

**FACULTY OF SOCIAL SCIENCES,
UIS BUSINESS SCHOOL**

MASTER'S THESIS



Universitetet
i Stavanger

How can innovation and lean be combined to improve the economic performance of a company?

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i Stavanger

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UIS BUSINESS SCHOOL**

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Acknowledgement

This is the closing assignment of our two-year masters program in business administration at the University of Stavanger. It is written within the field of business innovation in the spring of 2018.

We started brainstorming back in december of last year and developed our initial research question in cooperation with our supervisor in january. Since then, we have worked on it every week until our research is now finally completed. We decided early that we wanted to write about something we found interesting, and both of us agreed that the effect of innovation on economic performance would be an interesting topic to examine further.

To write the thesis in cooperation has been very fun, but also at times demanding. It has been important to be able to discuss and to compromise when needed. We are both happy with our cooperation and have had a great time working together on this research.

We would like to thank our supervisor, Ragnar Tveterås, who has always been available if we had questions and encouraged us with constructive feedback. We would also like to extend our gratitude to CEO of Malm Orstad, Lauritz Haringstad Løvø, who has allowed us access to his company and presented us with all the information we have asked for. He has always been available in person or through e-mail whenever we needed anything, and has been a great help for our research. In addition to this, we would like to thank all the other employees at Malm Orstad, who was involved in our quantitative- and qualitative research. Without their help, we would not have been able to complete our paper.

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Summary

Companies are always looking for new ways to improve, in order to grow and outmaneuver their competition. There are many strategies that can be implemented to achieve this, but two popular tools used in order to gain competitive advantage are innovation and lean.

This research contains a case study of the Norwegian company Malm Orstad, located on Voll, south of Stavanger. Malm Orstad is an industry company, delivering equipment and components to the oil industry. The company was on the brink of bankruptcy in 2015, and has performed a remarkable turnaround in order to become profitable again. A lot of credit for this turnaround goes to their new lean strategy and focus on innovation and improvements. Our aim was to answer the question: *“How can innovation and lean be combined to improve the economic performance of a company”*. Our overall goal was to see if a company that combine innovation and lean can experience improved economic performance. To answer this question we have studied theories about innovation, knowledge and lean. We also look at employee driven innovation and discuss if this has developed as a side-effect of a lean strategy.

To answer our research question, we have performed qualitative interviews, as well as a quantitative survey, in order to gather data and reach a conclusion. We have also reviewed the accounting data of Malm Orstad from the last ten years to see if we could find evidence of improvements in economic performance as a result of their new strategy.

During our research we discovered several similar characteristics between lean and employee driven innovation, and wanted to research the connection between these. Our findings display that Malm Orstad possess a lot of the values you often find in a company that succeed in employee driven innovation. We have also seen that Malm Orstad is an organization that to a high degree can be counted as innovative, and we present arguments for this. Our conclusion from this research is that companies that combine innovation and lean will experience an increase in incremental process innovation, which can be observed in the accounting through reduction of costs. When lean is implemented the way it is at Malm Orstad, it can become the source of innovation, through increased involvement from the employees.

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1.0 Introduction

1.1 Research question

Over the last two years we have gone through our masters degree courses with specialization within business innovation. Throughout our degree we have acquired a lot of knowledge about innovation in different fields and how it can be used for different purposes. Perhaps the most important learnings we have acquired is the importance of innovation for firms and organizations in order to achieve development and competitiveness. For a firm to become successful in today's market, they will almost always have to compete through innovation, whether it is through development of new products, the improvement of existing processes or other innovation strategies. No matter what innovation you want to pursue, it is important that the firm knows how to promote innovation and how to use it as an asset.

We decided early in our process that we wanted to look at how innovation can be used as a tool for companies in order to improve their economic results. Our next step was to find a company we could cooperate with that shared our interest in innovation. With the help of our supervisor we got in touch with the CEO of Malm Orstad, and arranged our initial meeting. After our first meeting with the CEO we decided that this was a good match for us, based on the history of the company and the changes they have experienced in the recent years. Malm Orstad has turned a deficit of 44 million NOK in 2015 to a 5,7 million NOK surplus in 2017 and we have been lucky enough to get a first hand view into how this change has been possible, through cooperation with the company. We learned that the company had implemented a lean working method, which we consider as an important process innovation. In 2017, they won the Inspiration Award at a yearly lean convention that focus on how to lead a company into a profitable future. This fits very well with the initial plan for our research and would be a good case study to illustrate how a struggling company can gain a new life through the strategic use of innovation.

Through talks with the CEO we understood that a great deal of their improved results was credited to their new working methods and the changes made within the company. We wanted to research if these changes was the consequence of innovation and lean only, or if there are other factors involved. Our goal is to examine how the implementation of lean,

which we see as a process innovation, have resulted in improved results for the company. We have previously learned about lean and innovation individually, but we have never heard about how these two strategic tools will affect each other. In the end, we drafted this research question, and will use it in our case study with Malm Orstad to further research how the company became profitable again.

“How can innovation and lean be combined to improve the economic performance of a company?”

To better answer our research question, we also want to answers these supplementary questions:

- To what degree is Malm Orstad an innovative organization?
- How does a lean working method relate to employee driven innovation?
- Will lean and innovation complement or disrupt each other?
- Is there a correlation between the oil price and the results of Malm Orstad and have they become less affected by external factors after the implementation of lean?

1.2 Structure of the thesis

Our thesis consist of six chapters.

1. In this first chapter we aim to introduce our thoughts and motivations behind our choice of research. We will present Malm Orstad as a company and explain how we have developed our research question and how we aim to answer it.
2. Our second chapter will cover the previous literature and the theoretical structure of the thesis with focus on innovation, lean, learning and employee driven innovation. Our theories are chosen to help us answer our research- and supplementary questions.
3. In the third chapter we substantiate our choice of method for data gathering, as well as discussing pitfalls and advantages of the methods we have chosen.
4. In the fourth chapter we will present the data we gathered through our qualitative- and quantitative methods, as well as accounting data and company data.
5. In chapter five we will discuss our case opposed to the theory and previous literature. We will use the data collected throughout our research and use established theory to explain them, in order to answer our research question.

6. In our closing chapter, we present the results from the discussion section and the final results of our research. We reach a conclusion to our research question through answering our supplementary questions and discussing our result.

1.3 Case: Malm Orstad

Malm Orstad AS was founded in 1946 on Voll in Rogaland, 25 kilometers south of Stavanger. They started as a mechanical workshop, but have developed over the years and today their main areas of expertise are engineering and fabrication, mainly related to the oil industry. Over the last few years they have focused on diversification in order to enter other industries, like defence, fish farms and hydropower, to become less dependant on the ever volatile oil industry. The company currently employ 96 people and have been run by CEO Lauritz Haringstad Løvø since late 2015.

1.3.1 Production

Their areas of expertise is mainly engineering and fabrication of several different components and products. Their main production comes from CNC, computer numerical control, which is a tool that allows machines to execute production of pre-programmed sequences (Lynch, 1997). This way, a product like a bolt or a plate can be designed as a 3D sketch on a computer and cut out automatically by the machine from a full block of raw material. When producing with these tools, the amount of manual labour is highly reduced, and this should also reduce the amount of human errors made in production.

The company employs different types of workers:

- CNC operators use a computer to control the CNC machines. Their day to day work consists of preparing materials and data, perform maintenance of equipment and monitor the processes.
- Engineers produce digital 3D-sketches that can be inserted in the machines in order to produce a wide variety of different products.
- Project managers have responsibility of sales, marketing, planning and production. The sales department are responsible for reviewing demands and chose what projects can be possible and profitable for the company. After this, the operations are planned, before production is completed.

- Management has the responsibility for the day to day operations of the company. They keep track of all departments and make sure the company moves forward in a profitable way. They decide the objectives the company aims to complete and how they are going to do it.

The close proximity between engineers and machines allows Malm Orstad to handle complex orders all the way from ideas to finished products. Customers can also approach Malm Orstad with their own designs, that can be fed into their computers and cut by their machines. When the order is finished, they perform a quality control, surface treatment and packaging. If the document control is approved, the product is shipped to the customer with the invoice.

Malm Orstad delivers a wide range of parts and prototypes. To give an idea of how the finished products look like, we have added some pictures as illustrations.



Picture 1: Hydraulic cylinder. Picture 2: Continuous movement skidding system. Picture 3: Tether management system

1.3.2 Current status

Back in 2015 their operating profit was negative at -40,3 million NOK, down 50 million from the previous year, which was an unfamiliar and scary situation for the company, who had a history of delivering solid surplus most years. Everyone in the company realized that there would have to be taken immediate action to turn this around, to not face the likely scenario of the company going bankrupt.

This sudden deficit in 2015 can be seen in context of the weak economic climate in the Rogaland-region, as a result of falling oil prices from the end of 2013. The oil industry dominates the area and when the price fell, it affected all companies related both directly and indirectly to this industry. Malm Orstad, as a supplier to the oil business, felt this as hard as anyone else through falling demands and sales.

When we started writing this paper in January of this year, Malm Orstad had just delivered the accounting for 2017, where operating profits were back to positive numbers, at 7,3 million NOK. This has been an incredible turnaround in just two years, from being on the brink of bankruptcy to once again delivering solid profits. Malm Orstad want to be known as an innovative organization, with focus on efficiency and improvement, so we find them to be an excellent subject for our case study. We want to research how innovation and the implementation of lean have played a crucial part in the impressive improvements experienced over the last two and a half years.

1.4 Refinements

In our research, we have only looked at one company, that is closely related to the oil sector, and can not know if our results apply to Malm Orstad alone or if they can be transferred to other companies in the same industry. We only have a small data period to look at after the implementation of lean in the company, since this started halfway through 2016. We have tried to differentiate our interview subjects to cover the whole hierarchy of the company, but we only had time to conduct one interview with a subject from each department. This can complicate the reliability of the results from the interviews because of the small amount of subjects. The time we have had to conduct research and write the thesis, six months, is not enough to interview everyone involved with the company, but by talking to subjects in different departments we think we have enough information to cover the company as a whole.

1.5 Hypothesis and assumptions

Going in to our thesis we had interviews with different companies that we thought could fit our line of research and we chose Malm Orstad because of the first impression we got from our initial meeting. We were convinced that they had knowledge about how you can use innovation and felt it was a good base for our research. Through our preparations, we learned that the company had gone through a rough time during the oil crisis and that they started to perform better from 2016, after the change in leadership and strategy.

When we chose to work with Malm Orstad, we knew they refer to themselves as an innovative organization. We also knew that they have implemented lean manufacturing as a tool to reduce costs. In theory, the strategic use of innovation and lean should result in improved competitiveness and reduced costs. Based on this, our hypothesis before we have conducted any research is that innovation and lean have resulted in a positive boost to their economic performance.

2.0 Theory and research literature

2.1 Background for our choice of theory

In this section of the thesis we will introduce the theoretical concepts of innovation, knowledge and lean. This will be vital for us to reach the conclusion of our study, and will act as a foundation for our discussion and data analysis. Innovation is often a broadly defined word, and we will present the different types of innovation to be able to discuss them later. We will take a deeper look at innovation in general and how it can be boosted by employees through learning and knowledge transfer. Learning within the company is vital and we want to look at how it is possible to combine science, technology and innovation with doing, using and interacting to excel in innovation. Because lean manufacturing is the main strategy at Malm Orstad, we also want to present the theory behind it and to look at lean as a process innovation. When we have presented the theoretical background on these topics we can look at how they will impact each other, and if they will complement or disrupt one another.

2.2 What is innovation?

Innovation is a buzzword often used, but not necessarily in the same context. With innovation, we refer to an idea or practice that is perceived as new to and individual or an organization. It is often a common misconception that innovations are the same as inventions, but this is not the case at all. Innovations are often confused with inventions, which is the discovery of something that is brand new to the world. To be an innovation the idea itself do not have to be new, but it has to be new for the specific individual or organization that is going to use it (Rogers. 2013). It is important to understand that an innovation is the result of a process, and is not discovered through a single event. It is also crucial that the company is able to implement and use it, in order to generate value for the organization and other stakeholders. The creation of value through innovation will in most cases be visible through improved income or through a reduction of costs, but can also be lower sick leave, better happiness at the workplace or other health, safety and environmental improvements.

2.2.1 The 4 P's of innovation

Innovations are often divided into four categories, referred to as the 4 P's of innovation (Tidd and Bessant, 2014). All of these types of innovations can be either radical- or incremental innovations, illustrated in figure 1.

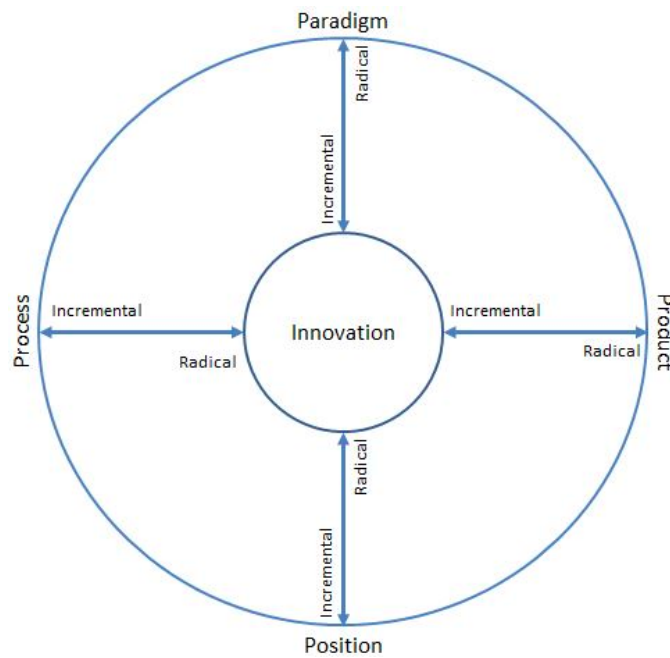


Figure 1 - Tidd and Bessant, 2014. The 4P's of innovation

- **Product innovation:** Product innovation is the improvement of an existing product or a brand new product that is introduced to the customer (Tidd and Bessant, 2014). An example of this can be a improved version of mobile web access from 3G to 4G internet. This is an incremental product innovation because the fourth generation web access is an improvement to the already existing third generation web access for mobile phones. Product innovation also include the introduction of a qualitatively new product that is not yet in the market, like the internet. Product innovations often lead to an increase in demand from customers, because they desire the new product the company can offer them.

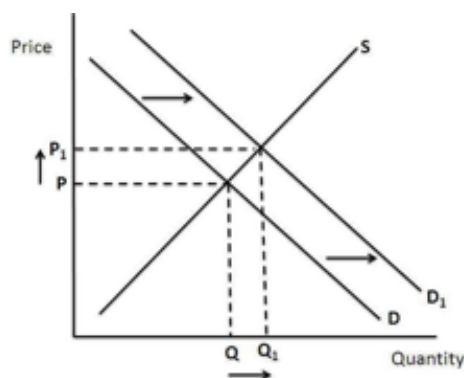


Figure 2: Product innovation results in increased demand

- **Process innovation:** Process innovation is an improvement in the way a company offer their goods and services to the customers (Tidd and Bessant, 2014). The industrial revolutions are good examples of how process innovation works by making the way of producing goods more efficient. In the first industrial revolution the textile industry went from manual production methods to machine production, which offered a much more effective way of producing textiles. The overall target of process innovation is to be able to improve production to make it faster and cheaper. When production is cheaper, a firm can sell more products for the same prices, increasing the supply.

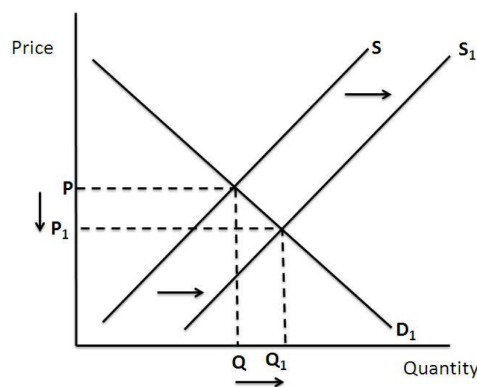


Figure 3: Process innovation results in increased supply

- **Position innovation:** This is the way of repositioning the company to reach new segment of customers. This can be done through marketing themselves to new segments of the markets or a completely different market (Tidd and Bessant, 2014). An example of this can be is the ice-cream business who changed their marketing model from focusing on kids to focusing on both kids and adults. This change happened when they changed their marketing and ads to being more sensual and romantic, thus applying to a grown up audience.
- **Paradigm innovation:** The last category relates to the paradigm of the company and is focusing on changes in the underlying mental model of how the company is operating (Tidd and Bessant, 2014). An example of this is Ryanair who changed the mental model of air travel. Travelling with an airline was previously considered exclusive and expensive. Ryanair changed this mental model of how travelling was

perceived as, by offering their customer low cost tickets that made it available for most people to afford.

2.2.2 Incremental- and radical innovation

When we measure the degree of innovation, we usually divide between incremental- and radical innovations. Incremental innovation is the introduction of something new in the company, that is not new to the industry as a whole. Based on the work of Schumpeter, incremental innovation are often referred to as continuous improvements (Fagerberg, Mowery & Nelson, 2013). In incremental innovation, companies use existing knowledge and technology to further improve the work they already do. Many companies prefer this form of innovation, because it contains little risk and will often be relatively cheap to implement.

Radical innovation is about doing something new and groundbreaking that has not previously been done in the industry. This can be technological revolutions that disrupts the market and completely changes the way you look at something. These are the kinds of innovation that take a lot of time and resources to implement, and also contains a higher risk. It is estimated that as many as 96 % of attempts at radical innovation are shut down before they are even completed (Norman and Verganti, 2012).

For a company to stay competitive, it is important to be able to use combine both types of innovation. When a radical innovation is created, it needs to be updated regularly, using incremental innovation, to not lose market share to competitors that will quickly adapt to your new innovation. It is important to keep focus on incremental innovation, to improve existing products and processes, in orders to achieve bigger margins (Norman and Verganti, 2012).

2.2.3 Innovative businesses

Managers are always looking for ways to one-up their competitors, and they often look to do it through the use innovation. Many aim to build an innovative organization, but there is no universal answer to what an innovative organization is. There are, however, recurring characteristics like organization and leadership that are important components. This has been established multiple times in studies where innovative- and non-innovative corporations have

been compared (Tidd and Bessant, 2014). These studies show us that contribution from the top leaders will have an effect throughout the entire organization. The numbers have varied, but it is estimated that leadership directly influence 15% of performance differences (Jacobsen and Thorsvik, 2007). It is therefore vital that the leaders in charge possess personal traits like intelligence, responsibility and the ability to take charge of any situation.

Jacobsen and Thorsvik (2007) write that innovative organizations are often recognizable through the fact that they are loosely organized. The authority is often decentralized and the employees are actively taking initiative to implement improvements. Employees are also familiar with the fact that tasks change regularly and have the ability to adapt. Communication is also vital to keep the decision makers up to date with everything happening, and what improvements are needed.

2.3 Employee driven innovation

2.3.1 What is employee driven innovation?

Innovation is all about implementation of new, value creating solutions for the company. Employee driven innovation, or EDI, is used as a way to describe the employees active involvement in development of this process (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

Employee driven innovation can also be referred to as non-R&D innovation, meaning it is not created by experts. This type of innovation has a stronger focus on the improvement of processes and business models (Høystrup, 2010). It implies that everyone from employees to the leadership comes up with suggestions for improvement that can be implemented to move the organization forwards. This way of working with innovation implements what is possibly the organizations biggest asset; its employees. The value from the involvement of employees can range from improved products and processes, but also just as important factors as higher employee happiness.

Research about the effects of using EDI has been measured in about 1000 european companies, and the results show that there is an average gain of approximately 15 % in areas like quality, productivity and delivery reliability (Aasen, Amundsen, Andersen, Gjelsvik,

Gressgård, Hansen, 2011). Best practices will vary, depending on the organization and the industry the company is in, but there is no best practice that fits all. There are, however, a set of similarities in companies that has been successful with EDI. There are nine values that define an organization that works with EDI, these are; engagement, trust, safety, teamwork, pride, tolerance, development orientation, autonomy and openness. An organizational culture that encourages engagement between the different parts of the company is also important.

Companies are different and no two companies are exactly the same as another. This means that employee driven innovation can, and should, be practiced differently in different companies. In the handbook of employee driven innovation (2011) there are distinctions between small to medium companies, and big companies. In smaller companies it is easier to operate without meetings and you have a better overview of the organization than in a big company. In a big company there should be meetings, tools and rules when going forward with employee driven innovation. In smaller companies the distance between the employees and the management is often smaller, thus making it easier to communicate together (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011). In a report published by the Norwegian government from the industry and trade department they classify companies with less than one hundred employees as small to medium sized, and companies with more than one hundred employees as big (Nærings og handelsdepartementet. 2012).

There are also made a distinction between companies that practice their work with an employee representative or shop steward versus companies that do not. There was conducted a research through twenty companies, where half of them operated with a steward and the other half did not, to measure the difference. The job of the steward is to ensure cooperation between the employees in the company and to make sure that their voices and opinions are heard. They work as an intermediate between the employees and the management and can generate trust between the two parts. It is not necessary to use stewards to work with employee driven innovation, but the results show that it is easier to use employee driven innovation if you have one (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

2.3.2 Phases of the employee driven innovation process

It is normal to split the innovation process into four phases; search, select, implement and capture.

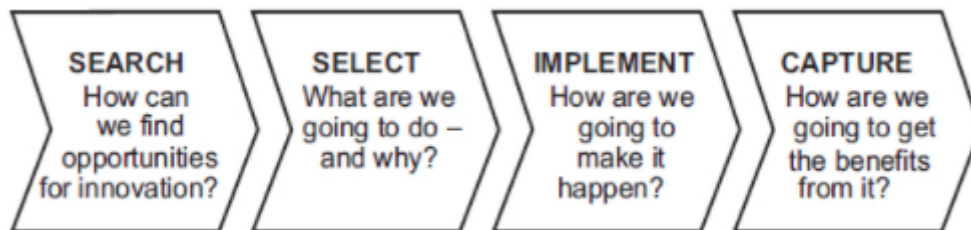


Figure 4 - Tidd and Bessant, 2009. p. 285 - The SSI model

The first phase is the search for ideas or innovations that can improve the company. These ideas or innovations can come from different sources within the company in the day to day work. These can be discovered through problems that need solving, opportunities that arise when working with something or acknowledgement that what you do can be done in a different way (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

The second phase is about selecting what improvements you should go through with and why you are choosing some improvements ahead of others. It is important to prioritise improvements that are most value creating for the organization if the capacity for improvement work is limited. If the company has available capacity it should aim to complete all improvements available (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

The third step is the implementation of the improvement, which is one of the criteria for something to be called an innovation. If you cannot implement your idea, it will not be categorized as an innovation. For something to be an innovation that creates value you need to implement the improvement within your organization or launch it into the market (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

The last step in the phases of the innovation process is to capture the value from your improvement. This step is crucial because without the capturing of value your innovation will not have any effect on the company's bottom line. There are a lot of reasons to do

improvement work, but the main motivation behind it is economic gains (Aasen, Amundsen, Andersen, Gjelsvik, Gressgård, Hansen. 2011).

2.3.3 Four tools to improve employee driven innovation

Here we will describe the four tools discussed in the *Handbook of employee driven innovation* developed by the Norwegian Ministry of trade and industry (2011).

1. *Tools to capture ideas:* Ideas are obviously a vital part in order to generate innovations. The reason why tools are important in this process is to catch these ideas, write them down and make sure they get discussed. These tools can be digital, like company wide clouds, databases etc. but can also come in simpler forms. Meetings with supervisors, boards in common areas and idea boxes are also commonly used tools in order to discover areas of the organization where improvements and innovation can be implemented.
2. *Tools to select what ideas to pursue:* One of the commonalities of companies that succeed with EDI is focus on implementation of both radical- and incremental improvements. It is also vital that employees are included in the selection of new processes and that their ideas are implemented. As with all form of business, the selection of innovations should be based on what is most profitable for the company. However, when it comes to incremental innovations, it should aim to implement as many improvements as possible. Small savings in all part of the process can add up to considerable cost reductions.
3. *Tools to help share information:* These tools are used in order to keep the employees updated on improvements within the organization. This way, the employees will feel more ownership of the organization and get more motivated to participate in the innovation process. These updates can come in the form of letters, e-mail and other forms of direct communication. What is most efficient is probably face-to-face meetings in an informal environment, where everyone can get updated and come with their own input.

4. *Tools to help create an innovative culture:* The former mentioned tools are all important to create and maintain an innovative culture. To maintain this culture, it is important that the leadership display that they are invested in innovation and that they listen to inputs from the employees.

