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Customer perspective of the Order-to-delivery process in company x

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Company X is a global company with worldwide operations. This thesis is part of a larger project of developing a lean order-to-delivery process in this company. The objective of the development work is to improve the performance of the delivery and production processes so that the expectations of the end customers are met.

The decision of analysing the whole order-to-delivery process comes after the company wide implementation of lean principles, one of the main effects that this implementation had was to bring out operational challenges that were once hidden by the excess safety stock levels.

In a global company such as Company X, communication and running of integrated processes with suppliers and customers is often challenging. Operating in different countries means that a wide variety of needs and expectations has to be fulfilled in order to satisfy the customers.

In this thesis the target was to analyse and develop the order-to-delivery process of the company and focus on the communication and operations with the daughter company in Italy. Information about customer needs and expectations was gathered and performance KPIs used by both the factory and sales unit were analysed. The target of this thesis was to identify the key phases in the order-to-delivery process. Data from the company X´s ERP- systems has been analysed with quantitative research methods. Interviews to subject matter experts were qualitative methods used in this research.

The findings of this study were that there are some discrepancies between customer expectations and factory promises. These are mainly due to fluctuating demand and the general availability of the factory. Ongoing changes in stock keeping as well as global procurement of resources are also some of the root causes of the findings.

More detailed points of actions needed were suggested to company X and will be analysed deeper in other further studies related to the wider project of the company X.

Keywords	Lean, KPI, JIT, OTD

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Glossary

Consolidation: Is the act of combining cargo from different orders into one shipment.

DAP: Delivery At Place incoterm used between Factory and Italy LSU. Under this incoterm the seller arranges the transport to the place defined in the sales contract. The risk is transferred from the seller to the buyer once the goods are delivered at destination. (Ramberg, 2011)

E tube: Automatic system that handles the orders when there is no particular condition applying to it, requiring manual handling.

End Customer: Customer to whom the goods are delivered.

End User: End customer that installs and uses the goods.

Incoterms: international terms of delivery used to identify who bares risks and responsibilities of the various aspects of deliveries, such as transport arrangement, cost, insurance, risk, etc. (Ramberg, 2011)

Informed Order: Order that had been placed ahead of time (usually with a wished date longer than 5 weeks from order creation)

KPI: Key Performance Indicator, type of performance measurement used to evaluate a particular function or activity.

LSU: Local Sales Unit, in this research refers to Company X's Italian sales unit as they are the ones responsible for sales and customer relations with end users of our products and services.

OTD: On Time Delivery, measure used for tracking the timeliness of our deliveries. In this document we will use this measure to track if the orders have been delivered according to the promised delivery date.

Working Day: Business days, does not include Finnish public holidays or weekends

1 Introduction

1.1 Company X and scope of research

Company X is a global company with worldwide operations. This thesis is part of a larger project of developing a lean order-to-delivery process in this company. The objective of the development work is to improve the performance of the delivery and production processes so that the expectations of the end customers are met. The author of this thesis is working for the company and therefore was commissioned this research.

Altogether four students including the author of this thesis were given the task to analyse and revise the whole order-to-delivery process of company X. Each student had a different focus and scope in their research. The four subprojects formed a full analysis of the order-to-delivery process in company X highlighting points of actions and quantifying known criticalities to then offer possible solutions that management could implement to improve overall performance.

The focus in this thesis was to look at company X's performance from a customer perspective and compare them to the industry standards and customer expectations. The Findings of this research will serve as a source of critical information needed in the research done by other three students in their subprojects.

In a global company like company X, the factory cannot handle worldwide sales on each local market but relies on the expertise and knowledge of local sales units (LSU) of the same Group. These LSUs have the responsibility to contact new potential customers and to maintain relationships with existing customers trying to meet their needs and trying to provide technical support when needed. The factory, which is located in Finland, has to provide as much support as possible to the LSUs so that they can offer the best level of service to the end-customers. State- of- the art products as well as timeliness of deliveries and efficient technical services are the main services that the factory has to provide to LSUs.

