Furthermore, the deadlines should be established.

The second step is to make the list of all the items and their amount in the warehouse. It could be also useful to make the layout of the warehouse to see where and what items are located. After that all of the items, tools, spare parts, and equipment should be divided into “needs and wants”. Needs are the items that are needed to ensure the efficient work and have to be in the right quantity in the warehouse, and wants are items that wanted but not needed. For instance, the wants are 3 screwdrivers instead of 1. So at this step all of the items should be sorted according regularity of their use and items for disposal have to be removed from the working place.

| Item | Needed | | | For disposal |
|----------------------------------|--------|--------|--------------|--------------|
| | daily | weekly | semiannually | |
| Drysuit | x | | | |
| Diving Helmet | x | | | |
| Scuba Equipment | | | x | |
| Underwater Welding | | x | | |
| Hydraulic tools and powerpack | | x | | |
| High Pressure cleaning Equipment | | | x | |
| Expired Air Cylinders | | | | x |
| Expired First Aid Kits | | | | x |
| Insulating tape | | x | | |

Figure 9. The example on sorting equipment.

Examples of items to be removed from the working place: old equipment which does not work anymore, old dry suits with holes in them.

It is clear that sometimes it is hard to find out to what category the item belongs, that is why Debashis Sarkar in his book suggests to use the 6 months test for items that are not used regularly. For items that are not in any category yet, a tag with a current date should be attached. Then it is necessary to create a separate list of those items and add a reminder on Evernote in 6 months to check if any of those items were used. Most likely, if an item hasn't been used for 6 months, then it is a want. Though this statement requires an important remark: the warehouse contains rare equipment and sometimes equipment is needed only once or twice a year. In

this case, this equipment should not be disposed, but placed on a separate shelf with the rest of equipment which is used very rarely.

During this step the plan for disposal of the items should be made out. For example, if there is old equipment and it has to be repaired, the tag should be placed on it with a date when it is going to be picked up to a repair service.

If follow various instructions in the books and articles, the second step can be also named as “sort”. It is usually the first step in implementation, but our instruction is adopted according to the specific case in the company.

Sorting the equipment, tools and spare parts is essential in for saving time later and leaving valuable space for the items that are really needed for work. In that way, it is also aiming to help to decrease time on looking for necessary items.

According to the 5S methodology, the next step is about defining a place for each item in the warehouse. But before this step it is very critical to make sure all the items were sorted properly. Then the layout of the warehouse should be created. All the shelves, boxes have to be numbered and the information about items placed there has to be mentioned in the layout as well. Having a layout or a plan of the office or warehouse gives a better understanding where the items can be placed.

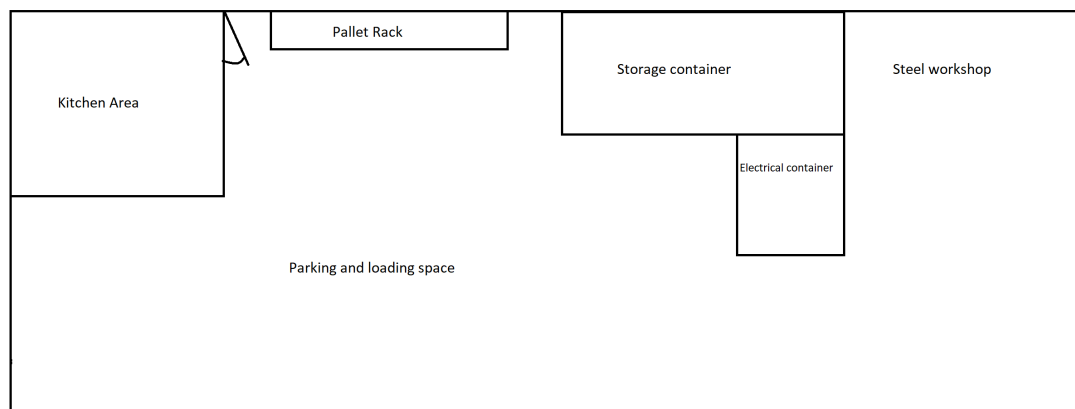


Figure 10. The layout of the compound.