The implementation of these tools will not come without its costs. Employees might struggle to implement these tools in the beginning, but to succeed the strategy must be implemented through the entire company, from top to bottom. What characterizes a successful company is that it manages to combine these tools in a way that complements each others.

2.4 Knowledge driven improvements

2.4.1 The importance of knowledge to boost innovation

Knowledge and learning plays a major role in the innovation process within a company. In the section below we compare two modes of learning, the science technology and innovation-, and the doing, using and interacting form of learning. To be able to have innovation within an organization it is important to educate employees within their working field and to give them knowledge and responsibility of improving the company. We want to take a closer look at those two modes of learning and how they can be an important tool in order to boost innovation. Johnsen, Lorentz and Lundvall (2002) conclude in their research that it is the company that combine STI and DUI learning that excel in product innovation.

2.4.2 Codified and tacit knowledge

We want to cover two different modes of knowledge that is used for learning and innovation. The first mode covers science, technology and innovation (STI) and is based on codified and technical knowledge. The basic argument about what codified knowledge represent is that it can be written down in a “code book” format that can be interpreted by others (Johnsen, Lorentz, Lundvall, 2002). The other mode is about doing, using and interacting (DUI) and has a focus on experience based know-how and the process of learning.

The distinction between these two forms of knowledge and learning is in general about explicit and implicit knowledge. The STI mode of innovation revolves around the

codification of knowledge, almost like a recipe, so that others can absorb and implement it on their own. This is what can be classified as explicit knowledge because there is a way to write it down and talk about it (Jensen, Johansen, Lorentz & Lundvall, 2007). What is important to understand when discussing STI is the idea of effortless knowledge transfer and that recipes or codified knowledge is not of value to those who cannot understand and implement it. In order to extract the value from the codified knowledge you need to have some prior competence or understanding about what you are actually trying to learn. The know-why and know-what modes of knowledge that are related to the STI mode of learning are often taught by reading books, attending lectures and looking at data bases (Jensen, Johansen, Lorentz & Lundvall, 2007).

The DUI mode of innovation is more about the experience-based model of learning where you learn what you know by being ‘hands on’ in a problem. This often involves getting experience with the subject you want to learn (Jensen, Johansen, Lorentz & Lundvall, 2007). It can often be taught through a master and apprentice relationship. An example of this is how to be a good salesman, walking from door to door trying to sell goods and services. You can read about what it is, and why you do it, but the real learning experience is about getting out there and getting experience in the field you want to learn. Knowledge like this is not written down, but stored in the mind of the individual who has learned what they know through experience working with problems, also called implicit knowledge. Information that is stored in the mind of an individual is called tacit knowledge. The know-what and know-why are more rooted to the STI mode of learning while the know-how and know-who are more related to the DUI mode of learning. Information and communications technology is used to codify information that is tacit within a company. This means that you try to write down tacit knowledge in an explicit way so that other people can use this knowledge to their advantage.

2.4.3 The 4 know's of knowledge

Johnsen, Lorentz and Lundvall suggested that knowledge could be broken down into four different categories; Know-what, know-why, know-how and know-who. These four categories are meant to be at the individual level, but they also argue that they can apply to an organization. (Johnsen, Lorentz and Lundvall 2002, 2007)

Know-what: Know-what is the knowledge about facts and is easily codifiable. Those facts can be a cooking recipe for pizza, the population of the United States or the height of the

Eiffel Tower. Information like this can be written down and stored, and is often referred to as data (Johnsen, Lorentz and Lundvall, 2007).

Know-why: Know-why is knowledge about why things happen in the way they are. It refers to laws of motion in nature, the human mind and society. While know-what can be used more as an input for databases, know-why relates more to the theorem of why certain things happen (Lundvall, 2003).

Know-how: Know-how will, as discussed above, often be learned in a master and apprentice relationship by learning through experience. This can be the case of actually working with what you want to learn, and getting good at it (Johnsen, Lorentz and Lundvall, 2007). A good example of this can be learning how to ride a bike. There is a good amount of tacit knowledge involved in how to balance the bike on the two wheels by moving it forward and having your body in a position that makes you not lose your balance and fall. This is not something that is taught through explaining how to do it, but through trying and failing (Polanyi, 1962).

Know-who: Know-who is about knowing who can help you solve a problem, if you do not know it yourself. This kind of knowledge is often learned in social practices and educational environments. Getting to know different people with different skills increases your know-who knowledge. You can also argue that know-who is developing with day-to-day communication with colleagues, customers and sub-contractors. This is important in knowing who your customers are and what they want (Johnsen, Lorentz and Lundvall, 2007).

Johnsen, Lorentzen and Lundvall (2007) argue that “It is the firm that combines a strong version of the STI-mode with a strong version of the DUI-mode that excels in product innovation”. They draw their results from the empirical research done, and it shows that the innovative performance of a firm relying on STI, DUI or both modes of learning, is increased. Organizations combining both of the learning modes also tend to perform significantly better than an organization using only one of them.

2.5 Lean

2.5.1 What is lean?

The purpose of lean management is to give your customer exactly what they want, when they want it, with as little waste as possible through continuous improvement (Heizer, Render, Munson, 2017). The main goal of lean manufacturing is to eliminate waste in a systematic way (Santos, Wysk & Torres, 2006). Modern lean manufacturing has its origin in East Asia, as a result of the lack of raw materials following World War 2. In modern days, many companies have embraced lean manufacturing in periods of economic turmoil, to stay competitive. Because of this, it is vital that every part of the production is flawless, to avoid the loss of valuable materials. Lean manufacturing focuses on a continuous flow of production and information to avoid bottlenecks and non-value adding queues throughout the process. The goal of the concept is absolute perfection, to the degree where everything that is executed by anyone in the organization creates some form of value (Womack, Jones, 2003). A common misconception is that introduction of lean management result in the layoff of employees but, in the exception of extreme cases, this is far from the truth. If an employee is involved in non-value adding processes, it is important to find a way to make the employee more productive (Arnheiter, Maleyeff, 2005).

2.5.2 Muda, mura & muri

The Japanese divides lean into three different categories. The first one is Muda, which is the reduction of waste. Waste is often split into seven categories, known as the seven wastes (Heizer, Render, Munson, 2017). These are:

- *Overproduction*: Producing more than the customer has ordered, or producing too early is a waste and add no value to the customer. You also run the risk of being left with unsold products.
- *Transportation*: The aim is to move the product as little as possible. Transportation of goods is not value creating for the customer, but more of a necessity for the company. The end goal should be to move the product only once.
- *Queues*: When any product or process in a supply chain is stuck in a queue, or have idle time, it does not create value for the customer and it is considered as waste.
- *Motion*: This is another waste linked to movement of people or products that do not create value.

- *Inventory*: Unnecessary raw material, goods or products that are not in use do not create value for the customer.
- *Defect products*: To reduce waste the company need to have focus on removing defect products and the return of goods
- *Overprocessing*: This considers any work done in product that creates no value as another waste.

The next category is Mura, the reduction of unevenness and inconsistency. Unevenness can be found in several places, like production time and customer demand. If the organization fails to keep a smooth production all year around, they risk having to produce more in periods with higher demand. This can lead to more strain on production and creates a higher risk of the emergence of the seven wastes in Muda. By having a smooth production at all times, companies can reduce this form of waste (Heizer, Render, Munson, 2017).

The last category is Muri, the reduction of overburdening. This can be a result of Mura and other failures along the way, like unclear roles and too little training of employees. Lean is all about the removal of these forms of waste. By removing Mura and Muri, you also remove the creation of Muda (Heizer, Render, Munson, 2017).

2.5.3 Toyota production systems (TPS)

Toyota is often considered the inventors of lean manufacturing, and they therefore call it Toyota Production Systems instead of lean. We will now present the three main principles of this working method (Sonnenberg and Sehested, 2015).

Continuous improvement (Kaizen)

Kaizen comes from Japanese and means continuous improvement. What is meant by this according to TPS is to build an organizational culture where the employees in the company search for improvements, and this is a part of their job. Kaizen, or continuous improvement, is often the consequence of a kaizen event. The kaizen event can be where workers in a specific team have a meeting to find a way of implementing improvements in their work space. These improvements can be looked upon as incremental innovations, which are small changes in the way of doing things that increase productivity (Heizer, Render, Munson, 2017).

Respect for people

Respect for people is about understanding that your employees create value for the customer, and that you need to treat them accordingly. It is about treating your employees as knowledgeable individuals, and engaging them in challenging tasks of improving operations. The aim is for management to trust the employees who work directly with their task, and acknowledging that they often have a lot of competence in the field they are working in. It is important to give them the opportunity to improve their working conditions and giving them ownership to what they do (Heizer, Render, Munson. 2017).

Standard work practice

Standardizing your work practice is important if you want to increase the efficiency within your organization. For a process to be good, it is important to specify in detail how it should work according to content, sequence, timing and outcome. It is also important to have good communication channels with both internal and external suppliers, so that you do not overproduce or overprocess your goods. When having a learning organization, investing in the education of the employees, creates a higher chance that they can find defects so that your organization can improve. This will lead to a continuously improving organization (Heizer, Render, Munson. 2017).

2.5.4 The 5S

5S is a set of 'housekeeping rules' in lean to keep the workplace neat and efficient (Heizer, Render, Munson, 2017). This list consists of:

- Sort: Remove everything from the workstation that is not in use. This allows more space for equipment that is actually used and improve the flow.
- Simplify: Use labels and easy to use illustration so everyone can understand how to use equipment in a fast, safe and correct way.
- Shine: Keep the work area clean.
- Standardize: Create checklists and standard procedures to make sure everything is done the same way all the time.
- Sustain: Keep on reviewing the processes and implement improvements where found necessary.

These relatively simple tools can be used to drive continuous improvements, reduce costs and most importantly; increase flow.

2.5.5 Just-in-time

JIT is one of the main concepts of lean production. Just-in-time production aims to reduce the amount of products and raw materials the company holds in stock at every moment. This is according to the principles of Muda where inventory, overproduction, movements and queues are considered as waste. It states that you should not start production before you receive the customer order and the products should be finished in production the same day they are supposed to be delivered to the buyer. This will help improve flow and throughput throughout the company (Kannana and Tanb, 2005).

2.5.6 Issues with lean implementation

As with all other improvement strategies, lean manufacturing has not been universally successful. The two main issues when implementing lean manufacturing are management support and communication (Worley and Doolen, 2006). Commitment from the management is vital for implementation to succeed. Managers need to take an interest in the implementation and communicate its importance to all affected branches of the organization. If the employees feel that the leadership is not taking the implementation seriously, they might adopt the same view and the whole process falls apart. In relation to this, communication is vital. Managers must explain why these changes are important, to make everyone in the company understand the benefits of their effort.

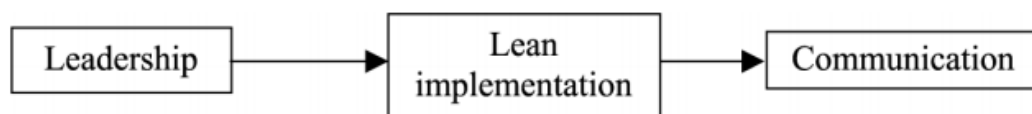


Figure 5 - Worley and Doolen, 2006

2.6 Research on the impact of lean on innovation

Many companies, especially in the manufacturing sector, are looking towards innovation to achieve productivity growth, with a target of achieving non-price based competitive advantage. Efficiency improving innovations create value through cost cut or time saving, which makes production faster and cheaper. Companies can then produce the same goods at a

reduced price, resulting in a higher revenue. This will have an obvious positive effect on a company's economic performance. Another way of improving the bottom line is to make more of the product while keeping cost constant. This will generate more revenue with the same cost, and improve the profit. These cost reductions occurs when a company manage to find a way to cut the costs created by one of the seven wastes. It is said that in the current globalized market, all outstanding businesses have to succeed in innovation. Innovation is all about improvements, while lean is about cutting down on everything that do not have a measurable value. Even though lean- and innovation theory have many different underlying objectives, could they be implemented simultaneously to compliment each other or would lean have a negative impact on innovation (Sonnenberg and Sehested, 2015)?

2.6.1 Conflicts

This effect of lean on innovation is rarely discussed in the existing literature, but there are a few relevant examples. One of the most used being Chan and Taylor (2009), who have written about how these concepts, with similarities and differences, can have a negative impact on each other if not managed correctly. Toyota is often used as the prime example for lean manufacturing, but much of the literature fail to mention that Toyota often outsource their innovation process or use benchmarking to learn from and copy their competitors. One Japanese engineer went as far as to say about Toyota that “they are great at manufacturing, but terrible at innovation” (Mehri, 2006).

While the target of innovation is to create value through the invention of new business opportunities, lean management focuses on value creation through the reduction of waste. In a case study by M. Lewis in 2000 it was discovered that $\frac{2}{3}$ of lean companies lost some of its innovation capabilities. This was because the innovation process often is time consuming and without any guaranteed value creation, leading it to be shut down in accordance with lean principles.

While principles of lean consists of reduction of risks, slack and variation, these are all factors that are often important to boost innovation. At the same time, Kaizen or continuous improvement can be helpful in the implementation of incremental process innovations, because of its continuous focus on improving processes. Lean also focuses on standardization of work environment, which can have a negative effect on the ability to do radical innovations. Lean companies also aim to have fewer suppliers and a smaller supply chain.

This will increase the company's efficiency and results in the short term, but could potentially reduce their innovative ability on the long term. When the company is exposed to less outside sources, the number of inputs and ideas decrease and they have a negative effect on the ability to come up with new radical ideas.

2.6.2 Complementarities

Sonnenberg and Sehested (2015) have a different view and argues that lean will not kill innovation. They presented three reasons why:

1. Creative people are not creative all the time. Cutting out processes that takes up their times gives them more time to do innovation.
2. Creativity does not always come naturally. You have to be working to be able to see where improvements or new ideas can be implemented.
3. Working together will boost creativity. Working together and discussing issues are the best ways to come up with ideas.

Lean can in their view be a helpful tool to encourage employees to take part in the innovation process in ways they have not done previously.

We have seen different sides of this discussion. It is important for companies to realize that lean and innovation, as two popular forces in the current business world should be implemented to complement each other and that you should never aim to separate them. The benefits of having both are discussed through this theory chapter and includes reduced costs, larger market share and an increase in customer demand for the product and/or service the company delivers. The figure below illustrates how lean and innovation combined would potentially create more value combined than they would individually.

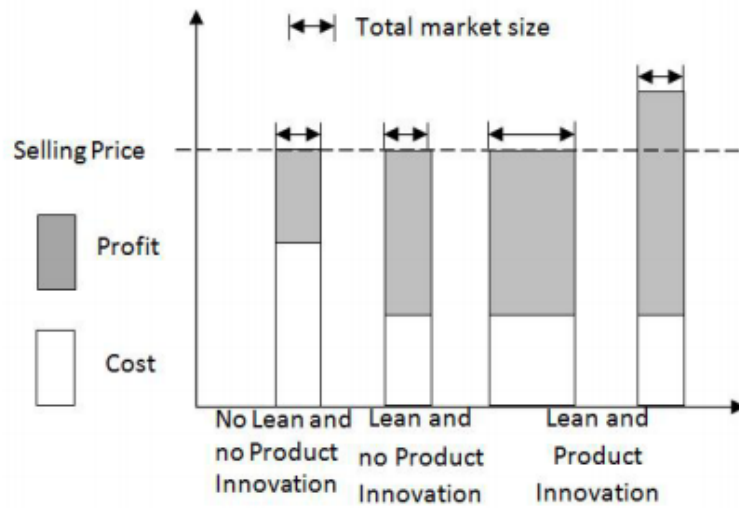


Figure 6 - Chen and Taylor, 2009

A company that are able to manage both of these processes will therefore be a lot more likely to achieve long-term competitiveness (Chen and Taylor, 2009).

3.0 Method, data and empirical research

The choice of method is a vital prerequisite in order to be able to complete a research. The social research method consists of both organizing and interpreting data to give a better understanding of society (Holme, Solvang. 1996). The methods we choose are the tools we use to collect the data necessary to give a satisfactory conclusion to our research. Our objective is to find an answer to our research question and it is important that we keep this in mind before we decide how we want to proceed. When our research question is decided, we can move forward and decide the structure. The next phase is the collection of data from outside sources through qualitative- and/or quantitative methods, to give us the foundation we need to answer our research question. This process is described below by Jacobsen (2015)

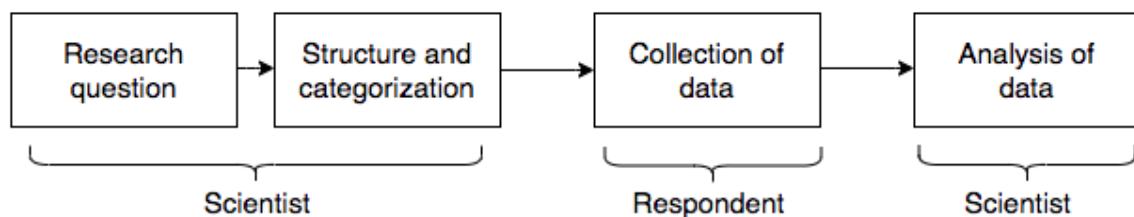


Figure 7 - Jacobsen, 2005

3.1 Research design

The design of the research is the executive plan of how we decide to move forward in order to answer our research question. It can be seen as the map, directing us to our desired destination. It is vital to plan the scope and the target before the start of the research, even though the end result is uncertain (Sander. 2015).

There are three types of research design:

- **Exploratory design** is the type used when the research question is vague and unclear. This can be used as a pilot survey, to obtain sufficient background information about the topic, to be able to start the research. The aim is to obtain background information that can give insight and understanding before the implementation of the main study.
- **Descriptive design** looks at different variables to discover if there is a connection between them. This can be used in research where the target is to describe a current situation.

- **Causal design** can be used when the target is to examine the effect of one independent variable on a dependant variable, also known as a cause-effect relation. This is the best way to go if you want to study how a dependant variable will vary if we make changes to the independent variable.

Our research have a clear topic question, which we decided before we started our research, so we will not use an exploratory design to do a pilot survey. We will use a combination between descriptive- and causal design. Firstly, we will use a descriptive design to depict the current situation of the company. The aim of our research is to look at the effect of innovation and lean on the economic performance of Malm Orstad. In our case, we see lean and innovation as our independent variables and want to look at their effect on the economic results. In this part, we will use a causal design.

3.2 Case study

Our main method in this research is a qualitative case study. The reason we have chosen a qualitative approach is to get a more detailed and broad view into the changes experienced by the company (Johannesen, Christoffersen, Tufte, 2005). A case based study is very useful when you aim to go in depth and explore a real life topic. Johannesen, Christoffersen and Tufte (2005) write that a case study can contain subjects in the form of a person, an organization or an event. The main target is to be able to obtain as much data as possible about the chosen subject. With our obtained data, we can add theoretical concepts in order to discover an overall context. We have chosen to perform a case study about Malm Orstad. We will collect data through our methods, which we will discuss later in this chapter.

3.3 Methods

Methods are the tools we use in order to collect data we can use in our research. In social science, we can usually choose between two different methods; qualitative- or quantitative methods.

3.3.1 Qualitative methods

Qualitative methods can be somewhat difficult to describe. At a general level, we can say that it is the method of observing a phenomenon from the interior side (Ritchie, Lewis, Nicholls,

Ormston, 2014). This method is characterized by a direct connection between the author and the object of a research. Qualitative methods can be useful as a way of obtaining data that is hard to obtain through statistics and surveys. In this method, we analyze text and not numbers. An advantage here is that you can get an overview of thoughts and feelings, which are hard to find from statistical numbers. Data can be collected through interviews or other verbal interactions, between two or more individuals. The important element that separates it from quantitative research is the personal dialogue between the subject and the ones who are collecting the data. If you want to achieve a deeper understanding of a topic, the qualitative methods is a good choice, because you can be flexible and ask follow-up questions based on earlier answers, as well as getting more in-depth data.

3.3.2 Quantitative methods

When using a quantitative method, the intention is to collect data in order to test a hypothesis and investigate if the data fits with your assumptions. In this method, data is collected in the form of numbers, which can easily be transformed into statistics. In many cases, data is collected through some form of a survey. A survey will normally contain standardised questions, making it less flexible and easier for subjects to give faulty data. Quantitative methods are often called extensive methods, because they allow us to examine a large number of subjects. To be able to collect data through a survey, it is important to have extensive knowledge about the topic in advance, to formulate a questionnaire that will give the answers to your hypothesis.

3.3.3 Our choice of method

We decided to use a combination of quantitative- and qualitative methods in our research. To start of, we will perform several qualitative in-depth interviews with employees across the company. We wanted to interview the CEO, COO, CPO, lean coordinator and two employees who have all been a part of the company both before and after the implementation of lean management. Our aim was to get a perspective on how the implemented changes has affected the working conditions and also to learn how it has been received in different parts of the company. The reason we have chosen this method is because it can give us in-depth information about the decisions and opinions from the people who actually was there to observe the series of events we want to describe. We decided to implement structured

interviews, following a line of questions planned in advance. In preparations for our interviews we composed two different interview guides, containing different questions specified for our different subjects. The questions were customized so subjects in management positions are asked questions about why changes were implemented and employees are asked questions about how these changes have been received and affected their work.

It was not a part of our initial plan, but towards the end of our research we decided that we also wanted to conduct a quantitative survey to collect data about the values and culture of the company. This was implemented to see if Malm Orstad obtain the values often found in companies that succeed in employee driven innovation. We chose this method because we needed a higher number of respondents, in order to determine the widespread opinions of the employees. We will undertake a survey of the employees at Malm Orstad, asking them to rate how much they agree with ten statements related to the workplace. The purpose of this is to see if Malm Orstad has the characteristics of a company succeeding in employee driven innovation, compared to the list of characteristics discussed in the theory.

3.4 Advantages and disadvantages with our chosen data collection methods

As described by Sander (2014) there are several positive and negative factors related to personal interviews as a data collection method. Interviews is a good way to collect data, because you can ask the questions personally and thereby correct any misunderstandings that might occur. It also gives us the opportunity to ask more in-depth questions, because we are face to face with the subject. However, there are also several negative factors with this methods. This collection method is time consuming and demands more planning than other methods. It can also be difficult to get honest answers to personal questions, where the respondent might be hesitant to reveal sensitive information or personal thoughts when their identity is known.

When it comes to quantitative research, there are several positives with the use of surveys. First of all, it will not be time consuming for us and we can collect data from a large group of subjects in a short period of time. The answers can thereafter easily be transformed into numbers, making them easier to analyze and to see what is the opinion of the majority.

Answers will here be anonymous, so we do not have to worry about subjects hiding their honest opinions. There are also negative sides with this data collection method, because people might not take the survey seriously when it cannot be traced back to them. It is also easier for subjects to misunderstand questions, without the opportunity for us to explain exactly what we want them to answer.

3.5 Validity and reliability

The aim of any research is to find reliable data, which is vital to be able to find a satisfactory answer to the research question. The collected data will need to have high validity and reliability (Sander. 2017).

3.5.1 Validity

The validity of a research tells us if it really measures what we want it to measure. When a research is valid, the results and conclusion will probably be interpretable and generalizable. If the research is not valid, it is likely that it is impossible to reach a correct conclusion. A case study must normally focus on three types of validity; internal-, external- and construct validity (Yin. 2013).

- Internal validity: Shows us the causal relationship between different conditions. It is therefore very useful when trying to observe a cause-effect relationship.
- External validity: Shows us in which degree our results can be transferred to different situations, not studied in our research.
- Construct validity: Is to what extent the research explains what it claims to explain. Similarly to external validity, it is concerned by how our finds can be generalized. This is the executive concern in the theory of validity.

Validity will help us reach a conclusion about the topic we have chosen to research. The statistical validity will be stronger the more data we are able to acquire throughout our research process. If we have a large selection of respondents, it will help us increase the validity. We want to interview several employees from different departments of the company to get higher internal validity, to see a cause-effect relationship throughout the company. If we manage to interview employees with six different positions in the company, we feel the validity will be sufficient enough to generalize.

3.5.2 Reliability

Reliability can illustrate to what degree the research depicts the real situation and to what extent it can be verified by others. When a research has high reliability, you expect to get the same conclusion if somebody else conducted a similar research. Reliability is to this extent a measurement of stability (Sander, 2017).

The main difficulty with reliability in interviews is that it can be a challenging to decide the right questions to ask before the interview is conducted. It is also important for the writer to stay unbiased and not let their own opinions affect the way questions are formulated or the way answers are interpreted. To be able to review data it is also important that answers are written down immediately after the interview, to make sure they are transcribed correctly. We have decided to write down all answers word by word so our data can be read back and reviewed.