Having divided the order-to-delivery process into 4 subprojects each student focuses on researching a specific aspect of the process: customer perspective, forecasting and material availability, production and material allocation, freight forwarding and delivery issues.

The purpose of this thesis was to analyze the differences between what has been promised to the end customers by Local Sales Unit and what actually has been delivered. Following the process the second student will focus on forecasting and components availability. The focus in this research is on orders of big value and volume and how they affect the availability of the products in general. The third student's focus is to look more in depth on how the production system of the company impacts the availability and what are the actions needed to improve production. The fourth student is looking at issues connected to transportation and his focus is to suggest more efficient deliveries both economically and in regard of improving the timeliness of deliveries.

1.2 Objectives, methodology, criticism and limitations

As can be seen all these separate research projects support the main goal of a leaner order-to-delivery-process in company X. In this thesis, the main focus is on availability of goods, timeliness of deliveries and co-operation between the factory and the LSU in Italy and the end customers of the LSU. The overall target of this thesis is to provide a better understanding of the whole process and to improve the overall customer experience and level of service.

Italy was chosen to be the target market of the case study for this thesis because it is one of the most significant markets for company X both in composition of customers and size of the market. LSU in Italy is responsible for sales and good customer relationships with the end customers and partners. In order to provide a better service, a better understanding of the trade agreements and business practices between LSU and end customer was needed.

Company x follows the definition of a "Global company" given by Lynch (2014), where the whole world is treated as one market and with very little or no difference of the

product portfolio in the different countries. The findings of this research can therefore be applied to other sales units in different market areas of company X.

The main research questions to answer were:

- How are orders handled between factory, LSU and end customers?
- What are the expectations of the LSU and the Industry standards in relation to availability and delivery of goods?
- How well is the factory performing in relation to the Industry standard in Italy?
- How well is the factory performing in relation to the expectations of the LSU?

This research was conducted through both quantitative and qualitative methods. First qualitative methods were used both by author's own observations based on the experience gained while working for company x and by conducting interviews with subject matter experts to better understand different internal processes. In a second moment a quantitative research has been done by analysing raw data extracted from the company's ERP system and applying the knowledge gained during the interviews. Data analysis was then used to prove the hypothesis and research questions.

Confidentiality is one of the factors that has imposed some restrictions for this research. The author has delivered a more in depth analysis of the case study with more detailed conclusions and findings to company x. As the original data contained sensitive information the focus of the analysis for this research was shifted from in depth analysis of results to how and why the analysis was made. Sources of information have been reliable as everyone interviewed had an interest in better understanding the whole process and the causes of some of the issues. The quantitative information gathered from the ERP system has been reliable but quite difficult to analyse as an in-depth knowledge of ordering details was needed to do the appropriate calculations and assumptions. The product portfolio of company x contains a wide variety of products that have different availability and are in different points of their lifecycles. Knowledge of all of these details had to be gathered before any analysis could be made. The results of the research are useful for company's x development. There is a risk for the data to become quickly obsolete because of the timeframe analysed. This is why the focus has been on highlighting the more systematic problems that emerged from KPI analysis on

the whole timeframe analysed more than on the single events causing shifts in availability or timeliness of delivery.

1.3 Italy as a Market area

When an analysis of the Italian market for this company was conducted, it was important to identify the different segments catered. Since there was need to analyse different needs and wants of different customer groups, segmentation by benefits was used. (Fifield, 1992) Customers can be grouped into different segments by identifying the different needs that different customers have. This grouping was done by analysing the sales data provided by company X. As a result, five main groups of customers, shown in figure 1, were identified.