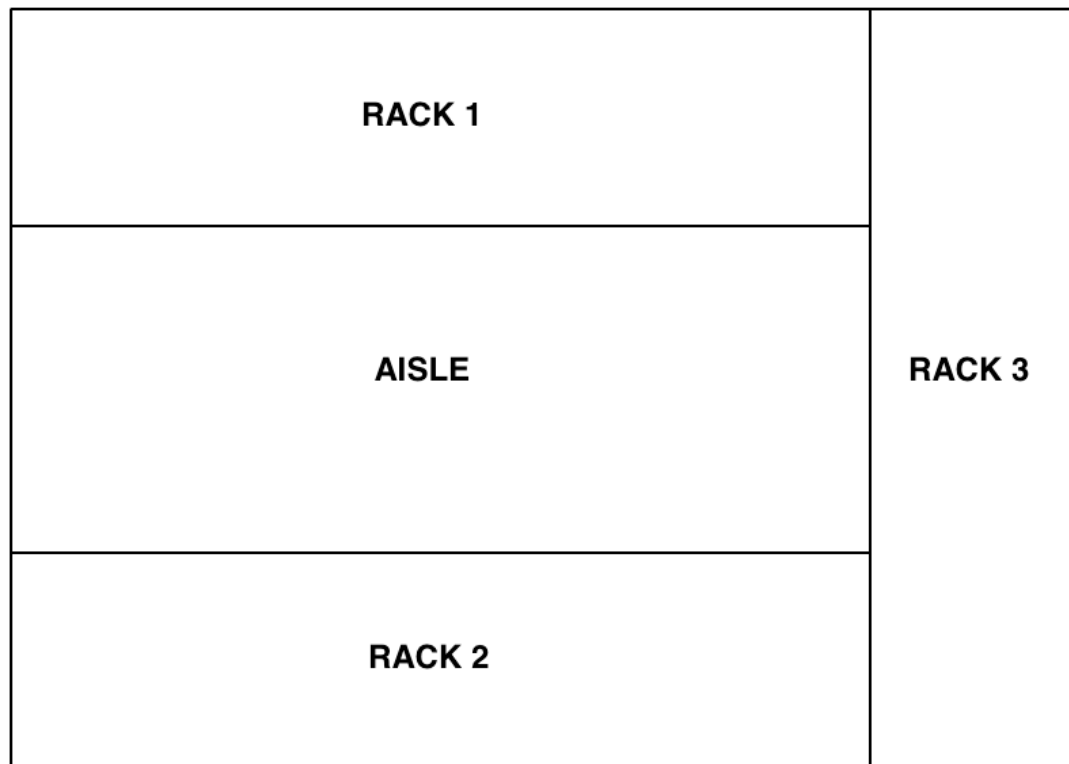


Figure 11. The layout of the storage container (warehouse).

Since disposal and repair of the items, which are not used, will take some time, the place for storing those items should be chosen. As it was mentioned above, those items should be tagged. Having a clear layout of the office will help to define what place exactly is going to be used for those items. More than that, marking areas on the layout, specifying what areas are already occupied is going to simplify the implementation process.

Afterwards the system for arranging the places for items should be made. It is important to ensure that it is done in a logical way. In our case it was chosen to place items according to their frequency of use. This way the rare equipment was placed to the furthest rack from the entrance, and basic equipment, which is needed for every kind of a job, was put right next to the entrance. Then according to old statistics, it was decided to place inspection equipment next to the basic one, since the statistics shows that inspections are performed most often in comparison with the other jobs.

| | | | |
|--------------------------|------------------------------|---------------------|-----------------------|
| Basic equipment | Inspections equipment | Oil leakage | Rare equipment |
| | | Entanglement | |
| | | | |
| Basic tools | Spare parts | Ropes | |
| Basic consumables | | | |

Figure 12. Suggestion for placing the equipment.