To make the quantitative data more reliable we wanted to survey several employees from different departments in the hierarchical structure of the company. All of the respondents has gone through the same questionnaire making us able to compare similar data. The subjects has been allowed to give their answers anonymously to get the most honest and reliable answer from the respondents.

3.6 Population and selection

We have made a selection of interview objects based on the information we want to receive for our study and what sources was available for us to work with inside the company. The selection is done with the purpose of getting relevant information from personnel located in different departments of the organization. It is a conscious decision that we want to interview employees in different sections of the hierarchical system in the company, so we are able to see if their opinions and perceptions differ.

Our interview approach is different towards the different interview subjects. The reasoning behind this is that they are working in different aspects of the company and might have different views on the same questions. Their knowledge and perception of what lean is and how it works will also be different because of the amount of time used to learn about lean and

how it works. When interviewing the CEO, COO, CPO and the lean coordinator we are trying to ask more theoretical questions focused on the managerial side of the company. When interviewing the employees working in the production section of the company we ask more work practice oriented questions and how they feel lean affect their day to day job. The reason we do this is because the employees working with production do not have any formal education within the field and their thoughts about lean will be focused around the experience they have had when working with a lean focus compared to how it was before.

The subjects interviewed are anonymous and referred to as different subjects. The reason for highlighting their role in the company is to get a better understanding about where the individuals are in the hierarchy and how the different positions in the company have experienced the change from a normal company to a more innovative and lean workplace.

Subject:	Title:	Role in the company:
Subject 1	CEO	Implementing lean from a leadership position.
Subject 2	COO / Engineering manager	Operational manager and technical director.
Subject 3	Lean coordinator	Helping the CEO with implementation of lean
Subject 4	CPO / Production manager	Ensuring that the company work within their capacity. Coaching and decision making.
Subject 5	Team leader CNC	Team leader for CNC operators. Working with production.
Subject 6	CNC operator	Working with the production and projects in the company.

3.7 Secondary data

Secondary data are data sources collected by others and are often collected for a different purpose. One reason to use these is that they are already available, making the process of the research significantly faster than collecting the data yourself. These types of data can be collected from previous research and other data sources. The disadvantage of secondary data is that we often can not know how it was collected and in which context. This can hurt the validity of the data. We can never really trust most secondary data, because we have no guarantee that the data is legit, unbiased or unchanged (Sørensen, Sabroe, Olsen, 1996). Some data, like data from national databases or revised accounts are sources we can trust. Other secondary data can still help us validate our own primary data, through comparison. If our own data is similar to previously collected data, it gives an indication that they are more likely to be legit.

Our use of secondary data consists of accounting data and company data only. Accounting data are collected from proff.no. This is a website delivering accounting data from all registered norwegian companies for free, allowing us to see data from the last 20 years. We consider these datas to have the highest level of reliability possible, considering they are displayed publicly and confirmed by an authorized accountant. Other data are received directly from the CEO of Malm Orstad on our requests and we also consider these as very reliable.

3.8 Analysis of collected data

To be able to analyze our data, we will transcribe our interviews as soon as possible after they are completed so we can read them again later. We will record all interviews with our phones so we can easily play them back and transcribe everything after the interview is completed. This way, we can avoid having to take notes during our interviews and can focus on the subjects and their answers. A challenge with a case study is that there is no official approach or tools to analyze our collected data, leaving us with the task of doing this manually (Yin, 2014). Yin (2014) states that a good way to complete this analysis is through finding a pattern between theory and empirical data to increase the validity of the study, and this is how we plan to approach our analysis. We will look at previous literature and established theory to see if our findings correlate or deviate from these.

For our quantitative survey, it is far easier to analyze our findings. There are nine values in the handbook of EDI that are important for employee driven innovation and we want to examine to what degree the employees agree that Malm Orstad holds these values. To measure this, all of the questions are stated in a way so that the employees can rate statements about Malm Orstad in relation to the EDI values. The value will be ranging from one to five where the value of one indicate very low score and five indicate a very high score. The data will be added to a Microsoft Excel document to compute the mean values and variation of the different characteristics. We do this to get an indication of the most common perception of the company.

4.0 Findings

In this chapter we will present the findings from our qualitative- and quantitative research.

4.1 Implementation of data collection

In total we performed all six interviews we had planned, over two days; March 6th and March 13th. We interviewed subjects with six different positions in the company and everyone we approached were happy to participate and very helpful. The length of the interviews varied from 25 to 40 minutes, depending on the length of their answers, but also because our interview guide for subjects involved in management contained more questions. It was also important for us that all subjects had been in the company for four years or more, so we knew that they had experienced how the company worked previously and had a basis to comment on what changes has occurred. We will then present our findings from the quantitative research in a diagram where we explain the score from our survey. To finish of, we will submit our secondary data, which are collected through public sources or received directly from Malm Orstad.

4.2 Our findings

We conducted our interviews with two different interview guides, one for the the subjects in management positions (CEO, COO, CPO and Lean coordinator) and one for employees in production positions. First of all, we will present the findings from our interviews with subjects in management positions, before we present results from the other employees. After that, we compare the results to illustrate deviations and similarities.

4.3 Findings from management

4.3.1 The reasoning behind the change and how it was implemented

First of all, we wanted to know why the company who had been doing things in the same way for 70 years, suddenly decided to change its entire business model. The first thing everyone responds to this question was: “*to survive*”. The overall sentiment from management is that the company was suddenly performing very badly, as a result of the sudden drop in oil prices worldwide, and needed to make changes in order to survive. It was in this moment they

decided that they needed a new CEO to improve the company. One of those involved in the hiring process told us that they knew about the CEO from before and was aware that he had performed great results in implementing lean production methods in his former company. The same subject told us that it would not have worked as fast as it has done, if they had not been able to get a competent leader that was able to implement lean and create better communication throughout the company.

The possibility of implementing lean had been discussed in Malm Orstad earlier, back in 2009, but it was scrapped as a result of lacking support from the board and the owners. This time they had to succeed and the new CEO got the green light and the backing of the board to do whatever he thought would benefit the company the most. After landing the job, the CEO went on stage in front of the entire company, presenting his plans of implementing lean production methods in order to save time and money, in a last ditch attempt to avoid bankruptcy. When the employees had been informed, it was time to gather the management to get everything into an A3 analysis to see where the problems really occurred. This way, they could discover where improvements were needed first.

When we ask what the best new result of lean has been, the first change that everyone brought up is the introduction of daily morning meetings. In these meetings every department will gather around a board and discuss challenges and solutions to problems discovered the day before. All results from the previous day and week are visualized through graphs and tables on these boards to ensure that everyone have insight into the results and performance of the company. This resulted in employees being more involved and taking more responsibility to ensure production was as efficient as possible. As a result of this, Malm Orstad managed to implement 1334 new improvements in 2017, varying in size from reorganization of entire departments to a new subsidiary. Other tools that have been successfully implemented to save time and money are 5S and Just-In-Time.

We then wanted to know how the lean way of working was different from the way the company had operated previously, and one subject said: *“We do the same things, only more systematic. People know what to do at any time, leading to less waste of time”*. Clear instructions of what work to do and who is doing what increases effectivity between the departments and improves teamwork. Through the implementation of 5S, the workshop is

always clean and tools are found where they are supposed to be, so workers do not have to run around looking for them in the middle of the process.

4.3.2 How does lean affect innovation in the company?

The main focus is to improve in as many ways as possible. Small, incremental improvements can be implemented by the employees without authorization from management, while bigger and costlier improvement must be discussed, but are usually also implemented as long as they are seen as profitable. The best practice is to start with the so called 'low-hanging fruits', the ones that are easiest to implement. It is also important that statistics are updated to show the employees that their suggestions are implemented. We get the impression that improvements are found in different ways, some are implemented to make it easier to answer to the demand of customers, but employees are also encouraged to bring up their own ideas.

In our interview with the CEO we asked if he could mention three innovations the company had implemented over the last year that had improved their economic results. He was happy to tell us about these three innovations the company have implemented:

- The creation of 4C Solutions, a subsidiary formed in cooperation with Randaberg Industri, Isotech and Designbanken. This allowed them to deliver a complete product, instead of components, giving their customers smaller supply chains and package solutions.
- They cut back on the amount of project managers from eleven to four. The reasoning behind this was that the project managers were a bottleneck in the company because of bad organization. The project managers are now specialized and have clear work tasks, leading to a better flow of information in production.
- They have implemented one-point lessons, which are one-page manuals describing the approach for every machine, so everyone can perform easy tasks even if they have not done it previously.

At this point we had heard a lot about what had changed and how it had led to positive improvements, but we wanted to ask the difficult question of what has been the single most important change out of all improvements since 2016. Several subjects points to the change in culture inside the company as the most important improvement. Everyone involved, from leadership to employees, are involved in the process of finding and implementing improvements. The company does what it has always done, but in a more efficient way,

driven by an organization-wide search for improvements. They also point out the flow of information throughout the company, highlighting how people know what to do when they receive a task and move it on to the right person once its finished. This has led to less standby-time where machines have been running without producing anything.

However, the implementation of lean has not been an easy task. We ask what factors have been important in succeeding with this company-wide change. When implementing a lean philosophy throughout the company, leadership is brought up as an important factor. They agree that the cooperation of owners, board, CEO and everyone else involved in the company has been vital. There is no way to implement the system if it is not followed by everyone. This is also why they were not able to implement it back in 2009 when it was discussed for the first time. A knowledgeable leader that can guide the process is also a factor that several subjects brought up, while everyone was complementing the work of CEO.

There will always be challenges when a new, company-wide system is introduced. In the beginning, the employees lack of knowledge was a problem. There was a perception that lean means assembly line production and that it would lead to people losing their job. This was not the case, and the target was always for everyone to work more efficiently in order to create more value and bringing the company back on the right track. There is also agreement between the subjects that when the implementation was completed and everyone started to understand how it was supposed to work, most people were positive to this change.

4.3.3 What are the effect of these changes?

When we ask how the implementation of lean have changed the economic results, we get several different answers. One of our subjects bring up the fact that the oil industry is on its way back up and that this is a contributing factor, that maybe have something to do with the improved results. There is no doubt among them that the implementation of lean has been a major cause of improved financial performance. They agree that without this innovative change in processes, the company would most likely be gone today. However, they will not give all the glory to lean theory, as one of our interviewee said to round up the interview; *“we can not say that lean have turned it around, but that our employees have rolled up their sleeves and done the job with the lean tools they have been given”*.

4.4 Findings from employees

4.4.1 *What is lean to you?*

We asked this question in order to get a grasp of what the employees think about lean and what it means to them. This is also a good way to identify how much they actually know about lean. The employees we spoke to seems to have an overall positive mindset about the lean methodology today, but they agree that not every aspect of lean is viable for the production work at Malm Orstad. The reason being their large product mix and not working on an assembly line. One of them say that the change to a lean methodology was hard in the beginning, but after some time they realized that it worked and that it was meant to do their job easier, not to take their job away from them.

The first impression when learning about the change to a lean working practice was split between the respondents. One of the respondents had worked with lean before, but for others this was something brand new, which they had not experienced before. For one subject who had not worked with lean before the impression of lean was that it was meant for employees working with an assembly line. For those who had experience with lean it was still new, but they knew a little bit about what lean was and how it worked.

4.4.2 *How has lean changed the work day?*

The respondents agree that the working environment is more organized and that there is less clutter in the workshop. There is a greater focus on improvement work and the suggestions for improvements get handled by management and implemented consecutively. The suggestions for new ways of working can be written down and reported to the management for implementation through the blackboard that can be found in each department. There is also better flow of information between the departments and less defects when they get new production jobs. *“We always think about how we can do things faster”* one of them tells us. *“And when we come with suggestions to things that can be improved, it is almost always implemented”*. They also tell us that they have received more responsibility after they started using lean working methods.

4.4.3 *Communication*

One of the most important characteristics of innovative organizations are communication and culture. We asked the employees how the implementation of lean have been communicated

from management to the employees. They told us that implementation of lean and the communication from the management has been done in phases. The management presented the lean philosophy to the employees in a meeting as an introduction. The amount of changes was a lot to handle in the beginning, and it was a lot to get familiar with. After the initial change, the workload got easier to handle and the implementation of new improvements has become a an easier process. Their perception is that the lean implementation now happens gradually and that it is easier to work with lean now compared to before. They emphasize that the communication has continued after the implementation and not stopped at any point.

We then ask them what was their motivation to contribute to the lean culture in the company. “*To make sure I have a job next year*” one of them answers jokingly. But even though it is not to be taken literally, he knows that the company probably would be bankrupt today if the employees had not adopted to this new way of working two years ago. Job security and possibilities for higher wages in the future has been motivation as the profits of the company has increased. This has helped create a culture around improvements and innovation inside the company.

4.4.4 Can lean improve innovation?

We were wondering if lean working methodology has helped innovation to some degree. There is always a new improvement to look for, and when something is improved another opportunity arises. There is a continual focus on improvements every day, and this contributes to the amount of improvements and innovations in the company. One of the subjects mentions the one-point lessons that they have introduced. A one-point lesson is a short description of how to perform a task without having to talk to someone who already knows what to do. It is a short and simple instructional sketch of how you are to solve the task that is located close to the object, which have led to more learning and knowledge being shared around in the company.

4.4.5 Negative sides

The respondents did not mention any specific negative sides of lean, but mention again that there was a lot of work to do when they first started implementing it. After the implementation and the fast change in working practice, the lean methodology was accepted and thought of in a positive manner. The respondents also mention that even though the process has been going for over a year and a half, there are still potential for improvements.

There is also a mention of the importance of a strong leader and that it is important that the CEO is informed and invested in the strategy to make the employees motivated to follow it.

4.5 Differences

Everyone we interviewed agreed that lean working methods have had positive results for the company. The common opinion is that the working day has not changed much, but they are working more efficiently than before, meaning they can do the same processes, but with less time and effort. There seems to be a shared vision between everyone, aiming to find improvements and implement them in order to achieve the best possible results.

One difference was that employees were more sceptical to lean in general, and was often less willing to call changes improvements, because they saw them more as logical implementation. This is understandable, but in lean working environments we can label almost anything as an improvement as long as it removes waste. It is natural that management is more determined in documenting all improvement to be able to show how things are happening in the company.

4.6 Findings from quantitative research

In this section we want to present the findings from our quantitative research. On the 22nd of May we conducted a survey of respondents from all the departments in the company. We went out to Voll in the middle of the day and managed to collect answers from the majority of those who were at work at the time. In total, we managed to collect data from 30 employees, about 31 % of everyone employed by the company. Almost everyone we approached were happy to participate in the survey, while a few were busy at work and did not have the time when we were there. Because of the work shift schedule, half of the production was not at work while we were there, but we got to talk to the ones who were working in the day time. 30 answers was a bit less than we wanted, but considering we managed to get everyone who was at work at the time to answer, we feel like our findings are extensive enough to apply to the entire population.

The reason we conducted this survey was to get a better understanding of how the employees of the company rate the values in Malm Orstad, compared to companies who are successful at employee driven innovation. The nine values we use are taken out of the handbook of employee driven innovation (2011), stated as the most important for a company practicing employee driven innovation. We have chosen to calculate the mean value of the gathered results as well as the variation in the answers.

Position		
CNC Operator	10	33 %
CEO	1	3 %
Mechanic	6	20 %
Logistics	2	7 %
Quality controller	1	3 %
Apprentice	1	3 %
Sales	2	7 %
R&D	1	3 %
MPS Management	1	3 %
Undisclosed	5	17 %
Total	30	100 %

4.6.1 Demographics

We can see from our demographics that more than half of the participants are either mechanics or CNC operators. These are the employees working in production, manufacturing the goods. It is natural that most participants are in this category, because this is the position held by the majority of the employees of the company. There is naturally only one CEO and a few people involved with sales, logistics and other

Table 1 - Demographics

management positions. Those who are declared as undisclosed did not put their position on the survey, but we know at least two of these are doing consulting work for Malm Orstad and does not have a formal titles in the company.

4.6.2 Findings

Our aim with the quantitative survey was to collect data that could be used to describe the culture and values within the company and compare these against the values that are usually found in companies successful with employee driven innovation. We asked our subjects to rate the nine statements on a scale from one to five, where one is very low and five is very high. Below, you can read the ten statements and in figure 8 we present the mean value from each question.

1. I feel ownership to my job.
2. I trust my coworkers.
3. I can say and think whatever i want to.
4. I feel that cooperation give better results.
5. I am proud of and enjoy my job.
6. I am allowed to makes mistakes.
7. Making improvements is part of my job.
8. I am independent at work.
9. I feel there is openness in the organization.
10. I am happy with lean work methodology.

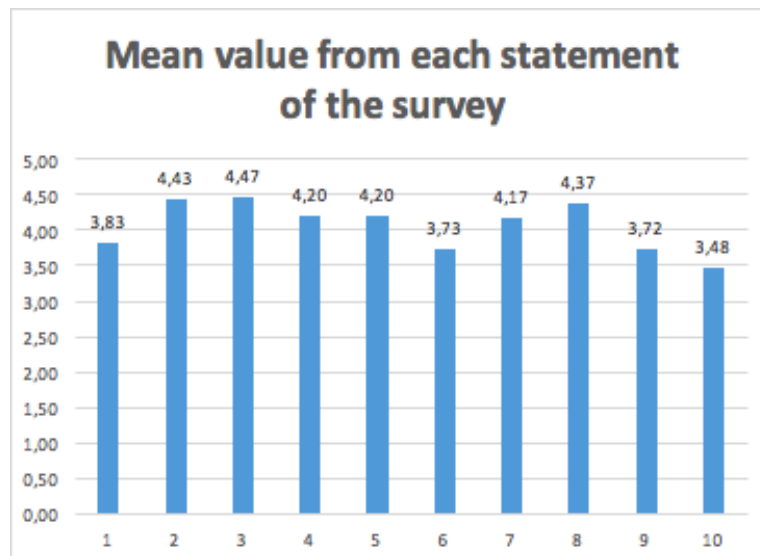


Figure 8 - Mean value of statements in survey

We can see from our results that the employees rate the company above average in every category. Only four statements has a mean value lower than four. The statements with the lowest rating are related to ownership, mistakes and lean working methods. Although, they are still rated above average with a good margin.

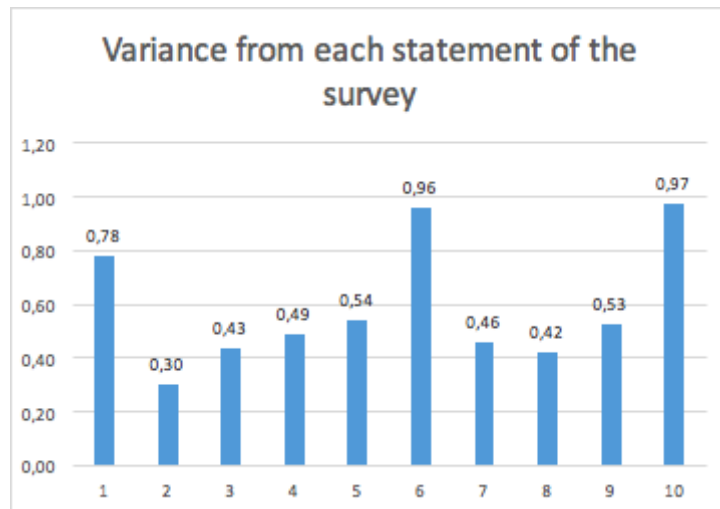


Figure 9 - Variance in our survey

The variance, illustrated in figure 9, is relatively low for most of the statements, with one, six and ten standing out with higher variance. These were also the statements with the lowest mean score. Low variance means that there is a high agreement between the subjects, in our case this means that most of the subjects give us the same answer, but that there were disagreement on the three mentioned statements.

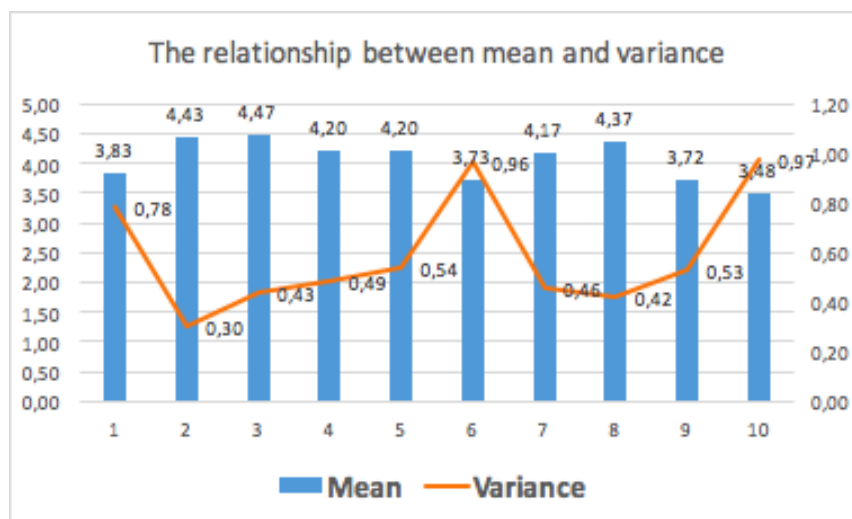


Figure 10 - Relationship between mean and variance

When implementing the survey, we got some questions by participants about the meaning of question six. Some of the respondents interpret the question as to what degree it was allowed to make mistakes, while we wanted to measure to what degree it was accepted that mistakes could happen. This question has the shared highest variance, so there is a chance the results are more different because the subjects have interpreted the question differently. Another

strange observation is that, even though the score is high, some people are not completely satisfied with the lean working method. They do, however, rate the other questions high, like independence at work and involvement in improvements. These are often a result of the lean strategy, giving us some contradictory data.

4.7 Secondary data

In this part we will take a look at the secondary data to back up our qualitative data. We have collected two types of secondary data; accounting data and company data. Our accounting data was collected from proff.no in April, after the accounting from 2017 was made public. The company data has been given to us directly from Malm Orstad on our request.

4.7.1 Economic performance

We want to look at accounting data to back-up the information received in our interviews. This way, we can validate that the changes implemented actually have had a visible effect on economic results, and that it is not a coincidence that results have improved. Since lean was not implemented before August 2016, we will look for changes in the last two years; 2016 and 2017, but assume that they will be most prominent in 2017.

First of all, we look at their operating income, see figure 11. This is the money the company has earned through sales. We can see that their income remains pretty much unchanged from 2016 to 2017, after going downwards since 2014. We know operating income fell from 2014, as a result of declining demand from the petroleum sector, following the large decline in oil prices. However we can see that it has stabilized from 2016.

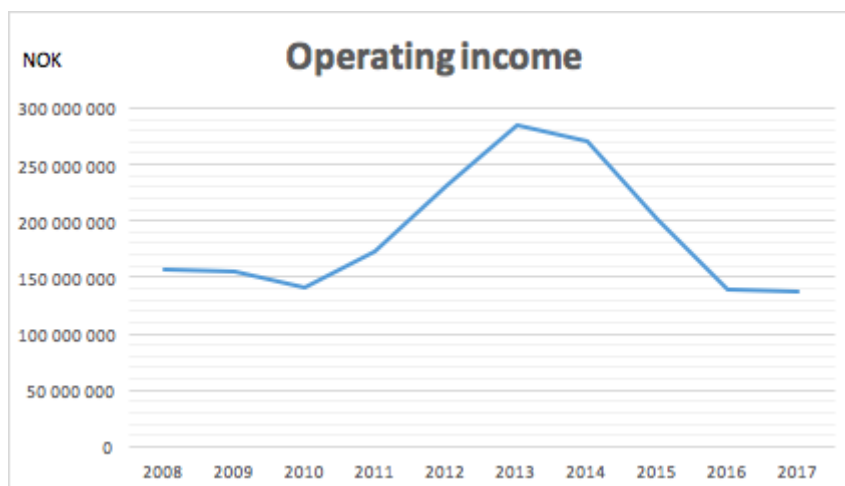


Figure 11 - Operating income 2008-2017 – proff.no

We then move on and look at the operating profit, which is income minus operating costs. We see that they operated with a loss in 2015 and 2016, but that they were back up at positive numbers in 2017, see figure 12.