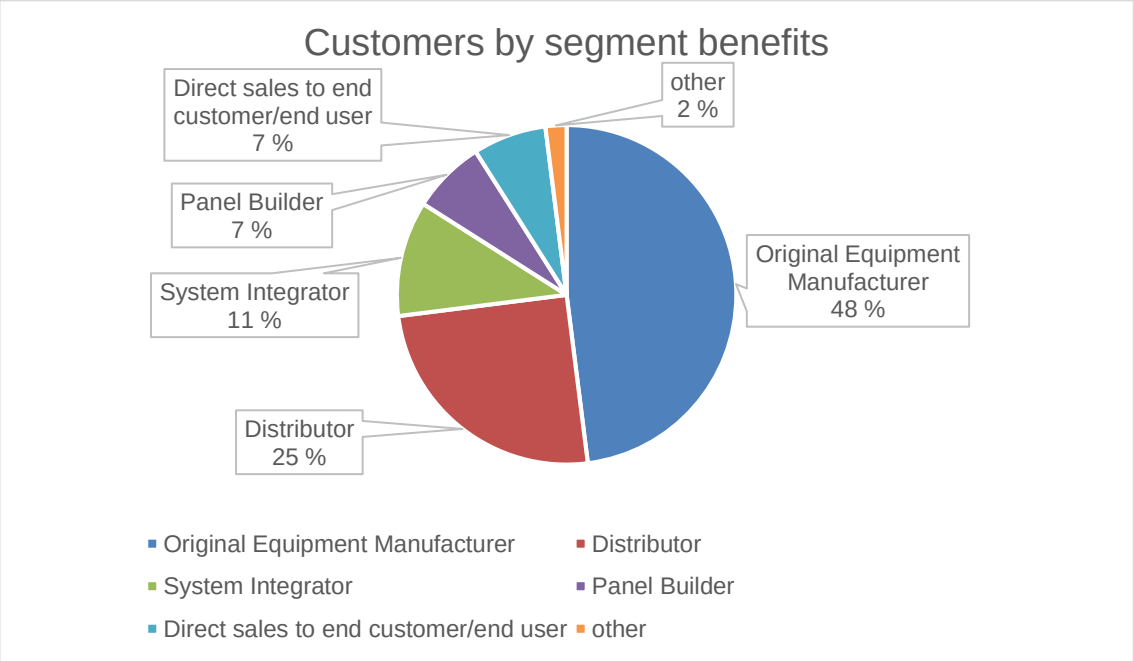

Figure 1 Market composition by segments In Italy? (Company X, 2017)

As we can see in Figure 1, two main customer groups that altogether make up to 73% of total customers can be identified. This data is relevant in order to understand Italy as a customer better. Other countries have a different mix of customers to which they offer services.

Since the interaction and communication takes place between two different cultures, Finnish and Italian, understanding the differences between them will help the further analysis and understanding of the challenges in the order-to-delivery process. Based on the research and analysis tool by Geert Hofstede (2017) there are six main aspects that are important to understand this. These aspects are shown in figure 2.