So after all the equipment has been sorted and a place for each item was defined, it might seem that implementation has been finished. But there are a few other steps to take to guarantee the successful implementation and sustainability of it.

The fourth step is to keep the area clean, meaning unnecessary items should be disposed and necessary ones are to be returned where they belong. It was decided that twice a week one person is going to be chosen to ensure that the area is clean and all the items are where they are supposed to be. The note in Evernote with reminders will be added and each person in the office is going to take care of the maintenance and update stock levels. After the revision, a responsible person should tick the box with his name and a date if everything was completed. In case there were missing items and it was not possible to clean the area, the person should make a small report stating what is missing. Each worker is going to get a reminder about the day he or she is an assigned person.

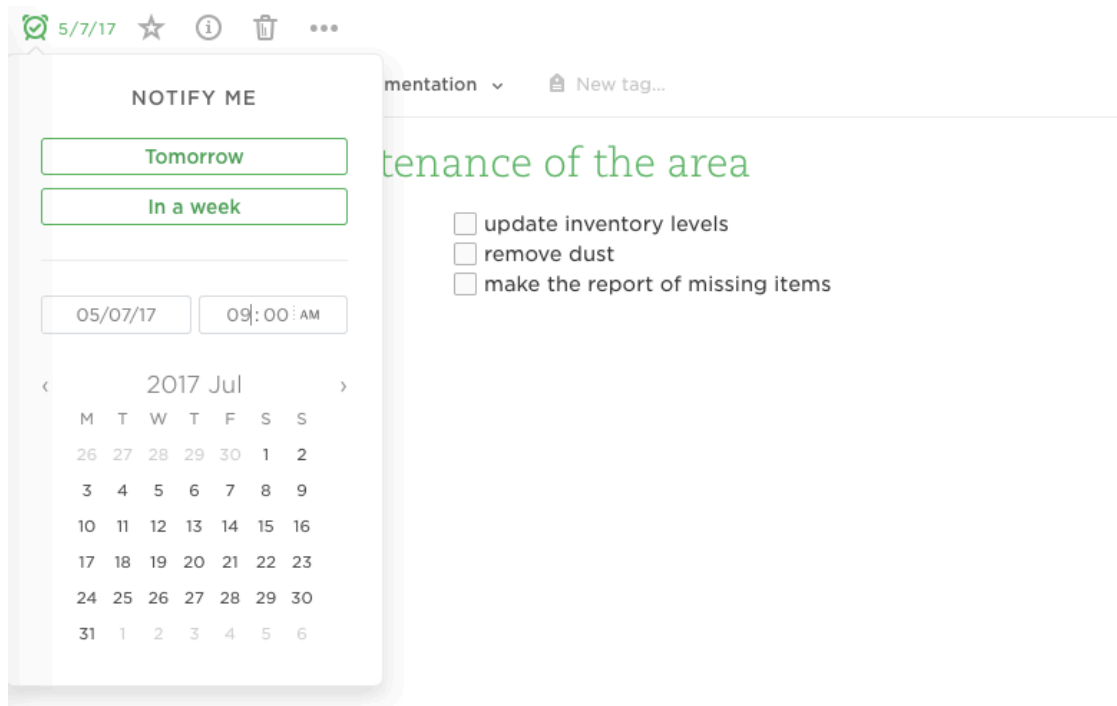


Figure 13. Screenshot from Evernote. Plan for maintenance of the area.

After the schedule for maintenance and cleaning is arranged, the next step is to make a set of rules to follow in the warehouse. It is crucial that each employee follows the rules and the schedule is updated regularly.