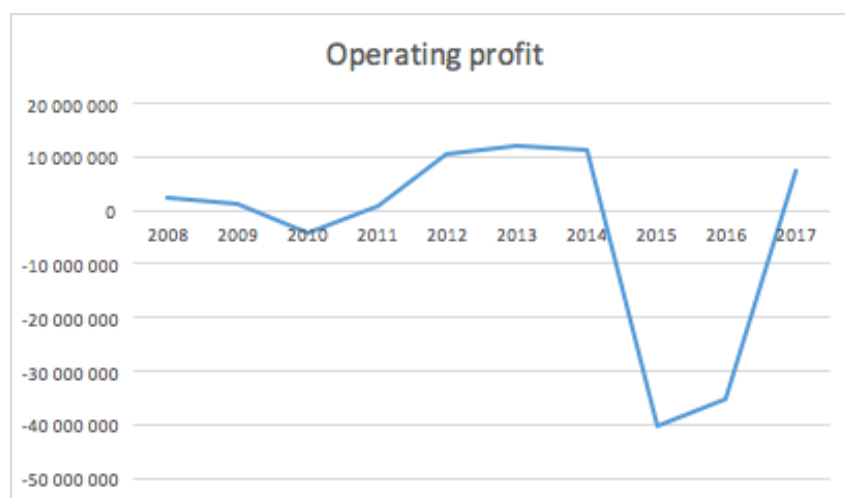


Figure 12 - Operating profit 2008-2017 – proff.no

We find this very interesting, because income was more or less the same as the year before, but profits after taxes are 35 million NOK greater than the year before. How was this achieved?

Because operating income was similar to the previous year, we know that the reason the profit has increased must be the result of lower costs. We can observe that the post for cost of materials is reduced by 68 % from 2015 to 2017, see figure 13.

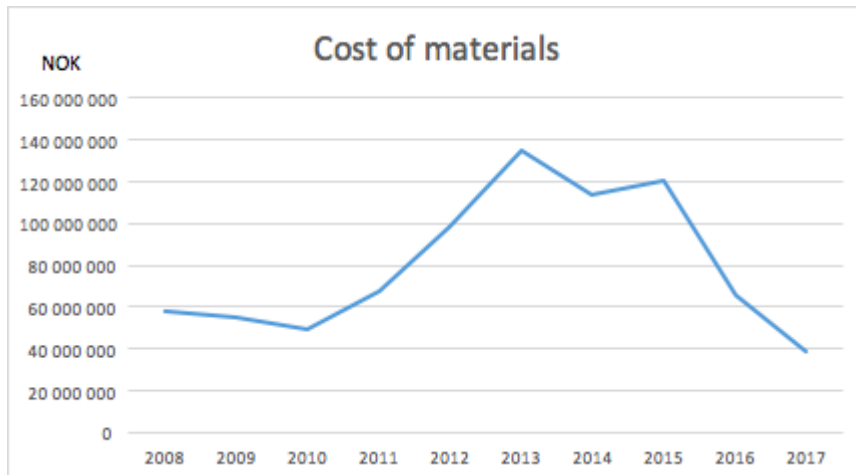


Figure 13 -Costs of materials 2008-2017 – proff.no

This illustrates how the main reason behind the improved results come from a great reduction in the costs of materials. From our interviews we have heard that they have had a focus on better flow in production and the reduction of waste. We were also told that they now have more focus on procurement of raw materials, fewer supplier and less defect products. We can see this illustrated in the accounting data and it also fit with the principles of lean theory and the reduction of waste.

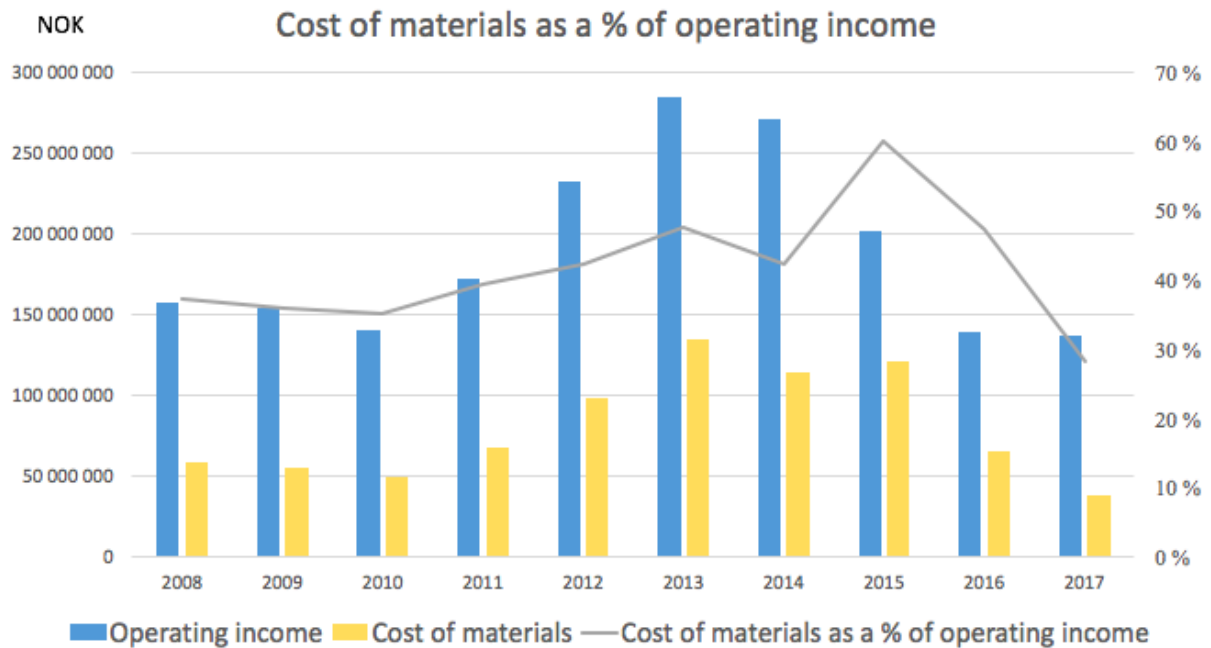


Figure 14 - Cost of materials as a % of operating income

We have inserted all these data into figure 14 to illustrate the changes. We can see that cost of materials increased at a similar rate as operating profits, as is natural. Higher turnover also lead to higher costs. However, when the oil crisis came in 2014, profits was reduced, while costs were still high. This led to cost of materials ‘eating’ more than 60 % of operating income. After lean was introduced in 2016, this have been reduced to less than half, and we can see that costs are reduced, without a change in profit.

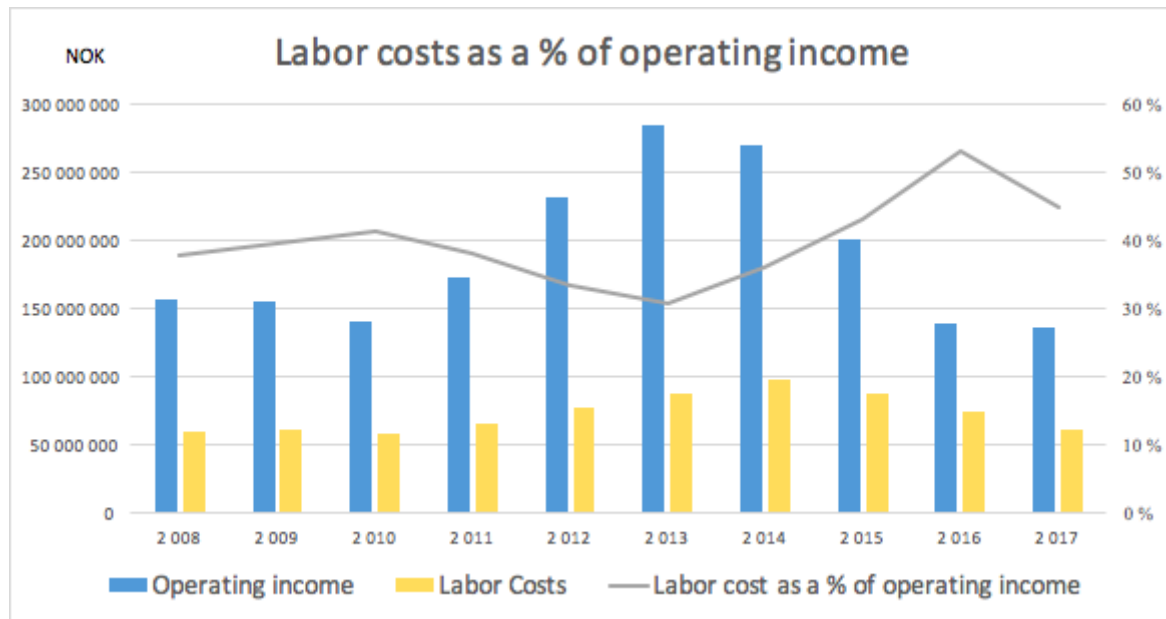


Figure 15 - Labor costs as a % of operating income

The other major cost is labor costs, illustrated in figure 15. When we look at these, we can see that they are not changed nearly as much as the cost of materials. From 2015 to 2017, Malm Orstad cut down the number of employees from 128 to 108, something that has been a contributing factor for this.

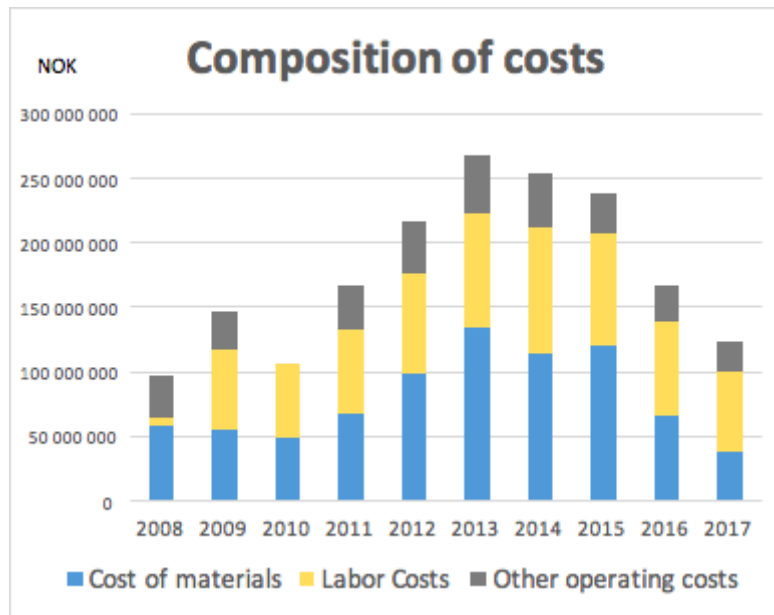


Figure 16 - Composition of costs

When we look at the total composition of costs in Malm Orstad in figure 16 we can see that labor costs have seen reductions since 2014, but this is mainly related to a cut in employees. On the other hand, costs of materials has almost been cut in half. This illustrates that the reduction in costs of materials has been the vital factor in the greatly improved the economic performance.

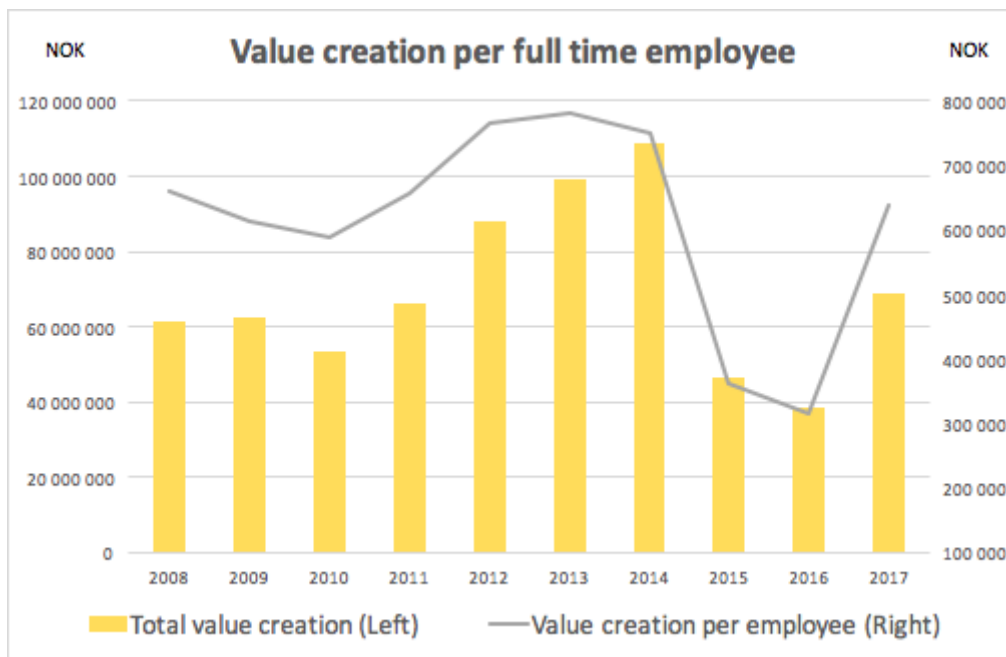


Figure 17 - Value creation per full time employee

Lastly, when we look at the value creation per full time employee we can see that it has almost doubled from 2016 to 2017. This can be the result of the new lean working methods that aims to make the production processes more efficient to reduce waste. The last two figures, 16 and 17, illustrates how costs are reduced and efficiency are increased, which both coincide with the expectations we would have from a company that apply lean working methods.

4.7.2 Company data

We will here briefly present data received by the company that will be used later in our discussion.

Delivery reliability

2012	2013	2014	2015	2016	2017
71,4%	90%*	89,3%	-	88,3%	96,1%

Table 2 - Delivery reliability

**Measured in August*

Delivery reliability is to what degree the company deliver their projects on time to their customer. We see an improvement in their delivery reliability in year 2017 compared to the previous years. For year 2015 there were no data recorded, and we can not tell anything about that specific year. In April of 2018 we are told the delivery reliability surpassed 98 %.

Short term sick leave

2012	2013	2014	2015	2016	2017
1,58%	3,81%	2,46%	2,23%*	1,84%**	1,93%**

Table 3 - Sick leave

**Measured in October*

*** Measured in November*

Short term sick leave indicate the amount of time their employees were absent from work because of illness. On a national basis, the average sick leave in Norway measured in 2018 is 6,5 % (SSB, 2018), meaning Malm Orstad was well below this. According to the documents

we have received, the aim have been to have a sick leave lower than 2 %, something that has been achieved in the last two years.

Implemented improvements

2016	2017	2018
666	1334	569*

Table 4 - Implemented improvements

**Data from June 5th*

Since the implementation of lean, Malm Orstad has consciously kept track of every single improvement implemented in the company. This information is also presented to the employees on the blackboard in the working areas to let them know what improvements have been made. This way, they can see that their suggestions are being followed up and get more insight into what the company is doing. So far this year they have implemented 569 improvements. If they keep it at this rate they will be able to implement even more improvements than last year.

5.0 Discussion

5.1 Implementation and results.

In this part we will review the empirical findings from our interviews, survey and assessment of accounting data and discuss them in conjunction with previous literature and established theory. We will here summarize our most important discoveries.

5.2 The result of lean and innovation on the economic performance of Malm Orstad

To start off, we want to see if the economic results of Malm Orstad can be explained by an external factor, and in this case we wanted to examine the relation with the oil price. This is done to see how much of their economic performance can be affected by internal changes. The oil price is a major factor for development in the Norwegian economy and especially in the Rogaland region. Back in 2013, the local paper Stavanger Aftenblad published an article about Malm Orstad, talking about how results were growing and that there were no signs of any decrease in the market (Skarsaune, 2013). Little did they know that only one year later, the oil price would fall by almost 50 %, leading to falling demand and a critical decrease in operating margin. In one year, their operating margin crashed down from 4,22 NOK in 2014 to -20,07 NOK in 2015, a dramatic reduction for any company. It was at the same time as the crash in operating margin that they decided to change their CEO, with an aim to implement lean working methods as an attempt to improve results. After two years, operating margins are back up at 5,39 NOK, even better than they were before. Their efforts certainly seems to have paid off, but how much of this turnaround in results can be attributed to the new lean strategy and their newfound focus on constant improvements and innovation?

Malm Orstad were far from the only company in the region to suffer during the oil crisis of 2014/15. In fact, the entire region suffered and more than 20.000 people lost their jobs in the oil sector nationwide (Hopland and Raustøl, 2015). We have created figure 18 below, illustrating the changes in operating profit at Malm Orstad in relation to the changes in oil prices over the last 10 years to look if there are similarities.

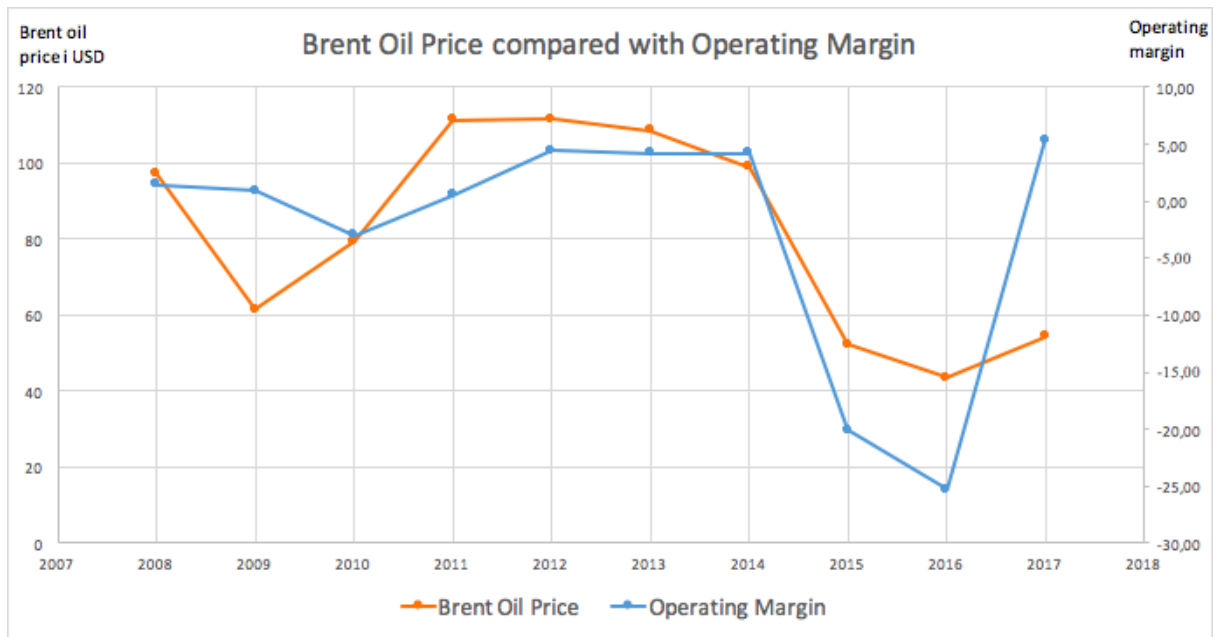


Figure 18 - Brent Oil Price and Operating Margin

Using the correlation tool in Excel, we calculated a correlation coefficient of $r = 0,6675$ between Brent oil price and the operating margin of Malm Orstad, meaning almost 67 % of the operating profit can be explained by the oil price. This shows us that there is a direct correlation and that economic results in the company will change in accordance with the oil price. We are, however, very interested in the change from 2016 to 2017. This is the very same time when lean were introduced in the company, and the operating margin seems to grow at a rate much higher than the oil price. When we remove year 2017 from the correlation calculation, we get $r = 0,8463$, meaning that almost 85 % of Malm Orstad results from 2008 to 2016 could be explained by the oil price.

From this we can interpret that Malm Orstad has become a lot less dependent on the external factor of the oil price after the implementation of lean in 2016. This is an important development, meaning Malm Orstad has more impact on their own results.

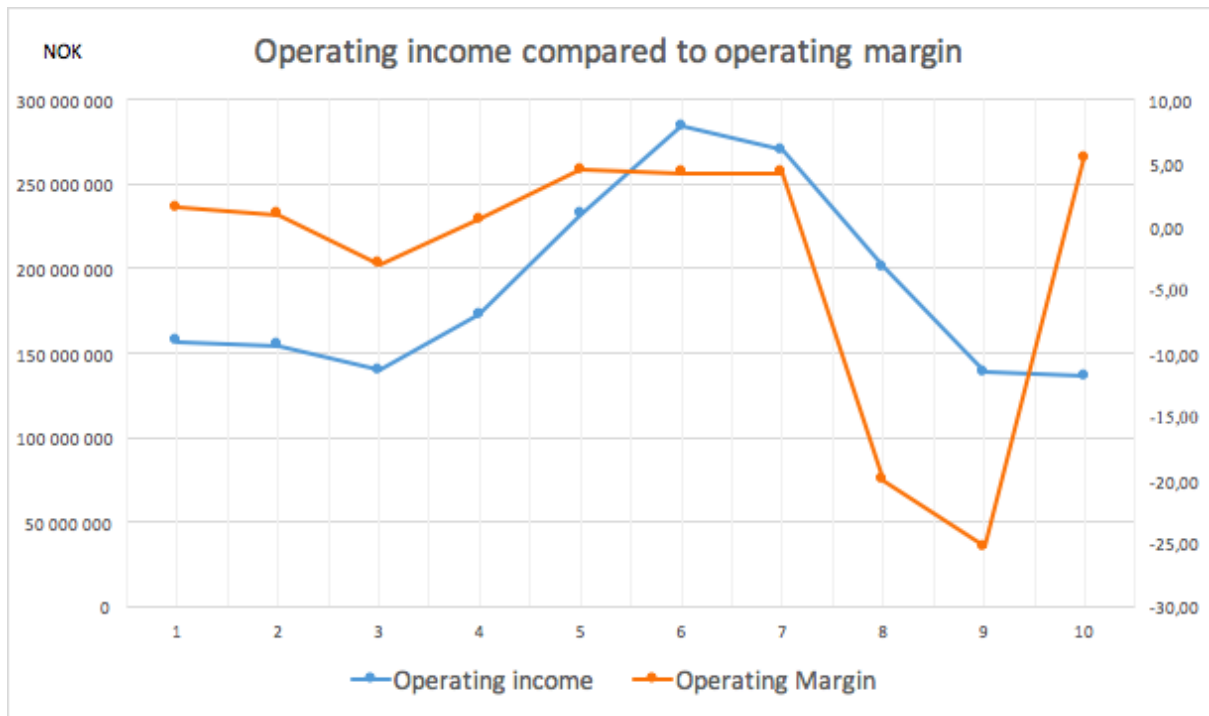


Figure 19 - Turnover and Operating Margin

The reason we chose to look at the turnover in relation to operating margin is because of our findings from accounting data, where we discovered the reduced costs resulting from lean. As our model shows they have almost identical turnover in year 2016 and 2017, while operating margin has gone from -20,07 to 4,22 NOK. We also know that the organization has become profitable and account with a surplus from year 2017. As this model shows it will mean that because of a stable turnover and different operating margin that costs is down.

One of our supplementary question we wanted to answer was to what degree the results of Malm Orstad are affected by the oil price and if the oil price correlate with their operating margin. Our findings points towards a correlation between these two variables, but Malm Orstad appear to have become a lot less dependant on the oil price after the implementation of lean in 2016. Because the implementation of lean is so recent, we only have data from one year, makin it impossible to conclude with total confidence, since it could be a one year thing. Based on the data we have gathered through our research we strongly believe that there is no coincidence that we find this change in the company.

These results are very interesting and we now want to move on to the rest of our supplementary questions to examine what changes has been done in the organization to allow

them to become more independent of external factors. Our goal is to point at the most important changes and measure if they are the reason for the improved results in the company.

5.3 Innovation and learning in Malm Orstad

We want to research to what degree Malm Orstad can be considered an innovative organization. Through our interview process we heard from several employees that the company are constantly searching for improvements, in order to save time and money. In their own words, they call these improvements, but we could also label some of them as innovations. Innovations are changes that are new for the company and can create value in the form of economic results or improved health-, environment- or safety conditions. Malm Orstad has had a constant focus on improvement of processes in order to save time and money. Many of these are process innovations for the company, even though they are not labeled as such. Malm Orstad implemented 1334 improvements in 2017, which amounts to three and a half improvements every day, whereas a lot of these are innovations that have never been done previously in the organization.

We can not label all of the new improvements as innovations. Some of our interview subjects would not even call them improvements, since they were so small and could be considered common sense. The reason we can not call all of these improvements innovations, using the definitions established in the theory, is because many improvements are not new to the company and has been done previously. This is basically a return to a former state where things were more efficient. Examples of this can be the use of the 5S tools from lean, which is just a way of keeping the workspace clean and improve flow. This can be a great and time saving improvement, but is not an innovation. They have made changes that are new to the company, which we can consider as innovations, like the restructuring of departments and focus on new markets. These are all innovations, even though the employees refer to them as just improvements.

Even though not all improvements are innovations, we have discovered that Malm Orstad has made several innovations, which might have been important in their effort to improve results and save the company. We will now share how Malm Orstad has used innovation and display concrete examples of how innovations have been implemented over the last few years.

5.3.1 Malm Orstad and the 4 P's of innovation

Even though the company has a strong focus on process innovations, they have introduced innovations in almost all sectors. Through our interview with the CEO, we got insight into several improvements done in several areas of their business.

5.3.2 Product innovation

After talking with employees in Malm Orstad we learn that there has been product innovation within the company. These innovations are incremental innovations where they try to minimize cost as well as keeping the quality of the products the same. Some of the solutions have been to exchange steel material in their products with much cheaper plastic while not trading reduced cost for performance.

5.3.3 Process innovation

The biggest and most important innovation that has been introduced to the company is the implementation of a lean working method. This is the basis of a lot of our research and has also been the foundation for the large amount of other process innovations introduced. There is no doubt that this was an extraordinary innovation for Malm Orstad and was a conscious decision made to save the company. When they acquired a new CEO in late 2015 his main task was to make the company profitable again through a lean strategy. This introduced a completely new way of working for everyone compared to how they were doing things before, with a focus on the principles of the Toyota Production System. We also get confirmation from the interviews that the employees in the company agree that lean working methods has been a big change, and also that they do not believe that the company would have survived without it. Processes are the area where they have experienced the most innovation and employees are now encouraged to come with suggestions of what can be improved in their working area. Those innovations are very often what is categorized as incremental innovations, because it is improvements to existing processes or 'doing what we do, but better'. Employees are encouraged to help in these processes and will almost always be able to contribute to necessary improvements.

We can also see that the restructuring of the project manager department has led to positive results. Previously, these were involved in several processes, but have now received more specified working areas. This has improved their delivery reliability, which is now above 98 % (table 2). By having less people involved in each part of the process, they have managed to increase the delivery rate and are aiming to improve it even more.

5.3.4 Position innovation

Malm Orstad used to, and still do, deliver one-off prototype equipments and other parts to larger constructions. This used to work well, but several customer would rather buy the full products to downscale their supply chain and deal with fewer suppliers. Instead of buying products from an external supply chain, the companies that Malm Orstad relied on as customers would rather use companies in their own supply chain to deliver the products they needed. The reason behind this change in customer demand was a direct consequence of the oil crisis, according to the CEO. Malm Orstad solved this in cooperation with three other companies (Randaberg Industri, Isotech and Designbanken) through the creation of a subsidiary called 4C Solutions. These four companies produce different parts and deliver them to their common subsidiary who assemble them and deliver finished products. This way, their customers only have to negotiate with one supplier, while the owners do not lose their customers. They have repositioned themselves as a seller of finished products through their subsidiary, while still selling parts through the original company. In other words, they have managed to enter a new market, while still serving their old customers.

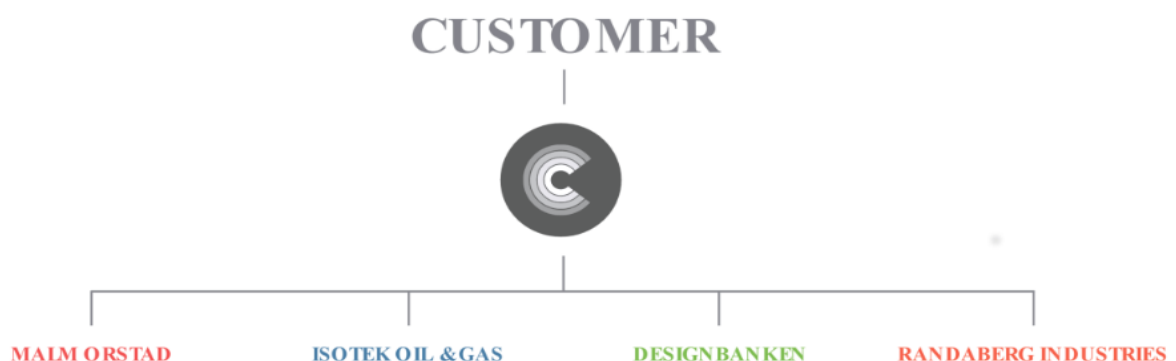


Figure 20 - Structure of 4C Solutions

After the oil crisis of 2014/15 Malm Orstad have also gone out and diversified their customer mix. Previously, they delivered almost exclusively to the oil sector, leaving them very vulnerable to fluxuations in the oil price. As a producer of prototypes and parts to larger equipment they are flexible and can make most products a customer requests. They have now started delivering parts to companies in the defence industry, fish farming and hydropower. Even though they told us that these industries are also shifting quickly, it has given them a more diversified customer mix. Today, the oil industry still make up around 80 % of their customers, but the hope is to reduce this number in the future, in order to become less exposed to periodical changes in demand and other external factors.

5.3.5 Paradigm innovation

A paradigm innovation is a change in the mental model of the company. The most important paradigm innovation done in Malm Orstad seems to be the shift in focus from resource optimization towards a more flow based working method. This is a direct consequence of the lean working method where keeping the flow in the company is important. When focusing on flow ahead of costs, you can make better decisions of which jobs to accept. Previously, they would take almost all jobs offered, but then realized that some jobs were not profitable. The aim became to only do jobs that are profitable, in limited time, to optimize the flow of products out from the company. This is vital for companies like Malm Orstad, who produce a high volume of products, but in small numbers. With the focus on flow, they have reduced downtime on machines and improved delivery times. Focus on flow have also led to better planning of production. A subject from management told us that they previously would buy the cheapest raw materials, but that they sometimes would be delivered later than planned, leading to downtime of machines, costing them up to 1000,- NOK per hour. In the few days the machines were not used, they had lost all the money they saved on the cheaper materials and more. Through the new way of focus on flow, this would not happen today.

5.3.6 Malm Orstad as an innovative organization

Through our review of the interviews we have found evidence of innovation in all of the four categories of innovation. It is obvious that Malm Orstad has implemented innovation, but do they possess the characteristics of an innovative organization? The two most significant characteristics of innovative organizations are strong leadership and good communication across the organization. We asked all the five subjects, that was not the CEO, and everyone

where positive towards him and told us that the CEO is a good leader. The other characteristics was vertical dialogue throughout the organization, from the top to the bottom and back. We know that Malm Orstad have meetings in all departments every day, where managers are present and that what is discussed in these meetings is taken seriously. We also know that daily and monthly results and targets are displayed in common areas, so everyone can stay up to date on the health and performance of the company. Based on this it looks like Malm Orstad possess these characteristics of an innovative organization, and we will use next chapter to provide further arguments for this. In the next chapter we will look at Malm Orstad as a learning organization to better understand if they are an innovative organization.

5.4 The combination of codified and tacit knowledge in order to become a more innovative organization

The empirical research done by Johnson, Lorentz and Lundvall in 2007 shows that the organization that combines a strong version of the STI-mode and DUI-mode of learning has a better innovative performance than companies only practicing one of the forms. We want to use the theory about codified and tacit knowledge to better understand to what degree Malm Orstad can be considered as an innovative organization.

From our interviews we got a lot of interesting information about the learning process within the company. The general shift within the company is that the responsibility and power is decentralized from the management and is now shared with the employees working with production. This is a direct consequence of the lean working method, drawing from the Toyota Production System principle of respecting your employees. This is also the same principle from employee driven innovation about giving the employees the freedom and responsibility to improve the organization from their point of view. The general consensus is that the employees are the experts in their own working area, and since they have the most competence within this field they are the ones who better know how to improve their processes.

The employees of the organization can be seen as experts in their operational field and they have a lot of tacit knowledge in their working ways. This is because they are working in the DUI mode, where they are interacting with their production process every day. Malm Orstad

wanted to get their opinions on how the company could improve by giving them a channel to funnel their ideas of how to make their working day better, as well as improving their existing processes. Acknowledging that their employees have a lot of knowledge by getting experience from working with their processes every day has been important. From our findings we see that there is a concrete process where they can either improve existing processes, if it is easy and fast to implement, as well as write down more complicated improvements that require more resources. These improvements goes on a blackboard in the production facility where the lean coordinator report this to the management. The management then try to give the employees the resources and time necessary to move forward with the improvement.

The DUI mode of learning is also practiced in a master and apprentice relationship. The way Malm Orstad has a master and apprentice relationship is their interaction between their employees and apprentices. The apprentice is a person who work at the company to get a practical degree within the field they have been studying at school. This practical experience is gained through working at a company that uses their education to do productional work. In this way you combine the know-how and know-who in the company by learning how to do your work with individuals who can teach you in a master apprentice relationship.

Malm Orstad has also introduced a way of making codified what is tacit knowledge from their employees. This is done by making, what they call one-point lessons. The-one point lessons are charts with instructions of how to do different tasks by writing down the work method as a recipe for how to do it. This is done so that others without the necessary knowledge can operate by learning it themselves, and is a great example of how Malm Orstad try to make codified what is tacit knowledge. This introduce the know-what element of STI mode of learning by making what can be considered a code book of instructions. It can also help their apprentices in the regard that they can do problem solving themselves and do not exclusively rely on their teachers in how to do their work, which in turn gives the employees more time to do their work and less time in helping their apprentices. This also reduces the amount of know-who required knowledge because the person who knew how to operate and do different tasks now has codified the knowledge so that others can do the work by themselves. This can be considered an improvement in learning because the employees now share their knowledge and they are less people dependent than before.

Based on this analysis we can see that Malm Orstad has improved the DUI mode of learning. This is a result of their lean working method where they wanted to be both more and less reliant on the people with the knowledge. They are more reliant on the knowledge of their employees in the way that they play an important role in the innovation/improvement processes in the company. The employees are also less reliant on each other to solve problems because they codify the knowledge so others can learn by themselves. These changes has increased the efficiency of learning processes in the company and push them towards being a more learning organization. The one-point lessons has been a great improvement to the company and the interview subjects also highlight this as a good improvement. The improvement in performance of the DUI mode of innovation can increase to what degree Malm Orstad can be labeled as an innovative organization. From the information we have received they do not seem to focus explicitly on the STI mode, but they use elements from the STI mode to improve their learning. Even though they do not have a strong combination of the DUI and STI mode of innovation, they have a strong version of the DUI mode. They also have elements from the STI mode of innovation, and both of these methods will make the company more innovative.

5.5 Employee driven innovation at Malm Orstad

As we were researching innovation and lean, we discovered that there are many similar factors in the lean working method and employee driven innovation. We wanted to use the data gathered from our interviews and the theories from both lean and employee driven innovation to research the similarities and differences between them, and figure out if Malm Orstad is a company that is engaged in employee driven innovation. We later decided to implement a quantitative survey to further research if Malm Orstad has the values often found in companies succeeding in employee driven innovation. Employee driven innovation has a lot of benefits and should improve the bottom line of the company, thus making it an interesting research subject for our thesis. We have learned through interviews that the strategy of the company has not been to focus directly on employee driven innovation, but on the lean working method. Because employee driven innovation and lean share several characteristics, we suspect that Malm Orstad is also practicing employee driven innovation as a result of their lean strategy.

The idea of a lean working method is to reduce waste, but it is also about giving the employees specialized tasks, power and responsibility to feel invested in the company. On the other hand, employee driven innovation is about actively using your employees to find new value creating innovations, through cooperation with employees. The focus on respecting your employees opinions and listening to those who are doing the job on a day to day basis is something we can find in both approaches. The lean principle from Toyota production systems, called respect for people, is all about acknowledging that the employees working on a day to day basis with production processes are capable to understand how to improve them. Employee driven innovation is also about non-R&D innovation without the use of experts, and more involvement from the employees.

Through working with lean, Malm Orstad has introduced several innovations throughout the company which they credit to their employees and their new working methods. In the handbook of employee driven innovation (2011) we learned of the four areas that should be improved by EDI. These are quality, productivity, delivery reliability and reduced sick leave as a result of higher employee satisfaction. As we have shown in our findings, we received data from the company that gave us insight into these factors.

- In the years before lean was implemented, they experienced 2,46 % and 2,23 % sick leave in 2014 and 2015. After the implementation of lean, this has been reduced to 1,84 % and 1,93 % which is lower than their targeted sick leave of 2 %. This might not sound like a lot at first glance, but considering it amounts to an estimate of eight hours per employee and calculates up to 768 hours per year, it ends up being quite a lot. A Norwegian full time employee is expected to work 1750 hours a year (SSB, 2018), so this reduction in sick leave would create the value 0,44 extra full time employees for the company.
- They have also achieved a big increase in delivery reliability since 2016. This used to be at around 90 % in the years before the oil crisis, but after the implementation of lean they have managed to increase this to an impressive 98 % in 2018.
- Their quality cost is also reduced by approximately six million NOK. Quality cost are costs related when ensuring that the quality demanded by their customers is met. These are costs that occur when preventing, detecting and remediating product issues related to quality. We have no detailed numbers on this, but we know that it is reduced by approximately six million NOK from 2016 to 2017.

A lot of the improvements to the company gained by lean implementation is also the same improvements you should gain from having a successful employee driven innovation culture. Previous research suggest that employee driven innovation should improve these factors by 15 %. Sick leave is reduced by around 20 % and delivery reliability is improved by 9 %, so we can see they have experienced great improvements in these areas. Because of insufficient data we can not say anything about the percentage in reduction of quality cost, but there is a tangible improvement of six million NOK. The parameters listed above are examples of qualities that should be improved if the company is successfully using an employee driven innovation strategy. These improvements can be related to their lean working method, but also show that lean and EDI share some benefits to their strategy. This is further strengthening our view of the connection between lean and employee driven innovation as they have similar gains.

Malm Orstad has a total of 96 employees and is in the intermediate between being classified as a medium and large organization. In Norway, the definition of being classified as a small to medium company is that you have below 100 employees. One of the main things we have pointed out several times is the implementation of a new meeting policy. There are continuous meetings between the employees and the management regarding the current state of the company and their work practice. The employees are encouraged to inform about challenges in the production so that the management can help them do their job better. This form of meetings are necessary for the company to keep up continuous improvements and innovation. The fact that there is relatively few employees can be helpful when it comes to employee driven innovation, because it allows everyone to be heard and it is easier for the leadership to get everyone involved in the processes.

According to the theory, large companies should have meetings and policies for improvement work, which is something Malm Orstad practice. We also get the feeling that there is a short way from the employees to the management, especially because of their use of a steward. When starting with a lean strategy they hired a lean coordinator whose job is to listen to the voice of the employees and ensure that they keep a high level of job satisfaction. This is a position that looks a lot like a steward or employee representative job in the company.

We previously presented the tools for employee driven innovation. These tools consists of tools to:

- Capture ideas: Malm Orstad utilized boards where employees can write down ideas that are forwarded to the management.
- Tools to select ideas: The tools say that you should implement ideas that are profitable and also those who are selected by employees, which is a practice MO uses.
- Tools to share information: We once again have to mention the boards in each department where new company data and information are displayed daily to keep everyone up to date.
- Tools to create an innovative culture: When all of the above are implemented it creates a strong basis for innovative culture. It is also important that leadership gets involved, something we know is the case at Malm Orstad.

These tools are implemented as part of their lean strategy, but they are the same tools used in employee driven innovation.

After we realized all the similarities between lean and employee driven innovation, we conducted a quantitative survey to measure the nine values that characterize organisations focusing on employee driven innovation. The findings from this research gave a mean value above three and a half or above on all characteristics, on a scale from one to five. We also had a low mean value on most of the questions, with the exception of tree, meaning there is a strong agreement among the employees. Malm Orstad scores high on all the hallmarks characterizing the culture of a company with successful employee driven innovation.

We can conclude that a lean strategy and employee driven innovation have a lot of similarities and that Malm Orstad has started using employee driven innovation as a result of their lean strategy. Their original strategy is to work with lean management, but employee driven innovation seems to be a side effect of their strategic choice. They also score high in all of the parameters used to measure a company's degree and success with employee driven innovation. We can thus conclude that they are a company that to a large extent practice employee driven innovation, although they do not follow the EDI-model as a part of their strategy.

5.6 The use of lean in Malm Orstad

Ever since we started to work on this research, we knew lean was an important tool at Malm Orstad and that they had consciously implemented it in 2016 to get out of the financial trouble they found themselves in.

5.6.1 Toyota Production System

We know that the most used interpretation of lean consists of three equally important principles; continuous improvements, respect for people and standardized work practices.

As we learned through our interviews, morning meetings are undertaken every day. These can last from two minutes to a quarter of an hour, depending on the issues presented. In these meetings, employees in individual departments discuss the production form the previous day and if they have any suggestion on how to improve or solve any emerging problems. Some days there are no issues to discuss, while other days they will have to spend more time in order to get production back on track. This way, they can make sure they maintain a smooth flow in production, and remove wasteful problems before they continue working. Allowing all employees to bring up their thoughts every day is a great way of collecting ideas, and can lead to continuous improvements.

In relation to the previous part, the involvement of all employees in these daily meetings is part of showing respect towards their employees. The management of Malm Orstad understand that the employees best know how to improve in their own work area, and their proposals for improvements are often implemented. As the CEO said in our interview:

“I don’t know anything about machining, it is therefore better for the company if those who work there can come with ideas on how they can improve”.

This has been an important part in creating a good culture and atmosphere in Malm Orstad. They have very little turnover of employees and almost nobody quits their job. From our quantitative data we can assume that this is because they feel included and take ownership in their organization. When we asked the employees in the qualitative interviews they talk about getting more responsibility after the implementation of lean and bring up two reasons for this. The first one is that their suggestions are being implemented and the second reason is that

they have gotten one specific area where they have more opportunity to affect changes. Those we asked in the management also answered that they feel employees have become more loyal to the ideas, mainly because they feel a stronger ownership to it.

The last principle in TPS is standardization. This means that there are developed best practices of doing the processes in the organization. Standardization is important to create discipline and less waste of time. Previously, different groups often did the same things others had spent time on before. Before the introduction of lean, they had a department of project managers who had the responsibility of purchasing, marketing, interacted with customers and more. After doing a value stream analysis, they realized that this was slowing down the whole process, resulting in way to many people involved in every process. They have now restructured, so that everyone have one specific job, like head of marketing, COO, CTO, production manager and more. This leads to better flow of information throughout the company, resulting in higher efficiency. Now everyone knows what to do when they receive a job and will not send it on to the next department before it is completed.

As one of our subject said, it is the continuous implementation of small improvements that saves the most money. He used an example of implementation of 5S, where all tools were labeled to be at the right place at all times. This reduced the time employees used to find the tools, when needed.

“If every employee saves one minute every time they need that tool, we might have saved 100 minutes in a day, and if you start to multiply that up to a year you can imagine how much time is saved that can be allocated to actual production”.

It would be extremely time consuming to find data that explains the time and, in consequence, the money saved from all of the 1334 improvements and innovations they implemented in the calendar year of 2017. What we do have is data that show us how much they have saved on different expenses. The constant implementation of incremental innovations in production have reduced the cost of materials with 27 million NOK (58 %) from 2016 to 2017. The sales revenue is almost unchanged, while the value creation per employee have risen with 300.000 from 2016 to 2017. We can clearly see that the improvements have led to more efficiency among employees, which shows in the accounting data through huge savings in costs, leading to higher results.

5.6.2 Malm Orstad and reduction of the seven wastes

Muda is the reduction of the seven wastes within the company. We want to present the reduction of different wastes and the effect of these reductions. Muda has also been reduced because of the reduction of mura and muri.

Waste:	What has changed:	What is the effect:
Overproduction	Malm Orstad has reduced production to warehouse. Implemented Just-In-time production.	Less money tied up in the warehouse. This is considered waste as it does not create value for the customers.
Transportation	Nothing has changed regarding transportation.	No effect.
Queues	More effective use of machines. Better flow of information.	Ensures smooth production when dedicating even workload to their machines/employees. Better communication between departments and better flow of information makes sure that vital documents do not get stuck in queues.
Motion	5S has been implemented to reduce motion.	Less motion because of the 5S changes. Employees know where their tools are and use less time walking around looking for them.
Inventory	Less production to inventory.	Less money tied up in the warehouse, they now produce according to their jobs.

Defect	Less trial and error work.	Less defects as a result of the changes. Stopping production when encountering a problem gives smoother production when the problem is solved.
Overprocessing	Better information flow. Database with sketches for jobs they are doing.	They do not make the same sketch for a job every single time, this leads to less overprocessing. Before they had a tendency to make a new sketch for every job, now they use the same sketch if a job is the same.

Mura is the reduction of unevenness and inconsistency. Malm Orstad has done a significant job with accepting orders from their customers that are within their capacity. This has, for example, improved their delivery reliability from an average of 90 % up to 98 %. We can see a clear improvement for the company in smoothing the demand for their services and being consistent in their delivery capability.

Muri is about the reduction of overburdening. After the implementation of lean they have redesigned all of the employee contracts to describe clear roles within the company. These responsibilities will make sure to not overburden the employees, because they know that the workload that is assigned is sufficient and not too overwhelming.

The main goal with the lean management in Malm Orstad has been to remove all parts of the production that does not create value. This means that all kinds of waste are removed to make the company more efficient, and free up more time for value adding processes. In findings we presented the numbers from their accounting data to see if we could identify where the largest changes had occurred. When looking through accounting data from Malm Orstad in the last 5 years, we saw that their cost of materials had decreased drastically after the implementation of lean. Compared to 2013, they have cut these costs by 97 million NOK, something that has been vital in the process to increase the results and save the company.

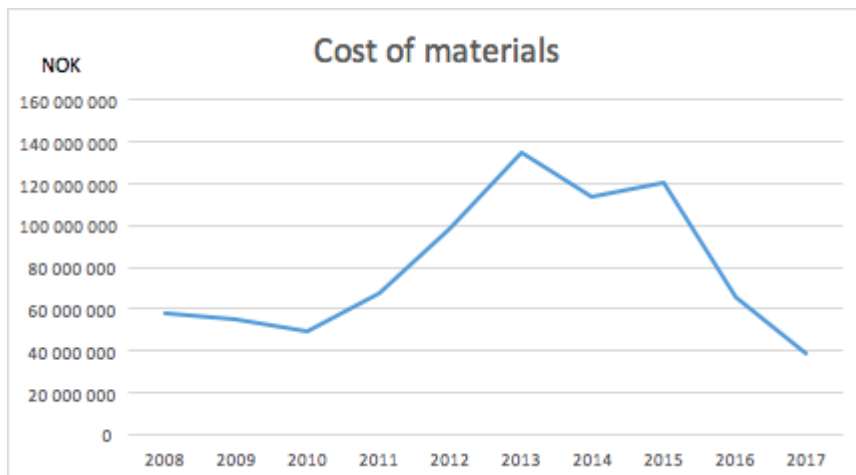


Figure 21 - Cost of materials

Many factors were changed in order to decrease cost of materials. Among others they cut the amount of suppliers in half to reduce time spending on interacting with each one. They also implemented a focus on producing less defect products, and no longer allowed trial and failure techniques, because this wastes both time and materials. They have also reduced the amount of production to store in warehouse, because products in storages do not create any value for the customer.

We can clearly see that the implementation of lean has created a more efficient work environment and a boost in the number of improvements implemented. The employees have gotten more responsibility and feel they have the opportunity to contribute to growth in the company. After they realized that the tools works, they have all joined in and acknowledge the lean production tools. We therefore have evidence of lean being successful in improving economic results.

5.7 The relationship between lean and innovation in Malm Orstad

In our theory chapter, we reviewed the previous literature which discussed how the implementation of lean can have a negative adverse effect on innovation inside a organization. So far in our discussion we have argued that a lean strategy have had a positive effect at Malm Orstad and that the introduction of lean have helped to boost innovation, using their most valuable asset, their employees.

5.7.1 Complementarities between lean and innovation at Malm Orstad

It is said that the main issue with implementation of lean is that it will not allow employees to spend time working with innovation. In Malm Orstad, this is solved through daily communication between employees and department leaders, where issues are brought up to the management and solutions are immediately discussed. This has resulted in a company that looks for innovation every single day. In accordance with Chen and Taylor (2009), it can be the source of a large increase in the number of incremental innovations at Malm Orstad. The introduction of lean have given more responsibility to the employees and given them the opportunity to contribute in the search for improvements, basically making Malm Orstad a more innovative organization. In the previous literature, there was a fear that lean would remove the time needed for innovation, but in Malm Orstad lean and the search for continuous improvement have given innovation a boost.

When it comes to radical innovations, Malm Orstad is a supplier of mechanical solutions throughout several industries. Their job is to deliver what their customers ask for, which basically means they get to outsource radical product innovations to their customers, similar to what Toyota does. The CEO told us in our first interview that they mainly search for incremental innovations themselves. A lot of previous literature focus on product innovation and forget the effect of innovation in other areas. When you are a producer of equipments and the characteristics of the products are defined by the customers, you do not have to focus that much on product innovations, as long as there is demand for the current product.