6.1.2 Risks

Even though implementation of 5S system might seem a solution to the problems, it is essential to take into account that it is not going to become the only solution for the problems the company is having. More than that, by implementing the 5S methodology, it is meant that it is going to be continuous improvement, since just implementation will not help to achieve high results. Everyone will have to change their mindset and be able to spend time on keeping the warehouse the way it was meant by deployment.

It also seems that the whole implementation process is just a waste of time, because it is going to take some energy, time and effort and the results will be quite hard to notice only after a few days. It requires commitment from all the workers and their desire to change the usual way of working.

6.1.3 Further suggestions

Once 5S methodology is implemented and all the rules follow day-by-day by every worker, it is recommended to choose the next area for implementation of 5S, for example, the office. The steps will remain the same, but the idea will be a little bit different, because the purpose of the office is different from the purpose of the warehouse. Furthermore, the steel workshop needs a shadow tool board to make it easier to use the instruments and find them when needed. The main idea was to suggest implementation of 5S methodology to the most used area which is the storing room. The equipment needed for every job should be maintained properly and have their own places.

6.2 Ways of communication

Based on my own observations and discussion with workers, an idea to add one more way of communication appeared. The reason is that there is no platform yet to keep track of jobs, equipment and boat condition. So the idea of adding Evernote was introduced. The Evernote is an application for taking notes and archiving them with the possibility of sharing them. It is easy to use and does not require additional training for the personnel.

The reasons for using Evernote:

- Write down the short-term and long-term goals and objectives of the company
- Add clear explanations about the projects and jobs
- Keep track of boats to be maintained
- Keep track of equipment to be maintained

Possible risks in using Evernote:

Using a new way of communication might cause more misunderstandings between workers. It is important to take into account that all the workers are aware of why and how they are using the new application and updating the required information.

That is why to avoid mistakes a meeting for workers should be held to explain the purpose of using an Evernote and the importance of using it.

Workboat 1

Short term

- Exchange engine oil
- Make a full inspection of the engine
- Install new diving communication panel
- Repair deck lights
- Paint the deck crane

Long Term:

dry dock plan: (most likely 11/2017)

- Clean bottom
- Sand blasting of hull
- Apply new anti fouling
- Spray paint full vessel
- Renew all propeller seals

Figure 14. Screenshot from Evernote.

6.3 Tools for managing customer satisfaction

The company is going to grow and develop its network of suppliers and customers, so an idea is to concentrate on creating various KPI for employees based on the feedback from customers. Furthermore, the customers' feedback has to be analyzed regularly and it is crucial to ensure that customers' needs and expectations do not contradict with the company's goals and objectives, so finding a balance between these issues is important.

6.4 Other suggestions

Workstation

Sometimes the parts and details needed for jobs are manufactured in-house, so the workstation should be clean and necessary tools are reachable all the time. In that way, making a shadow board for tools will help to ensure that all the tools are on their own places all the time and are easy to reach when needed.

Tracking items

When the company was smaller it was not that hard to keep track on the amount of items, spare parts and consumables in stock. But now it is becoming a real problem and it is hard to keep track of everything properly without using any kind of a barcode system. This is the reason why research on implementation of the barcode system and warehouse management should be carried out.

ERP software implementation

Due to the expansion of the company new ERP software might be needed. The research on the ERP implementation is also recommended. The ERP software be beneficial to ensure that the various offices of the company are operating well and

7 Conclusion

The thesis can be considered a success, since the objectives were achieved. The research was performed to give a brief overview of existing problems in the company and various research methods were used to have a look at the company's processes from the side of management and operations.

Qualitative and quantitative analysis of collected data was done and hypotheses were tested. In that way, with the help of various available sources several solutions for improving operations were suggested. Moreover, the possible outcome from implementation of a business tool was provided in the thesis.

However, due to a limited scope of the conducted research a few areas left uncovered and further research is recommended. The study gives ideas on other areas to investigate as well as provides with possible solutions for further improvement.

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