Sonnenberg and Sehestad (2015) presented three reasons why lean would not kill innovation.

1. Cutting time on other processes allows for more time to do innovation.
2. You have to be working to be able to see where improvements are needed.
3. Working together in teams creates discussions, creating an area where innovation can grow.

The employees at Malm Orstad are heavily involved in the innovation process and through working together and interacting with management, they have managed to create an culture where the employees are always looking for a way to make every process more efficient. Even though the main strategy for Malm Orstad back in 2016 was the implementation of lean

to reduce costs, it has had a ripple effect where it has increased the amount of innovations as a way of cutting costs.

5.7.2 How to stimulate both lean and innovation

Former research (Lewis, 2000) have suggested that lean companies lose some of their innovative ability. This was often because innovation processes were cut out of the company. In our case study of Malm Orstad we have seen the complete opposite. Implementation of lean manufacturing tools have been a huge boost to innovation at Malm Orstad. Many of the innovations have come directly from the employees, through the search for continuous improvement. To stimulate both lean and innovation we have seen that it is important to create a culture that involves everyone in the company, from managers to mechanics. When employees want to perform better, they search for new solutions in order to improve, resulting in continuous innovation.

6.0 Conclusion

The aim of this thesis is to answer our research question: *How can innovation and lean be combined to improve the economic performance of a company?* We have now discussed our empirical findings against the established literature on innovation, knowledge and lean, in order to research how these are connected. In our case study we see some limitations to our research, through the difficulty of combining theory with empirical findings. To condense more than six hours of interviews into a series of observations and data have not been easy, and demanded a lot of interpretations from our side. Using data from only one company will also have reduced the transferability of our findings, but we still managed to conclude on our research question, as well as our supplementary questions. In this final part, we will answer our research question based on our findings and discussion with the help of our supplementary questions.

6.1 Conclusion

Our first supplementary question aim to answer to what degree Malm Orstad is an innovative organization. We have presented and discussed the implementation of several innovations throughout the company in all innovation categories. Malm Orstad possess an ability to use innovation in order to implement changes that improve areas where the company was not performing at a satisfactory level. The most game changing innovation for Malm Orstad has been the implementation of a lean working method as their new strategy. Innovative businesses are often recognizable from their hands-on leadership and decentralized authority, two characteristics we have observed at Malm Orstad. To be able to conclude to what degree Malm Orstad is an innovative organization we also wanted to look at the two modes of learning and the connection between these. We found evidence from our qualitative research, as well as how the company operate, that the organization is excelling in the DUI mode of innovation. They do not explicitly focus on the STI mode of innovation, but use methods from this type of learning, as codification, to further boost their learning. We see that the company use the tacit knowledge of their employees and try to codify it so that they can become a more learning organization. Because of their focus on increased learning and improvement of their DUI-mode, they are set up to be a more innovative organization. Malm Orstad implemented 1334 improvements throughout the entire company in 2017 and even though not all of these can be considered innovations. We conclude that Malm Orstad to a high degree is an innovative organization.

Our initial plan was to look at the combination of lean and innovation, but during the course of our research we realized we were witnessing a company that performed employee driven innovation. We found interesting evidence pointing to everyday use of EDI without it being an official strategy for the company. This expanded our research, and we wanted to examine if Malm Orstad is an organization practicing employee driven innovation as a consequence of their lean strategy. There is evidence of employee driven innovation being the source of many of the incremental process innovations that the company implement on a regular basis. Our findings in the qualitative- and quantitative research, emphasize that Malm Orstad is an organization who has characteristics of a company that succeed in employee driven innovation. We conclude that there is a connection between the lean working method and employee driven innovation, and that the implementation of lean created a culture inside the company that encouraged employee driven innovation.

The next supplementary question we want to answer is the possibility that lean and innovation would disrupt each other when both are present. Our findings from Malm Orstad show the same results discovered in earlier studies, where lean has been the source to an increase in incremental process innovations. To date, we have not seen that lean has had a negative effect on innovation in the company, but since they have only practiced lean for two years it would be wise to keep in mind that it could do so in the future. With this we can conclude that the implementation of lean has had a positive impact on innovation, and that they should keep an eye out for negative effects in the future.

The last supplementary question we want to research was if the results of Malm Orstad were affected by external factors, and we look specifically at the oil price since this is an observable factor that affects all companies in the region. When the oil price goes down, the demand for the products from Malm Orstad will be lower, thus affecting their results. We can conclude that Malm Orstad is affected by the oil price, but that the introduction of lean has made them less vulnerable to oil price fluctuations and has given them more control over their operating results. Lean was implemented in 2016 and we do not have enough data to draw a definite conclusion. Based on the available data we can see that there is a correlation between economic performance and oil price, but Malm Orstad appear to become less dependent on external factors after the implementation of lean.

Through our research we have seen that lean and innovation can complement each other when implemented correctly. Introducing a lean production strategy was a big change for Malm Orstad back in 2016, but it has certainly led to an increase in innovations and economic performance for the company. Lean strategy has been the most important change, laying the groundwork for employee driven innovation and a huge turnaround in the bottom line of the company. A lean working methodology will cut costs through a continuous search for innovation opportunities and thus improve the economic results of the company. To succeed with a combination of lean and innovation it is important to trust the employees with the responsibility of improving the company. It is also important to give the employees the necessary tools to be innovative in their job and create a culture for continuous improvement. We can conclude that innovation and lean can be combined to improve the economic performance of a company. A lean working methodology will increase the innovative capability of the company through a focus on continuous improvement.

6.2 Lessons from Malm Orstad to other companies

If there is one thing to be learned from this case study it is to realize what a great source of knowledge and innovation your employees are, and to realize how much a change in strategy can do to save a struggling company. Malm Orstad has a knowledgeable leader who encourage everyone to follow the vision of the company. It is important to create a culture around the company that encourages innovation and sharing of knowledge, to get everyone involved and invested in the company. Through the introduction of lean methodology, Malm Orstad has been able to work with continuous improvements and innovation to steadily evolve as a company, which we have seen give manifestations in their economic performance. Having a lean working method should be applicable to most companies, and it is important to use lean in your own way. By this we mean that every company is different, and lean should supplement the already existing culture and working methods, instead of turning the company completely around.

6.3 Further research

To further research how lean and innovation can affect economic performance it would be interesting to do a similar research in another company with characteristics similar to Malm Orstad. If we had data of other companies that use lean methodology as part of their strategy, we could compare the results with Malm Orstad to see if they have experienced the same

changes in economic results after the implementation of lean. If this research turned out to be similar to Malm Orstad, we would assume that it could have transferable value to other companies.

One of our concerns with our thesis is that the use of lean at Malm Orstad is so recent that we only have a small data set. As a result of this, we have not had the possibility to see how these changes would affect a company in the long term. Even though we see a connection between lean, innovation and results, and can back this up with our data, we still only have results from one year. To be able to make a more certain conclusion we would like to see if the company can keep up the same trajectory moving forward.

We have seen that the implementation of lean has resulted in several incremental innovations. Lean is a tool that works well for companies in order to cut cost, but in order to grow innovation is needed. It could be interesting, as further research, to look at the innovational capabilities of Malm Orstad if they decide to branch out to different industries on a larger scale than they have done today. The feedback we have gotten from the company regarding their attempt of entering other industries, besides the oil industry, is that it is harder than expected. It would be interesting to see if a strategy that focused more on innovation and growth would work better than lean, when they try to penetrate new markets.

6.4 Criticism of our research

When our research is now completed, it is important to be able to look back and identify areas in which we could have improved. As mentioned in the previous part, the reliability of our research is clearly decreased by the fact that we only have data from one full year of operations after the implementation of lean manufacturing. We realize that it is possible to argue that one year of improved results can be seen as a fluke, although we feel we have presented enough evidence to prove otherwise.

We probably should have held two rounds of interviews, so that we could have introduced another line of questioning to answer the questions we were left with after the first round of interviews, but with the time we had to finish our research, this was not possible to implement.

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Figure 3: Process innovation results in increased supply.

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Figure 4: Tidd and Bessant. 2009. *Strategic innovation management* p. 285. The SSI model

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8.0 Appendix

Data from year 2008 to 2017

Year	Brent Oil Price	Operating profit MO*	Turnover*	Operating Margin
2008	96,99	2 277	156 921	1,45
2009	61,51	1 371	154 386	0,89
2010	79,47	-4 152	140 063	-2,96
2011	111,27	943	172 543	0,55
2012	111,63	10 382	232 014	4,47
2013	108,56	11 966	284 223	4,21
2014	99,03	11 408	270 302	4,22
2015	52,35	-40 335	200 977	-20,07
2016	43,55	-35 100	138 805	-25,29
2017	54,25	7 355	136 578	5,39
	* in thousands			

Regression Brent Oil Price/Operating Margin 2008-2017

SAMMENDRAG (UTDATA)									
<i>Regresjonsstatistikk</i>									
Multipel R	0,66751024								
R-kvadrat	0,44556992								
Justert R-kva	0,37626616								
Standardfeil	21,2381904								
Observasjon	10								
Variansanalyse									
	<i>fg</i>	<i>SK</i>	<i>GK</i>	<i>F</i>	<i>Signifikans-F</i>				
Regresjon	1	2899,97384	2899,97384	6,42923144	0,03494975				
Residualer	8	3608,48585	451,060732						
Totalt	9	6508,45969							
	<i>Koeffisienter</i>	<i>Standardfeil</i>	<i>t-Stat</i>	<i>P-verdi</i>	<i>Nederste 95%</i>	<i>Øverste 95%</i>	<i>Nedre 95,0%</i>	<i>Øverste 95,0%</i>	
Skjæringspunkt	86,3401459	6,9445392	12,4328114	1,6358E-06	70,3260098	102,354282	70,3260098	102,354282	
X-variabel 1	1,65007947	0,65076671	2,53559292	3,49 %	0,14940874	3,1507502	0,14940874	3,1507502	

Regression Brent Oil Price/Operating Margin 2008-2016

SAMMENDRAG (UTDATA)								
Regresjonsstatistikk								
Multipel R	0,84637828							
R-kvadrat	0,71635619							
Justert R-kva	0,67583564							
Standardfeil	15,1460357							
Observasjon	9							
Variansanalyse								
	<i>fg</i>	<i>SK</i>	<i>GK</i>	<i>F</i>	<i>Signifikans-F</i>			
Regresjon	1	4055,5681	4055,5681	17,6788391	0,00401246			
Residualer	7	1605,81679	229,402399					
Totalt	8	5661,38489						
	<i>Koeffisienter</i>	<i>Standardfeil</i>	<i>t-Stat</i>	<i>P-verdi</i>	<i>Nederste 95%</i>	<i>Øverste 95%</i>	<i>Nedre 95,0%</i>	<i>Øverste 95,0%</i>
Skjæringspunkt	92,2364586	5,33945205	17,2745176	5,353E-07	79,6106608	104,862256	79,6106608	104,862256
X-variabel 1	2,02175398	0,48084094	4,20462116	0,00401246	0,88474584	3,15876213	0,88474584	3,15876213

Results from quantitative method

	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 8	Question 9	Question 10	Position
Subject 1	4	5	5	5	4	4	4	5	5	3	2	CNC Operator
Subject 2	5	5	5		5	4	5	5	5	5	5	CEO
Subject 3	3	4	5	4	4	3	5	5	5	3	4	CNC / Team leader
Subject 4	5	4	5	4	3	3	4	4	4	4	1	CNC Operator
Subject 5	1	4	5	5	4	1	4	5	5	3	3	CNC Operator
Subject 6	3	4	5	4	4	2	4	5	5	3	2	CNC / Mechanic
Subject 7	4	5	4	5	4	4	4	3	4	4	4	Industry mechanic
Subject 8	4	4	5	4	4	5	5	5	5	5	4	Logistics
Subject 9	3	4	5	4	4	5	4	4	4	5	4	Logistics
Subject 10	4	5	5	5	5	2	4	4	4	4	5	Quality controller
Subject 11	5	4	4	3	3	4	3	4	4	4	4	
Subject 12	4	5	5	5	5	4	4	5	5	3	3	Mechanic
Subject 13	2	4	5	4	5	5	4	4	4	3	2	Apprentice
Subject 14	3	5	5	5	4	4	5	5	5	5	3	Mechanic
Subject 15	4	4	5	5	5	2	4	4	4	4	3	Mechanic
Subject 16	4	5	4	5	5	4	5	4	4	3	4	Mechanic
Subject 17	4	5	4	5	5	4	5	5	5	4	3	Team leader / CNC operator
Subject 18	5	5	5	5	5	4	4	5	5	-		
Subject 19	5	5	5	5	5	5	5	4	4	5	5	Sales and orders
Subject 20	3	4	4	5	4	3	4	3	3	3	3	Mechanic
Subject 21	4	4	3	4	3	4	3	3	3	3	4	R&D
Subject 22	4	4	3	4	4	3	4	5	3	3	3	CNC Operator
Subject 23	4	4	4	3	5	4	4	5	3	3	4	
Subject 24	5	5	4	5	5	4	4	5	4	4	4	MPS Manager
Subject 25	4	3	4	3	3	3	2	4	3	3	2	
Subject 26	4	5	4	4	3	4	4	4	4	4	4	Sales engenieer
Subject 27	4	4	3	3	4	4	4	4	4	3	3	
Subject 28	3	4	4	4	4	5	5	5	4	4	4	CNC Operator
Subject 29	4	5	5	5	5	5	4	4	4	4	5	CNC Operator
Subject 30	4	5	5	4	3	4	5	4	4	4	4	CNC Operator
Mean	3,83	4,43	4,47	4,20	4,20	3,73	4,17	4,37	4,37	3,72	3,48	
Variance	0,78	0,30	0,43	0,49	0,54	0,96	0,46	0,42	0,42	0,53	0,97	



Spørreundersøkelse Malm Orstad

Spørreundersøkelsen er anonym og svarene vil kun bli benyttet i sammenheng med vår masteroppgave ved Universitetet i Stavanger.

Sett ring rundt alternativet som passer for deg. Rangeringen varierer fra 1-5 hvor 1 betyr veldig lav og 5 betyr veldig høy.

I hvilken grad er du enig i disse utsagnene:	Veldig lav					Veldig høy				
1. Føler du eierskap til jobben din?	1	2	3	4	5					
2. Stoler du på dine medarbeidere?	1	2	3	4	5					
3. I hvilken grad er det lov å tenke og si hva du mener?	1	2	3	4	5					
4. Føler du at samarbeidet fører til bedre resultater?	1	2	3	4	5					
5. Er du stolt over og trives i jobben din?	1	2	3	4	5					
6. Er det lov å gjøre feil på jobb?	1	2	3	4	5					
7. Er forbedringsarbeid en del av jobben din?	1	2	3	4	5					
8. Er du selvstyrt/selvstendig i jobben?	1	2	3	4	5					
9. Er det åpenhet i organisasjonen?	1	2	3	4	5					
10. Er du fornøyd med lean arbeidsmetodikk?	1	2	3	4	5					

Hvilken stilling har du hos Malm Orstad?

Qualitative interview: Questionnaire for management.

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du vært en del av selskapet?

Q2: Hvorfor valgte dere å innføre en lean i Malm Orstad?

Q3: Hvilke endringer har bedriften opplevd etter at lean ble implementert?

Q4: Hvordan skiller disse arbeidsmetodene fra tiden før lean ble introdusert?

Q5: Hvordan prioriterer dere hvilke prosesser som skal forbedres?

Q6: I hvilken grad tror du lean har vært med på å fremme innovasjon i selskapet?

Q7: Hvilken/ eller hvilke endringer har vært viktigst for selskapet etter implementeringen av lean?

Q8: Hva har vært den viktigste faktoren for at lean har blitt en suksess i selskapet? (ledelse, ansatte, kultur, teknologi, annet)

Q9: Hva var de største utfordringene dere støtte på under introduksjonen av lean i selskapet?

Q10: I hvilken grad tror du lean og innovasjon har vært en faktor for deres forbedrede økonomiske resultater?

Qualitative interview: Questionnaire for production workers.

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du jobbet her?

Q2: Hva betyr lean for deg?

Q3: Hva tenkte du første gang du fikk høre om satsningen på lean?

Q4: Hvordan skiller denne måten å arbeide på i forhold til slik det var før implementeringen av lean?

Q5: Føler du at du har fått mer ansvar etter implementeringen av lean?

Q6: Hva er den viktigste effekten ved innføring av Lean på arbeidsplassen? Hvordan har dette påvirket ditt arbeidsområde?

Q7: Har du større mulighet for å komme med forbedringer for selskapet (produkter & prosesser) enn tidligere?

Q8: Hvordan har implementeringen blitt kommunisert fra ledelsen til de ansatte?

Q9: Hva er din motivasjon for å bidra til en leankultur innad i selskapet?

Oppfølgingsspørsmål: Hva har du eventuelt kunnet bidra med?

Q10: Vil du si at Lean som arbeidsmetodikk har bidratt til flere innovasjoner / forbedringer i måten selskapet jobber på?

Q11: Er det eventuelle negative sider ved Lean?

In depth interview with CEO 19.01.2018

Can you tell a bit about yourself, the company you work for and your role within the company.

Startet i selskapet 19. Oktober 2015. Startet som daglig leder, kom fra Øglænd System der han også jobbet som daglig leder. Har jobbet som logistikksjef og fabrikkssjef der resten av tiden. Bachelorgrad i ledelse som bakgrunn + etterutdanning. Har tatt eksamen hvert år de siste 20 årene. Etter å ha fått nye og utfordrende arbeidsoppgaver har det vært en av grunnene for etterutdanning. Gift og har 3 unger, bor på Randaberg.

Har vært på besøk i selskapet og oppfattet god atmosfære, hyggelige eiere og et selskap jeg kunne tenke meg å jobbe i. Ingen forkunnskaper om denne industrien, maskinering, men kan mye om bedrifter og ledelse. Mange i selskapet kan dette fra før (maskinering), så det var ikke noe problem.

Selskapet var egentlig i fritt fall når jeg tok over, selskapet hadde tapt 45.000.000 det året han kom til selskapet. Måtte bygge ny strategi, måtte egentlig lage en strategi fordi det ikke var noen satt strategi på den tiden. Porters 5 forces, VRIO, PESTEL, SWOT, strategiplan, sette mål og starte opp med Lean. Normalt sett starter du med kutt først og når det har roet seg starter vi med Lean. Var nødt å ta nødvendige kutt for å overleve, jobbet med lean direkte selv og prøvde å finne problemene i selskapet. Samlet teamet med folk som var bidragsytere i selskapet og grupperte problemene på en tavle slik at vi fikk skrevet dem ned. Oppsummerer problemene i A3, hvor det var en A3 analyse for hver pilar/kategori i selskapet. Vi måtte koble folk på og lære dem å bruke A3. Det skulle kulminere i en historie hvor det står problem og løsning, de som jobber i bedriften vet best hvor problemene ligger. Etablert et datafangst system for å finne problemer. 2017: 1333 forbedringer som er gjennomførte i selskapet.

What was the reason you started to innovate and why did you choose to focus on a lean strategy?

Eierne så at det var nødvendig med endringene, måten å styre bedriften på var ikke bærekraftig. Lytte til hva kunden sier, kunden stiller krav til lean, standardisering og digitalisering. Spesifikt taper de penger, det var ikke lønnsomt å drive slik det var og det var nødvendig med forbedringer og lønnsomhet.

In what way has innovation and a lean philosophy contributed to improving the organization's bottom line.

Samme omsetning, lavere kostnader og bedre resultat.

Can you name three process innovations that has made an impact on the bottom line of Malm Orstad in 2016/2017?

1. Som en del av den nye strategien så går det på å møte kundenes krav, de prioriterte sin egen supply chain og kuttet bestillingen fra oss. Vårt mål var å levere direkte til sluttkunden, og da måtte vi samarbeide med andre. Vi startet et selskap som heter 4C solutions sammen med Randaberg industri, Isotech i Leeds, Designbanken og Malm Orstad. Vi ønsket å levere et komplett system til sluttkunden. Vi lånte Statoil sine tegninger på H-rammene som vi hadde brukt tidligere og solgte dette produktet til en sluttkunde. Alle 4 i 4C solutions levere hver sin del av et komplett produkt til sluttkunden. Malm Orstad har hydraulikk og maskinering som deres hovedkompetanse. System og engineering kommer fra Isotech. Randaberg industri har råstålet. Vi hadde bygget dette produktet tidligere på vegne av Statoil, men denne gangen leide vi tegningene til produktet for å lage det selv.

Hvordan kom dere i kontakt med selskapene dere jobbet sammen med?

Vi kjente hverandre fordi vi alle jobbet sammen for Statoil tidligere. 4C solutions var en viktig bidragsyter i å snu resultatet i selskapet. Vi kan ikke leve på kun maskinering, vi må ha hele pakken for at vi skal være konkurransedyktige som organisasjon.

Flere ledd som går sammen (vertikal integrasjon) for å levere et klart sluttprodukt til kunden.

2. Vi hadde tidligere en avdeling med prosjektledere som kjøpte inn varer, lagde produktstruktur, rapporterte til kunder etc. Vi gjorde en verdistrømsanalyse og så at dette var en flaskehals, dette var på en måte et selskap innad i selskapet. De med tyngst fagkunnskap jobber i tilbuds avdelingen. Vi har en liten komite av ledere som sjekker hvilke tilbud vi får inn og siler de ut slik at vi bruker tiden på de tilbudene vi kan være suksessfulle på. Denne komiteen av ledere sender så videre jobbene til tilbud avdelingen som skal jobbe med å fullføre det. Vi strukturerte slik at salgs og markedssjef har en konkret jobb på det som går utenfor selskapet. COO/CTO har

ansvaret fra forespørselen kommer inn til ordren er registrert i systemet. Så overtar Morten som er produksjonsdirektør, han har ansvar fra ordren er registrert til levering. Tydelig ansvarsforhold, og da ble det fagekspertes som tok ansvar for jobbene. Færre hender som tar tak i jobbene og er mer spesialiserte, bedre flyt og gjennomføringsevne i organisasjonen. Dette endte opp med at vi satt med 4 prosjektledere istedenfor de 11 originale. Mer effektivisering, blant annet 1 prosjektleder på dokumentkontroll kontra 6 som satt tidligere. (Veldig lønnsomt)

3. I verkstedet har det vært mye forbedringer med en punkts leksjoner, avviksbehandling på A3 har vært viktig, redusere antall avvik har bidratt sterkt på resultatet. Lært opp operatører som har tatt mer eierskap til jobben selv. Ikke bare spesialisering men også generalisering slik at vi også bli fleksible og kan flytte arbeidskraft til hvor skoen trykker. Dersom jeg skulle hatt ansvar for alle forbedringspotensialene hadde jeg ikke hatt tid. Det å gi arbeiderne tillit og gi dem rammer for hva de kan endre på gir en helt annen gjennomføringskraft på slike innovasjoner. Viktig å få det fulle potensialet ut av de ansatte, men dette krever en åpen og innovativ kultur i selskapet og ikke en fryktkultur. Viktig å ha aksept for at de ansatte kan komme med problemene sine slik at vi kan hjelpe dem med å løse det.

1. HMS
2. Kvalitet
3. Levering
4. Kost

Vi ønsker langsiktige samarbeid og tenker på ansatte når vi gjør jobben vår.

How did you go forward to search for these improvement opportunities?

Det kommer veldig ann på. Kunden kommer ikke og bestiller, hva gjør vi da? Vi hadde et strategimøte hvor vi hadde en idemyldring og det er en måte å gjøre det på. En annen måte å gjøre det på er delegert, vi jobber med de problemene vi har i hverdagen og slik finner vi problemer vi kan løse. Vi må se hvor vi ikke er leveringsdyktige og hva skal vi gjøre for å møte disse kravene? Forbedringene vi skal finne kan komme fra alle mulige hold, men mye fra kunden på hva de krever og hvordan vi skal møte disse kravene.

In what way has these new processes been value creating?

Det åpenbare og direkte er at lønnsomheten har økt. Verdiskapning pr. ansatt har gått fra en takt på 1.400.000 i omsetning pr ansatt i 2016 til 1.600.000 pr ansatt i 2017. Økt verdiskapning pr. ansatt med 200.000 ila 2017. Ikke verdiskapende aktiviteter for kunden, men som kan være verdiskapende for selskapet? Trivsel på jobb via klimamålinger med positive tilbakemeldinger på at ansatte trives. Informasjonsmøte som holder de ansatte informert av hvordan det går i organisasjonen med åpne fora hvor de ansatte kan ta opp det de ønsker. Tavlemøte hver dag som tilrettelegges i alle avdelinger der vi etterspør at de ansatte sier ifra dersom det er noe som ikke er riktig i selskapet.

Det er helt klart at resultatforbedring er via prosessinnovasjon og lean. Produktmiks har bidratt sterkt på resultatet. Bedre produktivitet og mindre ansatte, mer effektive ansatte. Mer verdiskapning pr. ansatt direkte for kunden, mindre sending av papirer rundt. Verdistrømsanalyse for hvilke input/output som skal komme fra hvert ledd.

In what way does each change get evaluated after they have been implemented?

De fleste endringer blir fortløpende evaluert. Styremøte evaluerer de store endringene, store linjene. Ledermøtet evaluerer driftssystemet hver uke. I verkstedet på 24 timers tavlene evalueres dette hver dag. De som jobber med maskinering evaluerer sine forbedringer, innovasjoner hver dag og sier ifra dersom det er noe som ikke er som det skal. Under stadig evaluering på flere områder. Skreller løken lag for lag, tar de lavthengende fruktene først og jobber seg oppover.

Have you had any resistance when trying to change processes within the company?

Selvfølgelig har vi hatt motstand i implementering av nye prosesser. Sikret meg styrets fulle og entydige støtte før jeg gikk inn i jobben slik at det var en gjennomgående aksept for hva som skulle skje. De som sitter i ledergruppen må være lojale til hva vi driver på med og stå i stormen, de som ikke ville være med kunne ikke være med. Det å få med seg styret og ledergruppen var viktig ettersom det gir en helt annen gjennomføringskraft på hva som skal implementeres. De tillitsvalgte var også med på denne prosessen.

Benchmarking og inspirasjon fra andre selskaper?

Når jeg startet med lean i 2008 for første gang, meldte meg opp og tok et kurs i leanledelse, var etter jeg hadde hørt om Hydro Karmøy og andre som drev med lean og hadde gode resultater. Dette var en inspirasjon ettersom dette så ut til å virke.

Radical or incremental innovation?

For dette selskapet var det en radikal endring å implementere lean tankegang og drive med prosessinnovasjon. Senere har det blitt mer til en inkrementell måte å jobbe på. Det kan sees på som et sjokk innad i organisasjonen. Mer rettet mot kaizen og continuous improvement etter at kulturen var satt.

Interview lean coordinator 16/04-2018

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du vært en del av selskapet?

Q2: Hvorfor valgte dere å innføre en lean i Malm Orstad?

Q3: Hvilke endringer har bedriften opplevd etter at lean ble implementert?

Mitt navn er Petter Olsen, jeg er lean koordinator. Jeg starter her i 2014 på innkjøp, så begynte nedgangstidene og jeg ble permittert i 6 måneder. Så kom Lauritz høsten 2015, og ble ansatt som lean koordinator i 2016. Dette var egentlig ikke så veldig nytt for meg fordi jeg hadde jobbet i et lite selskap som hele tiden drev med mye prototypearbeid og nytenkning og det var ikke så veldig mye forskjell fra det.

Vi begynte ute i produksjonen med å rydde, fikk enormt mange spørsmål som “dette gir oss ingen verdiskapning. Dette er bare tull, det kommer ikke noe penger på bunnlinen”. Da måtte vi begrunne litt og si litt om hva vi hadde gjort de siste årene og at vi hadde gått veldig mye i minus, og var nødt til å gjøre en endring. Vi måtte begynne å få verktøy og lignende på plass slik at det lå på en fast lokasjon. Da var jeg veldig bevisst på at vi lyttet til det ansatte og hvordan de vil ha det. “Hvordan vil dere ha det? Diskuter sammen så skal jeg hjelpe til med å ordne hjelpemidler og tavler og lignende”. Så begynte de å gå i gang, og det er fortsatt mange skeptikere til dette.

Etter de hadde drevet med dette en stund begynte de plutselig å jobbe igjen og fant ut at det var greit at verktøyet hadde en fast lokasjon. At du slapp å springe etter arbeidsredskapene. De begynte å forstå at når du hørte ordet lean var ikke meningen at du skulle springe mer og jobbe mer, de er litt redde for slike ting. Så sier jeg, “det gjelder egentlig å jobbe litt smartere, å ha alt av hjelpemidler tilgjengelig rundt dere”. Så smittet det litt over på forskjellige plasser. Så begynte de å se litt gevinsten med at alt verktøyet som vi trenger beholder vi, så sorterer de ut hva de trenger og ikke. Det viste seg at det var 5-6 sett av alt og da fikk vi kassert det som var utslitt.

Etter det så startet vi litt over i CNC maskinene. De har også tavler og verktøy de trenger. Vi oppdaget litt at de var nødt til å lete etter dette og låne av hverandre. Vi fikset at alle hadde

tilgjengelig utstyr. Nå ser jeg at jeg har hoppet litt i tidslinjen her. Du ser når du kommer inn og nesten er konkurs, silk vi var, var det litt enklere for meg å si at nå har vi prøvd dette og gått i dundrende minus. Det var litt enklere for meg å komme inn i rollen som lean koordinator når det gikk dårlig med selskapet. Jeg tror det er vanskeligere hvis du er i en bedrift som alltid har tjent godt med penger. Da fungerer det vi gjør, hvorfor skal vi endre?

Det har vært positivt for oss med mer orden og system, og at alt har en fast lokasjon. Litt bilder på skap osv er også oversiktlig og greit.

Ellers er det en gammel bedrift, du har kultur og atferd som måtte endres. Måten å tenke på. Dele kunnskapen med andre for å lage en ett punkts leksjon f. eks. Dette så de ikke poenget med og svaret var f.eks. jeg kan jo dette. Denne personen jobber gjerne offshore eller har ferie, hva skjer da hvis noen andre skal gjøre det som ikke kan det? Vi var enormt personavhengige. Vi begynte så smått og lage ettpunkts leksjoner. En av de største motstanderene av dette, fikk i oppgave å skru på en kompressor. Han gikk for å løse oppgaven og fant kompressoren, men vet ikke hva han skal gjøre for å starte opp. Vi hadde laget en ett punkts leksjon som han kunne følge og i løpet av 2 minutter hadde han startet den opp og vi kunne begynne å produsere. Dette var en arbeider som var snakkesalig og spredde informasjon rundt seg og i løpet av en halv time visste alle at det var en ett punkts leksjon for hvordan å starte en kompressor. Da kom litt av forståelsen for hvorfor dette var bra, men så ble de omvendt positivt. Et annet eksempel er at vi kan gi lærlingene tid til å studere leksjonene istedenfor å bruke så mye tid på dem på enkle oppgaver. Hensikten er å utvikle leksjonene over tid.

Oppfølging: Var det mye motstand til lean innføring?

Q9: Hva var de største utfordringene dere støtte på under introduksjonen av lean i selskapet?

Vi er over 100 ansatte og var en stor bedrift. Vi hadde mange tvilere og mange som ikke ville komme med forslag osv. Det viste seg at tidligere hadde det kommet inn forslag til forbedringer mange ganger og at ingenting skjedde. Nå var det opp til meg å prøve å de ansatte til å forstå at nå skal dette virke og alle skal dra lasset sammen. Når de så at forslag gikk igjennom og at dette ble tatt på alvor endret de litt på synet sitt. Dette krever at du har en person som tar litt fatt i det og lager en handlingsplan og følger dette tett opp helt til det er gjennomført.

Q4 Oppfølging: Hvordan var det å jobbe her før og etter lean? Du fikk en ny stilling, vil du fortelle om arbeidsoppgaver?

Vi har i oppgave å rapportere nedetid på maskinene. Jo mer nedetid jo mindre produksjon. Når det er nedetid får vi opplysninger om dette, og får konkrete tall på hvor mye tid dette er. Da kan vi begynne å jobbe med å redusere nedetiden. Dette har vi jobbet mye med. Vi har 24 punkter med CNC maskinene som arbeiderne kan rapportere inn. Det blir rapportert hver uke, og jeg rapporterer til ledergruppen. Dette blir rapportert på formannskontoret på en tavle. Jeg rapporterer til produksjonssjefen. Ellers er det jeg og han som diskuterer hva vi skal jobbe med, har vi hatt utfordringer må vi gripe fatt i det og forstå hva som var utfordringen. Vi må snakke med de som har gjort jobben og spør om vi ville gjort noe annerledes eller likt.

Oppfølgingsspørsmål: Er det du som sier ifra hvis noe blir oppdatert?

Jeg har prøvd bevisst på å prøve å få de ansattes mening på hva forbedringen kan være. De ansatte på gulvet og stemmen blir hørt. Vi spiller ballen tilbake og dette skaper engasjement, og dette var de ikke vant til tidligere. Åpenheten og utførelsen i forbedringsarbeid er blitt veldig mye bedre. Du skaper mye ved å høre med dem hvordan de selv ville gjøre det.

Q8 Oppfølgingsspørsmål: Hva tror du den viktigste faktoren for at lean har fungert her?

En daglig leder som kommer inn og er veldig lyttende. Han har klart å skape et engasjement. Han har delt mye av erfaringen sin fra arbeidslivet og det har nok smittet på veldig mange mellomledere. Han stiller mer krav enn det som er gjort tidligere. Når du har jobbet i oljeindustrien før så vet du at selskapet har tjent mye penger. Med en gang nedgangstidene kommer er det vanskelig. Jeg føler han har bidratt til at det er slik det er pr dags dato. Han har laget en visjon og verdier sammen med eiere og styret. Vi har brukt dette aktivt mot alle ansatte. Vi har fått bedre informasjonsflyt. Vi starter sammen i mekanisk avdeling og han får inn alle henvendelser fra operatørene om hva som mangler. Det har vært mye bedre samarbeid mellom mekanisk avdeling og CNC. Informasjonsflyten har blitt enormt mye bedre. Jeg og Morten har et møte fra kvart på 9 til 9 og går igjennom utfordringer i CNC avdelingen, mekanisk, sveis, QC, planlegging og eksterne tjenester. Vi går igjennom dette og bringer dette videre til ordrebehandlere når klokken er kvart over 9. I løpet av et par timer så er informasjonen kommet ut til alle som trenger den.

Oppfølgingsspørsmål: Er dette en rutine?

Ja, dette er en rutine.

Morgenmøte i mekanisk avdeling kan ta alt fra 3-15 minutter. Sykefraværet kommer frem og vi kan prioritere hva vi skal jobbe med. Vi har også fått bedre informasjon om hva som skal leveres når og hva vi skal jobbe med. Vi jobber nok mer strukturert på de riktige tingene.

Oppfølging: Du touchet på kultur, tror du en endring i denne har spilt en rolle ved implementering av lean?

Jeg tror at når de ser at forslag som kommer opp blir gjennomført og at det skjer en endring at de ser gevinsten. Noen ser gevinsten tidligere enn andre. Så tror jeg åpenhet og informasjonsflyt bidrar til større trivsel. Lytte til de ansatte, av og til stopper jeg opp og spør hvordan de har det og “luffer stemningen” og om de trives på jobb. Dette får jeg tilbakemelding på om at de setter pris på.

Oppfølging: Dette er noe vi er interessert i å måle men det er veldig vanskelig å måle.

Åpenhet i hele selskapet og at det har åpnet seg og at det er bedre informasjonsflyt er viktig. Det at vi vet hva vi skal gjøre fra ordren er kommet inn til den er levert er bra. Vi jobber mye mer strukturert. Min oppgave er å følge forbedringsforslag som kommer inn og følge opp at dette blir utført. Prøve å motivere de ansatte og bidra til god kultur og atferd. Prøve å se andre måter å utføre ting på som jeg selv ser. Da prøver jeg å utfordre dem til “er dette den beste måten å gjøre jobben på”? Da prøver jeg å styre de mot at de finner løsningen selv og at jeg ikke tar æren for noe.

Q5 Oppfølging: Hvordan prioriterer dere forslag til forbedringer?

Det som kommer ann på er hva er enkelt å fikse? Dette prøver vi å få utført med en gang. Da ser de at det er bare til å ta tak i forbedringen og utføre den. Det som gir oss mest tilbake i verdiskapning er også viktig å prioritere dette, finne de viktigste tingene. Tid og penger er viktig.

I hvilken grad tror du at implementering av lean har bidratt til at det har snudd fra negativ trend til positiv? Tror du det bare er lean eller er det også andre faktorer?

Jeg tror at det at vi har satt ting i system er mye av årsaken. At vi jobber bedre sammen som team har også en stor del å si. De lean verktøyene vi har brukt har også betydning. Prisene er

stort sett det samme som i 2016. Gjerne litt på hvilke ordrer vi tar inn, men her har vi blitt flinkere på prising og hva vi tar inn. De andre i selskapet har nok også fått et løft fra lean metodikken. Forespørslene blir grundigere gjennomgått enn hva de ble for et par år tilbake.

Har det skjedd endringer i andre organisasjoner?

Flere har måttet slutte. Flere personer gjør flere ting. Jeg kan godt lage til eller kjøpe inn utstyr selv om jeg ikke jobber med innkjøp. En vaktmester hadde noe angående deklarerer av olje og slikt i retur, da lager jeg disse. Er det noe fra drift på bygget vi trenger elektriker til så skriver jeg dette og lager en liste for elektriker på hva vi har fått henvendelse om å fikse. Det er slik på grunn av at det er mindre folk.

Oppfølging: Vi ser at varekost er ned, dette har vel noe med at dere produserer kun det som går ut?

Dette er riktig, vi produserer ikke så mye til lager. Jeg er litt uenig med lean filosofien om at varer på lager ikke skaper verdi. Der jeg jobbet før produserte vi veldig mye til lager. Vi visste at dette var standardprodukter som ville gå. Vi hadde raskere omstilling til å levere utstyr på en dag. Dette hadde vært kostbart og ikke ha på hyllen. Ofte godt betalte jobber på hast. Her er jeg litt imot lean filosofi om at du ikke skal ha varer på lager.

Jeg tror at alle de forbedringene vi har gjort så jobber vi på en smartere måte. At vi jobber på de rette produktene til rett tid. Produktmiksen er ikke endret, det er mye offshore utstyr som det alltid har vært. Ett punkts leksjonene er absolutt bra for å spare tid. Det er ikke tvil om det. At det er delegert ansvarsområde slik at det er klart hvem som har ansvar for hva.

En enkel oppgave var å sette trucken på lading, når har vi faste personer som sjekker trucken til enhver tid. Når har vi nesten aldri gått uten drivstoff eller hatt hendelse hvor trucken ikke har vært i stand.

Q6: Tror du lean bidrar til innovasjon?

Jeg tror det er veldig viktig å ha en person som går rundt og stiller spørsmål som får de ansatte til å tenke. Selv om vi har gjort noe i tre år betyr det ikke at vi er ferdig utlært. Kanskje vi kan gjør noe på en annen måte, mer effektivt eller enklere. Hvis noen spør meg så

kommer jeg med forslag på at du kan gjør ting på forskjellige måter. Jeg følger opp og hører med de om det er gjort noe. Du får de til å tenke og prøve å gjøre ting annerledes enn før.

Q 9: Hva var den største utfordringen når dere begynte med lean?

Folk visste ikke hva dette var. Dette var noe nytt, når det er noe nytt kommer det en frykt inn. De så ikke helheten slik vi nevnte og de forstod ikke verdiskapningen og den langsiktige planen. Vi måtte bruke en del tid på enkeltpersoner for å få de til å endre syn på dette. Det hjelper jo selvfølgelig når regnskapet går bedre og bedre for hver måned, og da ser de at dette hjelper.

Oppsummering:

Q1: Min rolle er at jeg skal være med å tenke nytt og motivere ansatte til å endre kultur og atferd som har vært. Jeg skal prøve å følge opp forbedringsarbeidet. Jeg har et ansvar for at de ansatte trives på jobb. Jeg har et ansvar om at jeg må bygge opp tillit slik at alle ansatte har tillit til meg. Dette må bygges over tid.

Q2: Eierne ville ha ny leder. Han hadde jobbet med lean i mange år hos øglend system. Han mente at dette var det rette valget selv om det var mot oljeindustrien. Styret og eierne støtter dette fullt ut.

Q3: Bedre informasjonsflyt og åpnere mellom avdelinger. De ansatte har tatt større ansvar og eierskap.

Q4: Det er, igjen, utfordring om dette er optimale løsningen på en oppgave. Stoppe opp og tenke.

Q5: De enkle tingene gjelder å ta så fort som mulig. Se på hva som gir mest verdiskapning.

Q6: Innovasjon og lean har vi snakket om.

Q7: Åpenhet, informasjonsflyt, kommunikasjon, respekt for hverandre og arbeidsoppgavene vi har. Veldig høy takhøyde hos daglig leder.

Interview production manager 06/04-2018

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du vært en del av selskapet?

Min rolle i selskapet er CPO, eller produksjonssjef. Jeg har vært i selskapet i 20-25 år. Min dag til dag jobb er å sørge for at organisasjonen fungerer, at vi har alt det vi trenger av system rundt, samt tar avgjørelser om en del ting rundt, hvis ting ikke fungerer. Sørger for at vi har tilstrekkelig med kapasitet til enhver tid, samt coache formenn og andre mellomledere (som Petter).

Q2: Hvorfor valgte dere å innføre en lean i Malm Orstad?

Det som skjedde for noen år siden var at ting begynte å gå i motbakke, vi drev å gjorde mange forbedringer, men det førte aldri til at vi fikk fart på ting igjen. Jeg holdt på å ville innføre lean i 2009/10 (ca), hvor jeg hadde gjort mye jobb, vært på foredrag, hatt workshop med konsulenter og vi var enige om at det var lurt å kjøre i gang, men så stagnerte det litt internt.

Jeg fikk beskjed om at produksjonen kunne kjøre det i gang alene for å se hvordan det gikk. Da ble vi enige om at det kunne vi bare glemme, vi hadde ikke support fra toppen og organisasjonen rundt oss hadde ikke samme intensjon som produksjonen og det ville aldri funke. Enten måtte alle være med, eller ingen. Da ble ingen med og det ble borte en stund før det ble snakk om det igjen.

Da begynte vi å se etter en leder som kunne drive lean. Da dukket Lauritz opp. For å svare helt ærlig på spørsmålet ble lean innført fordi jeg hadde lyst til å ha Lauritz som sjef. Jeg kjente til han før han begynte her og visste at han kunne det fra før.

Q3: Hvilke endringer har bedriften opplevd etter at lean ble implementert?

De endringene som er størst for min del er at vi begynte å måle produksjonseffektiviteten og satte opp grafer som ga oss litt informasjon, om de ikke alltid var helt nøyaktig fortalte de oss noe. Vi begynte å måle leveringsdyktigheten og endret litt tankegang og satte fokus på å jage flyt, ikke kost. Det er de største endringene.

Vi begynte også å rydde på verkstedet og målte på hver enkelt maskin. Så begynte vi med tavlemøte i produksjon, hvor vi har resultat fra alle målingene hver dag også ser vi på

utfordringer vi har i hver avdeling og caser som er ongoing. De følges opp hver dag, inntil de er løste. I tillegg er det mer samarbeid på tvers av avdelinger, det ble jo gjennomført en ganske stor organisatorisk endring, spesielt i prosjektsiden, hvor prosjektleder ble ordnet med hvem som gjør hva for å heve kvaliteten for å få bedre kontroll. Nå er det mer orden i dokumenter og ting går riktig plass, det er ikke lenger dobbeltregistrerte artikler.

Før hadde prosjektledere ansvar i et år, det vil si at han legger ting inn i systemet og sørget for å lage alle artikler, da var det ikke alltid de gadd å søke opp for å se om det fantes fra før og vi kunne plutselig sitte med 15 av samme artikler, dette kunne føre til forvirring når innkjøp skulle gjøres og man trengte egentlig bare en artikkel. Dette ble endret for å gjøre det mer strømlinjeformet. Nå er det en mindre gruppe som gjør denne oppgaven og de kan det bedre og er fokuserte og vet hvordan de skal gjøre det, uten å ta snarveier. De blir på en måte spesialister på det. Effektiviteten blir bedre fordi man har bedre takt i det man gjør.

Oppfølging: Noe som går igjen i alle intervjuer er organisering og dokumenter, noe som har vært viktig for alle i selskapet.

Det handler mye om endringer, det handler ikke nødvendigvis om å jobbe raskere, det handler om å ikke gjøre mer enn det man må gjøre. Alle må vite hva man skal gjøre, for da blir det mye lettere. Når man er ferdig med en ting, vet man hvem man skal sende det videre til og da er man ferdig med saken. Det blir mer automatikk og man trenger ikke like mye oppfølging.

Det er fortsatt ikke 100%, er fortsatt rusk i maskineriet, men det blir bedre hele veien. Jeg har vært på noen foredrag og etter at vi hadde holdt på i 6-8 mnd. så der vi diskuterte utfordringer som vi hadde diskutert for noen måneder siden. De som diskuterte dette hadde jobbet med det i 2-3 år, mens vi hadde gjort det på under et år, så vi har hatt en ekstrem gevinst av å ha en toppleder som er såpass dedikert og har sterke meninger om hvordan det skal være. Han har fått teamet til å gjøre det nedover hele systemet på en effektiv måte, noe som har ført til at det har gått utrolig fort.

Det har aldri stått på kompetansen, det har bare ikke vært system på det før, slik at vi ikke har fått det beste ut av folk. Mange har gjort alt for mye jobb, slik at de ikke har fått ut potensialet. Alle kjører en rett vei, istedenfor å kjøre på tvers gjennom hele byen. Alle gjør det de skal, men ikke noe annet.

Q5: Hvordan prioriterer dere hvilke prosesser som skal forbedres?

Det er litt prioritering, litt ut fra hva vi ser er det nærmeste behovet, også noen flaskehalsar som må ryddes bort før vi kan gå videre. Vi gjør også en del målinger, så det kommer opp noen punkter. Pr. i dag har vi ikke hatt en reell gjennomgang der vi har gått inn på hvert punkt, men vi har vært inne på alle punktene så vi har fått med litt hele veien, som kanskje ikke vises så veldig godt. Vi har noen store forbedringspunkter som er utført, som er skrevet litt om og tatt opp på avdelingsmøter, men i utgangspunktet ønsker vi å ta de som er lavest, altså de som er kjappst å få gjennom, bruke krefter på lavhengende frukter. Noen ganger må disse prioriteres vekk for å ta tak i ting som hindrer eventuelle prosesser, slik at disse kan optimaliseres. Jeg tror det kommer til å dukke opp lavhengende frukter kontinuerlig, så det trenger ikke være store ting, men små ting som vi er på jakt etter. Vi er hele tiden på jakt etter forbedringen og det trenger ikke være store ting. Det er ikke det det handler om, hvis alle kommer opp med en forbedring kommer vi lenger enn en stor. Når vi gjør litt hele veien blir det mye til slutt. Vi kan hele tiden komme på noe nytt.

Q6: I hvilken grad tror du lean har vært med på å fremme innovasjon i selskapet?

Fokuset på lean har helt klart bidratt. Fokuset er på forbedringer, det startet litt tregt, men så begynte det å rulle fort, kanskje litt for fort med noe. Det kan diskuteres hva som er en forbedring og hva som ikke er, men greit nok. Mange små forbedringer og et fokus på dette har blitt etterlyst. Folk kan komme med forslag og få det godkjent på dagen, uten at det er oppfølgingsspørsmål. Folk har anledning til å implementere egne forbedringer fortløpende, trenger ikke spørre flere. En ting er å komme med forslag, noen ganger kan flere forslag slås sammen til en stor forbedring men også at det blir prioritert tid til å utføre forbedringer. Viktig å sette av tid til forbedringer. Planlegge tidspunkt, sette av tid og gjennomføre. Da skjønner de ansatte at vi mener alvor, når produksjonen stoppes for å implementere endringer.

Q7: Hvilken/ eller hvilke endringer har vært viktigst for selskapet etter implementeringen av lean?

Det faktum at små ting endres hele veien. Det viktigste er den store organisasjonsendringen, på prosjektleder-siden, og strukturert det på en helt annen måte. Oppsett av tilbud, prising, innkjøp etc. Rammeavtaler er godt i gang. Dette er små forbedringer som sparer tid. Dette er ting som ikke sees så godt, men som gir ganske gode resultater, kontra at du hele tiden må

finne ut hvor du skal kjøpe ting, spørre andre og ender opp med å kjøpe hos noen som er billigere men dårligere til å levere på tiden. Da står du plutselig noen dager med maskinen i stand-by, noe som koster 1000,- kr timen. Sparer du 100-lapper på kjøpet, er dette fortsatt penger tapt.

Det at vi har fått fokus på flyt, helt fra ordren kommer inn til den er ute er den beste forbedringen. Spesialisering og tydelige arbeidsoppgaver har ført til mer trygghet i organisasjonen siden alle vet hva de skal gjøre, kan føre til konflikter og at ting tar tid. Da er det også lettere å se hvem som har gjort feil og lære av dette. Ærlighet er viktig, innrømme når man gjør feil, istedenfor å vri seg unna. Viktig med en kultur hvor det er lov å tabbe seg ut, uten at det blir syting og klaging. Folk må si ifra hva som gikk feil, slik at det kan lokaliseres og forhindre at det gjentar seg. Det er lov å gjøre feil, uten å dekke over det. Denne kulturen er ikke helt gjennomført, men vi er godt på vei.

Q9: Hva var de største utfordringene dere støtte på under introduksjonen av lean i selskapet?

Den største trusselen mot lean er at de som ikke vet nok om det tror at det er noe som kun funker på bilfabrikker. Det er det som er den største trusselen, helt du klarer å vise dem at bilfabrikkene kan ha en type lean, mens vi har vår lean så har man et problem. Når man fjerner denne tankegangen og viser at vi kan bruke det annerledes hos oss kan man diskutere for og imot. Det viktigste er å finne 'sin' lean, og også om man skal kalle det lean. Samme hva man kaller det, det er noe bilfabrikker gjør, men også noe vi kan bruke. Det som har overbevist dem er forklart til gruppen er det lettere. Du er nødt til å ha med en lojal gruppe på det, hvis ikke går det ikke. Man må ha noen til å dra lasset. Man må ha hele organisasjonen med seg. Hadde kanskje med 60% i starten, nå er det kanskje 90%, men de siste vil nok aldri bli med.

Q10: I hvilken grad tror du lean og innovasjon har vært en faktor for deres forbedrede økonomiske resultater?

Tror at det har gradvis blitt bedre, tror ikke det har ansvaret for all forbedringen, men en stor del. En del er fra markedet, produktmiks, prosjekter etc. Så kanskje 60-40. Oljenæringen er ikke på vei opp enda, kanskje litt, men det kommer til å gå opp mot slutten av dette året tror jeg. Nå blir kontraktene delt ut og det går alltid 6-8 mnd. før det genererer noe i markedet.

Transcription COO 13/04/2018

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du vært en del av selskapet?

Min rolle nå er COO / CTO, så jeg er driftsansvarlig og teknisk direktør. Jeg har jobbet i Malm Orstad i 18 år.

Min dag begynner alltid med et møte hvor vi / jeg og salgsleder og produksjonsleder velger hvilke forespørsler vi skal jobbe videre med i tender team. Tender teamet ligger under drift. Så er det tavlemøte R&D og så er det tavlemøte drift. Det starter dagen alltid med.

Kort oppsummert å ta opp status på butikken. Dette varer til kvart over 9 halv 10. Vi har ett møte halv 9, ett møte kvart på 9 og et møte kvart over 9.

Når du jobber med lean/forbedringsarbeid skal du vokte deg veldig for å trekke møtene ut. I går fikk jeg kjeft fordi vi gikk 5 minutter over tiden. Det var en som sa dette var et forbedringsforslag, klar møtene på tiden!

Coache alle i R&D og drift, men også være med salg på teknisk og jobbe med kunder. Innkjøp, jeg har også innkjøpsansvaret også.

Q2: Hvorfor valgte dere å innføre en lean i Malm Orstad?

Det var vel fordi vi innså at vi jobbet veldig tungvint. Vi hadde voldsomt individuell kultur for individuell gjennomføring. Vi var ikke effektive i det vi gjorde. Det var for så vidt effektivt nok en gang i tiden, men vi hadde ikke den veksten vi ønsket.

Du kan ikke endre kulturen først, du må innføre lean før du endrer kulturen. Vi var heldige hvor eiere og styret valgte å ansette Lauritz som er det jeg kaller en lean professor. Når du gjør det får du forankret lean fra toppledernivå og det er vi stolte av. De som ikke har dette, de sliter veldig.

Vi var heldige og Lauritz fikk aksept fra styret om at vi skal innføre dette (lean journ. anmodning) og så tok han for seg ledergruppen som består av produksjonssjef, økonomisjef, HMS og salg og fortalte hva som var gjort og om vi var med på dette. Vi var med og så begynte reisen. Og da begynte vi å jobbe med kultur. Av oss som var her var det svært få, vi

hadde kunnskap om lean og visste hva det var, men vi hadde aldri jobbet med det. Så alle verktøyene som ligger i begrepet lean og filosofien visste vi egentlig ingenting om.

Vi sorterte i verktøykassen og en av de viktigste verktøyene er kultur, og dette er noe av det vi har jobbet mest med i MO. Veldig sterk kultur i en 75 år gammel butikk og det er veldig vanskelig å endre en så sterk kultur. Individuelt sett er det masse småkonger på hver haug. Dette var det første vi startet med.

Q3: Hvilke endringer har bedriften opplevd etter at lean ble implementert?

Vi har helt klart fått bedre effektivitet, bedre samhold og bedre samarbeid. Veldig god lojalitet til systemer som vi har, den enkelte inklusive oss i ledergruppen er bedre lagspillere som jobber på lag med teamet. Vi har fått mye ut av det. Vi har fått veldig mye ut av det. Vi får mye mer gjennom i dag enn da vi begynte på det.

Oppfølging: Du nevnte litt om lojalitet og høyere lojalitet, hva tror du grunnen for dette er?

Ett av de viktigste prinsippene i lean er å gi makten til folket, det vil si at fagmannen får gå og si hva som er mest effektiv måte å gjøre ting på. Når enkelte får lov å være med og bli involvert skaper dette umiddelbart lojalitet.

Q4: Hvordan skiller disse arbeidsmetodene fra tiden før lean ble introdusert?

Dagen min i dag er annerledes, nå gjør jeg det en leder skal gjøre. Coacher og motiverer. Tidligere var jeg brannslukker, ryddet opp. Istedenfor å coache og motivere så ryddet jeg opp etter dem. Et veldig godt eksempel på dette er prising. Tidligere så priste salg selv, de er ikke fagfolk, men selgere. Selgere vil jo ha mest mulig og går ned i pris. I dag er det fagfolk som priser, salg har ikke noe med dette å gjøre. De som sitter og priser i dag er folk med CNC og engineering bakgrunn. De priser, det er et godt eksempel på en endring. For mange ble det voldsomt når så mange folk skulle bidra med et tilbud, det er faktisk mye gunstigere å gi rett tilbud, med mindre risk og når jobben kommer er den ordnet in front. Smidig gjennomføring, du kommer i gang momentant med produksjonen.

Oppfølging: Er møtene nye eller har det vært det samme hele tiden?

Vi begynte med tavlemøte ganske så fort. Visualisering er det viktigste verktøyet i lean. Dette er etter at vi begynte med leanarbeidet. Ett av de viktigste punktene i lean er jo visualisering og å gi makten til folket. Visualisering gjør noe med folk. Vi begynte med drift, de hette

engineering før, men nå har vi skilt drift og R&D. Der startet vi. R&D begynte vi med for 2 mnd siden så de er i startfasen. Her må ingeniørene forholde seg til datoer. Dette er de ikke vant med i det hele tatt, så dette er veldig spesielt. Allerede nå har vi resultater, men vi må ta dette gradvis.

Skal du ha et godt tavlemøte krever det at folket møter forberedt. De må ville ha et tavlemøte. Du må gi dem noe og de må føle at det er viktig, da får det effekt. Det jeg har opplevd med R&D, det er jo en kjent sak, i oljeindustrien hører du at ingeniørene aldri blir ferdige. De er litt forsinket. Det som skjer med folk når navnet ditt kommer på tavlen med en dato er at du ikke har lyst å komme den datoen uten å ha levert varen. Du finner en løsning for å levere på tiden. Kanskje du lærer at det du gjør er godt nok, og ikke sitter og forbedrer og forbedrer.

Det må jo kunne brukes, eller så har ikke produktet livets rett.

Vi har et veldig kvalitetsstempel i MO. På godt og vondt, det gjør noe med folk og. Når alle sier at vi leverer beste kvalitet, og kunden ønsker noe enklere, så er det ikke sikkert at ingeniørene klarer levere det som er simpelt og godt nok. Dette er ikke et riktig eksempel nå da, men hvis du tar en kunde som ønsker en skoda så må de få det. De har ikke bedt om en porsche, men en skoda til den prisen, og da må det leveres.

Q5: Hvordan prioriterer dere hvilke prosesser som skal forbedres?

Det er veldig vanskelig å prioritere forbedringer. Dette er fordi at for den enkelte er forbedringen like viktig som det er for den andre. Det er farlig å prioritere en fremfor en annen. Vi prøver å sile og sortere, spesielt i driftsavdelingen, der er vi veldig gode i forbedringsarbeid. R&D jobber jeg med nå, de får ikke være medheng på drift nå lenger. Sist nådde vi målet på antall forbedringer, men R&D har ikke bidratt til en. I år får de ikke være vedheng.

Det vi prøver er å sortere. Mange av forbedringene går ut mot samme hovedpunkt. Vi har masse forbedringer i forhold til prising i systemet. Alt munner egentlig ut i å gjøre kalkylen i systemet, og ikke på et ark ved siden. Da var det mange forbedringer som gikk mot det samme. Som gruppe ble vi enige om hva vi skulle ta for oss og hvem som skulle gjøre det. Etter det kom det opp på aksjonslisten på tavlen. Mange forbedringer går sin gang og vi gjør ikke noe spesielt ut av det, det blir registrert inn etter fullførelse. Andre går vi dypere i.

Vi må aldri glemme hvorfor vi jobber med forbedringer i en lean sammenheng. Det er selvfølgelig for å forbedre oss, men det er også et viktig ord i å få den enkelte ansatte til å ha det tankesettet. Om vi registrerer en forbedring eller ikke så er det viktig at du har det fokuset på hvordan vi kan forbedre oss hele tiden. Når vi som organisasjon har fokus hele tiden så trigger det alle i det daglige livet og dette er hovedmålet.

Selvfølgelig er det bra og logge for statistikken sin del, men det er også for å vise at vi faktisk gjør det. Walk the talk er viktig, hvis du sier noe er du nødt å gjøre det. Hvis ikke stopper alt opp.

Q6: I hvilken grad tror du lean har vært med på å fremme innovasjon i selskapet?

Ja, absolutt. Når vi begynte med lean på ledernivå var det første vi gjorde å ta for oss alle prosessene. Vi gjorde mye innovativt på prosessnivå. Vi har vært innovative på software nivå og data nivå. Jeg har faktisk også IT ansvar, så jeg har jobbet mye med å se at vi har for mange systemer. Hvorfor har vi det, hvorfor prøver vi ikke å gjøre alt i hovedsystemet enn å drive rundt i tilleggsystemer. Vi har vært veldig innovative der og har skrenket inn på hva vi bruker. Så blir ERP systemene bedre, og vi jobber enda med dette. Prosessene er radikalt endret.

I stedet for å ha generelle stillingsinstruksjoner så er nå alle stillinger personlige. Det gjør noe med folk, det er ikke tvil om hva de skal gjøre. Spesialisering og tidligere slet vi med at den enkelte ikke visste, det var en instruks på ingeniører, en på mekanikerene, en på fagmennene og hva er på en måte stillingen? Så fikk vi også ofte at “oppgaven er ikke kommet til meg for det er ikke mitt område”.

Vi har fått enormt med innovativitet innenfor R&D. Når vi jobber med forbedringer og alle mekanikere og operatører får komme med forbedringsforslag, og de blir hørt, så tar det av. “Hvorfor designer vi dette på denne måten, vi kan spare 10 timer i montering / maskinering ved å gjøre det på denne måten etc.”. Det har vært veldig innovativt slik og istedenfor kun prosessinnovativt.

Q7: Hvilken/ eller hvilke endringer har vært viktigst for selskapet etter implementeringen av lean?

Den helt klart viktigste endringen er det kulturelle. Vi gjør mye det samme som vi gjorde før, men det er styrt på en annen måte. Den største endringen er det kulturelle. Det var det viktigste for oss.

Q9: Hva var de største utfordringene dere støtte på under introduksjonen av lean i selskapet?

Ja, motstand er det alltid. Vi kan begynne med å se på oss selv, vi har ikke skiftet noen i ledergruppen, vi har bare en ny øverste leder. For egen del var jeg selvfølgelig skeptisk, hvis du ikke er skeptisk og spørrende så har du ikke noen mening heller. Hvordan vil dette påvirke oss, hvordan vil dette påvirke meg? Sånn tenker man i og om hele organisasjonen. Mange lurte på om de hadde jobb og at lean var å gjøre like mye med halvparten av bemanningen. Det var stor, ikke motstand, men frykt for noe nytt. Jeg synes det gikk veldig godt og fort over. Så er det noen som ikke helt synes dette er helt ok og har helt roen på det.

Det rette spørsmålet til de tvilende er hvilke forslag de har utover slik det er og hva som kunne blitt gjort annerledes. De finner fort ut at de ikke vil gjøre det slik det var, for da hadde vi jo gått under.

Det er ekstrem lojalitet i malm orstad, det er nesten ingen som har sluttet i MO. Det er en samlet gjeng og lojale folk, i den perioden hvor det skulle være en stor endring var stort sett hele gjengen på lønns dugnad. De hadde ikke den gulroten i enden av hva de skulle gjøre, men enda gjorde de en god jobb og det synes jeg er fantastisk. Det er klart at de har lov å være spørrende, og skal være det, og det du får best til innen lean arbeid er de som yter motstand en stund og så snur og ser lyset.

Bare de ser det selv så er de som er spørrende noen som følger med. Hvorfor, fins det ikke andre bedre alternativer? Så ser det at det fungerer og ønsker å lære mer, og da kommer de for fullt. De som var mest i mot lean i sin tid går nå på forbedrings skolen så det er fantastisk.

Q10: I hvilken grad tror du lean og innovasjon har vært en faktor for deres forbedrede økonomiske resultater?

Helt klart lean, og helt klart folket først og fremst med lean som verktøy. Det vil jeg si, jeg vil ikke gi resultatet til lean, det er folket som har brettet opp armene og gjort jobben. Så har de et verktøy i lean som de kan bruke for å jobbe. Vi hadde vært konkurs i dag uten lean.

Interview Teamleader and operator 06/04-2018

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du jobbet her?

Jeg er teamleader for en avdeling på CNC og er tillitsvalgt for CNC og har jobbet her i godt 5 år.

Oppfølging: Var dette før endringen til lean?

Dette var før oljesmellen og endringen over til lean.

Q2: Hva betyr lean for deg?

Lean er noe vi gjør eller en måte vi bruker som mange andre, for å spare inn penger og spise oss litt ettersom tidene har snudd fra som de var. Tidligere så var alle i en komfortsone, den komfortsonen er litt borte. Det bringer forhåpentligvis ting den rette veien, mye er gjort og mye gjenstår. Vi begynte med lean i 2016 ettersom lauritz kom i slutten av 2015.

Q3: Hva tenkte du første gang du fikk høre om satsningen på lean?

Jeg har vært borti lean før. Jeg har erfaring med dette og det er tungt i starten fordi det er mye å ta tak i. Det er mye nytt, men mye av dette er veldig bra. Noen plasser er mer egnet for en kjapp omstilling og er bedre egnet fordi du har et lite spekter av ting du arbeider med, du har f. eks 20 produkter i motsetning til her hvor vi har nærmere 20.000 produkter. Det krever litt mer å få det inn, men det går sin gang.

Q4: Hvordan skiller denne måten å arbeide på i forhold til slik det var før implementeringen av lean?

Du har vært her i 5 år, hvordan er dagen din endret fra slik den var før?

Min dag er ikke kjempe endret fordi jeg er i maskin. Flyten er bedre på informasjon og det er mindre rot i papirene når de kommer til meg.

Oppfølging: Bedre organisert?

Bedre organisert, vi har en lang vei å gå, men det er bedre.

Oppfølging: Vi er interessert i å se på dette ettersom vi intervjuer mange på forskjellige plasser i selskapet så vi ønsker å vite hvordan dette påvirker forskjellig hos forskjellige

ansatte. Slik vi oppfatter det på deg er endringen litt organisatorisk og at det er mer orden i papir og at du vet hvor ting er?

Hvis det kommer dårlig informasjon inn kommer det dårlig informasjon ut. Arbeidet som er gjort før det kommer til meg er bedre og det skal ikke være noen spørsmål når jeg får det som er min jobb. Det skal ikke være slik at jeg må stoppe det jeg gjør og må gå og spør de som har arbeidet før meg om hva de mener med det jeg får. Planen er at dette ikke skal skje, men det er ikke alltid slik selvfølgelig.

Q5: Føler du at du har fått mer ansvar etter implementeringen av lean?

Ja, det føler vel alle tror jeg. Mangen av de forslagene som blir tatt opp som forbedringsideer har blitt implementert. En del av disse forslagene er veldig bra, noen sparer du litt på og andre sparer du mye på. Selve jaget etter forbedringer, og hvor du setter listen der vil være litt forskjellig. Jeg har jobbet offshore og der var listen litt lavere for hva en forbedring er enn det var for meg, det må være noe reelt.

Oppfølging: Du nevnte at det er små og store ting som kan forbedres, hvordan går du frem for å si ifra hvis det er forbedringspotensiale?:

Vi melder direkte til koordinator, mailer eller tar det opp på møtene. Petter får inn forslag til forbedringer og har en liste hvor vi kan registrere forbedringene på.

Oppfølging: Hvor lang tid tar det å få igjennom forbedringer?

Det spørs hva du skal ha gjort. Hvis du skal endre noe stort organisatorisk tar det selvfølgelig lang tid. Hvis du skal endre en liten ting kan du få dette gjort med en gang. Vi kan gjøre endringer selv som vi føler er bedre så lenge det er fornuft i dette. Vi kan ikke bare gå ut og handle for 5 mill i verktøy fordi vi tror dette er bedre, da må det gjennom flere ledd.

Oppfølging: 1334 forbedringer i fjor og 450 så langt i år. Ganske sykt på så kort tidsperiode. Forstår at det er mange som er ganske små.

Ja, jeg ville lagt liste høyere dersom det var jeg som bestemte, men det er det ikke.

Q8: Hvordan har implementeringen blitt kommunisert fra ledelsen til de ansatte?

Oppfølging: Det var altså et møte der det ble presentert?

Ja, det ble presentert for oss også har det vært en del små drypp underveis. Man klarer ikke å lære alt på en dag uansett, men det sklir inn etter hvert.

Oppfølging: Hvordan ble det mottatt av de ansatte?

Noen var helt klart skeptiske. Jeg hadde jo vært borte i det før, men mange synes nok det var litt uvant. Kan være mye papirarbeid i starten, men det går seg som regel til. Det viktigste er jo å trekke ut de faktorene som fungerer på den plassen der du er, hele lean vil jo ikke fungere over alt.

Q9: Hva er din motivasjon for å bidra til en leankultur innad i selskapet?

Man vil jo overleve. Jeg vil jo ha en jobb neste år også. JEg tenker at det er den viktigste motivasjonen for alle som driver med dette. Mer penger i kassen gir jo bedre lønn til oss og sikrere framtidsutsikter. Det er jo klart at dette er noe alle som jobber ønsker seg.

Oppfølging: Det er altså en felles forståelse av at lean vil gjøre selskapet mer konkurransedyktig?

Ja, hvis ikke vi hadde implementert disse endringene tror jeg vi hadde vært ferdige for lenge siden.

Q10: Vil du si at Lean som arbeidsmetodikk har bidratt til flere innovasjoner / forbedringer i måten selskapet jobber på?

Ja, det kommer jo noe nytt hele veien. Vi kutter hjørner og finner nye ting, dette er jo noe vi må fortsette å gjøre. Vi finner jo nye ting hele veien så vi har en pågående jobb kontinuerlig tenker jeg. Foreløpig har jo dette vært med på å forbedre de økonomiske resultatene til selskapet, og vi håper jo at trenden fortsetter, men for øyeblikket er jo hele bransjen litt stresset av Statoil som skal tjene trillioner. Men det er jo sånn det er.

Q11: Er det eventuelle negative sider ved Lean?

Det er ikke noen negative sider sånn sett, men det kan være tungt i starten for mange å omstille seg og du har utfordringer på et eller annet punkt, både med personell og med struktur i firma, men det meste ordner seg over tid.

Oppfølging: Men du føler at alle i selskapet er om bord nå?

Ja, mer eller mindre. Noen kommer jo til å være sterkere inne i det enn andre, sånn vil det jo være.

Oppfølging: Er det lettere å utføre oppgaver nå som dere har fått litt erfaring med det?

Selvfølgelig, det går mye bedre etter hvert når du har litt erfaring, men man er jo avhengig av å ha med noen som har gjort det godt før, slik som Lauritz i vårt tilfelle. Hvis ikke du har med en som han kan du bare glemme det for da blir det bare surr. Man må jo alltid begynne på toppen, hvis ikke blir det bare tull.

Intervju CNC Operator 06.04.18

Q1: Hva er din rolle i Malm Orstad og hvor lenge har du jobbet her?

Jeg har jobbet her i snart 5 år og er industrimekaniker. Jeg kom inn rett før oljekrisa i 2014, så jeg fikk med meg et par gode år først. På daglig basis driver jeg med montering av diverse utstyr og trener folk så jeg er litt leder og har kontroll på prosjekter.

Q2: Hva betyr lean for deg?

Sånn som nå ser vi at det er mye positivt med lean, men det er jo selvfølgelig ikke alt jeg er helt enig i alltid og at det kanskje er andre plasser det hadd fungert bedre for det er ikke alt vi lager som er samlebåndsproduksjon og det blir litt prototype utstyr, så det er ikke alltid det lar seg gjøre å effektivisere på samme måte som om du har en serie på 10. Det er bare en måte og gjøre det på og du har ikke gjort det før, aldri laget det før så da er det av og til nødvendig med prøving og feiling.

Q3: Hva tenkte du første gang du fikk høre om satsningen på lean?

Jeg syntes det hørt fornuftig ut. Fikk både positivt og negativt inntrykk, man forstår jo ikke helt med en gang hva det dreier seg om, men førsteinntrykket var at det virket som samlebåndsproduksjon og ble ikke helt imponert. Senere, når jeg forstår mer hva det gikk i, og at det ikke bare var at folk skulle stå på en rekke å skru sammen ting virket det bedre.

Q4: Hvordan skiller denne måten å arbeide på i forhold til slik det var før implementeringen av lean?

Man tenker mer på hvordan man kan gjøre ting raskere, det gjorde man jo før også, men nå er man mer bevisst på det og skriver det ned. Vi skriver ned ting vi kan gjøre annerledes også blir det lagt fram slik at alle får det med seg. Det skrives opp på en tavle i halen, så rapporterer formann inn også går det til Petter (leankoordinator)

Q5: Føler du at du har fått mer ansvar etter implementeringen av lean?

Ja, vi har jo fått tildelt større ansvarsområde, sånn at man har et bestemt område man må passe på at alt er i orden i og slike ting. Når vi kommer med forslag blir det stort sett alltid implementert.

Q6: Hva er den viktigste effekten ved innføring av Lean på arbeidsplassen? Hvordan har dette påvirket ditt arbeidsområde?

Det er at du alltid har verktøy og alt mer tilgjengelig, samt 5S og at ting er litt mer organisert, noe det ikke var tidligere. Du trenger ikke lenger gå rundt og lete etter ting og folk har mer fokus på at ting skal være på rett plass. Dette frigjør mer tid til å jobbe med det som faktisk er arbeidsoppgavene våre.

Q8: Hvordan har implementeringen blitt kommunisert fra ledelsen til de ansatte?

Det har kommet litt etter litt, så fikk vi jo tatt en skikkelig overhaling i den perioden det var lite å gjøre, så da hadde vi god tid til å få orden på sakene, dette var i andre halvdel av 2016 da vi startet skikkelig. Det gikk en stund fra det ble startet til vi kom skikkelig i gang. Det er en gående prosess og noe som forbedrer seg over tid.

Q9: Hva er din motivasjon for å bidra til en leankultur innad i selskapet?

Det er jo å holde selskapet gående. Motiverende å ha en jobb å komme til i morgen også.

Q10: Vil du si at Lean som arbeidsmetodikk har bidratt til flere innovasjoner / forbedringer i måten selskapet jobber på?

Det er det nok på noen punkter. Vi har slike ett punkts leksjoner som bidrar til læring.

Q11: Er det eventuelle negative sider ved Lean?

Mye er jo litt vagt med hva som er en forbedring. Er det at man rydder et verktøyskap, noe man egentlig burde hatt som standard, så mener jo jeg at det er sunn fornuft at det burde være slik uansett. Det er jo mye av dette som burde vært implementert fra begynnelsen. På den andre siden er det jo positivt at vi har fått fokus på dette gjennom lean.