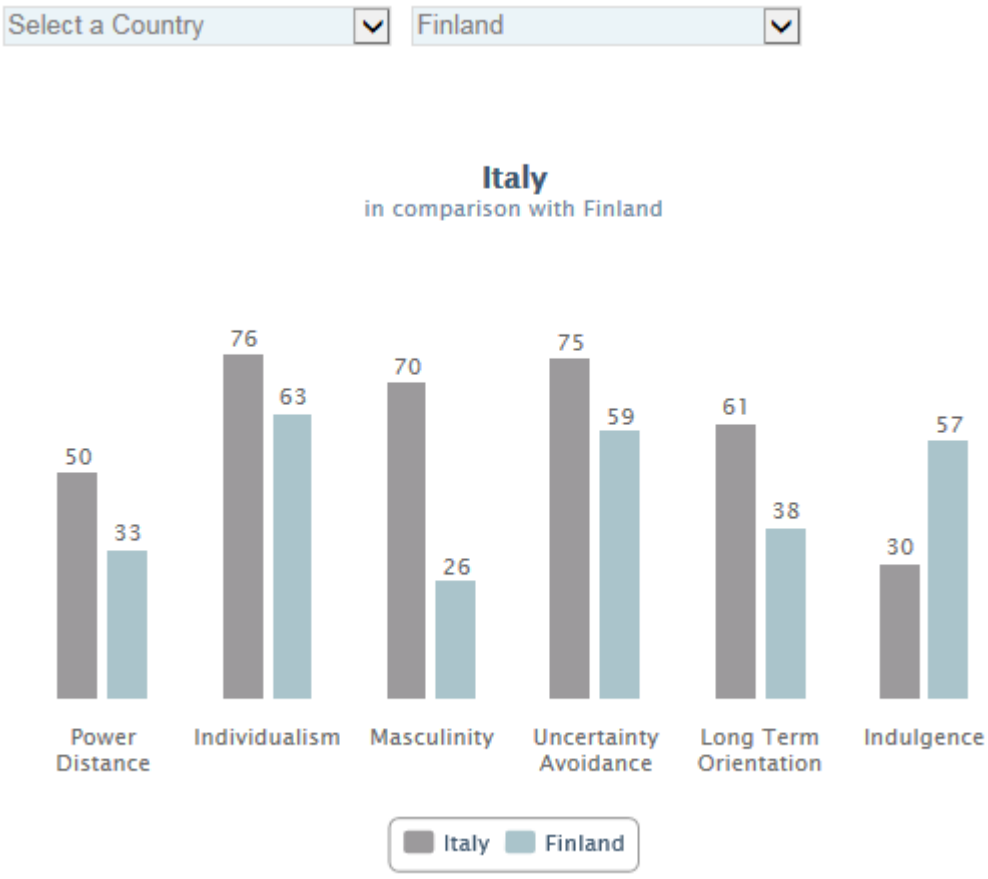

Figure 2 Comparison of differences in communication between Italy and Finland (Hofstede, 2017)

As we can see there are some main differences between the two cultures. According to Hofstede's studies (2017) the combination of High Masculinity and High uncertainty avoidance makes the work life really stressful for Italians. The high masculinity score highlights the fact that Italians are driven by success. Since an early age, competition is promoted and being a winner is an important social factor. In the working environment,

competition among colleagues is strong and the workplace is the place where every Italian can reach success.

High uncertainty avoidance score highlights the fact that Italians do not feel comfortable when situations are not managed well. In a working environment this means that a high degree of detailed planning is required. Emotions play a great part in Italian life and it is sometimes difficult for Italians to keep their emotions under control. This makes Italians passionate people.

An example of the avoidance of uncertainty is the fact that many businesses are still family owned. When doing business in Italy, the sales representative deals often directly with the owner of the company who usually has a hands-on-approach on directing the business. This is not only true for small businesses but also for big companies such as Barilla and Ferrero, which are still family owned. In these cases, usually the owners do not attempt to micromanage the company, but the decision making remains in the hands of very few key decision makers. Personal connections become paramount in such an environment and also sales people need to be as flexible as possible to meet the customer's needs.

2 Order-to-delivery process

When referring to order-to-delivery the whole process that contains all the steps from when order placement to order delivery are referred to. There are many different definitions of this process as it depends on what is included in it. For instance some definitions include purchasing and material management functions while others include only the sales related steps. In other cases order-to-delivery process is referred to under other names such as order management. For the purpose of this research the definition provided by the Cambridge dictionary will be used which refers to order management:

> *"The process of dealing with orders from customers for goods and services and making sure they arrive on time"* (Cambridge Business Dictionary, 2017).

2.1 Lean and Kaizen

Lean is nowadays a widespread concept that is used in many different parts of organizations. The way Lean has been applied and perceived has greatly changed in time evolving from a quality concept aimed to reduce waste in the production lines to a concept that should be embraced by the whole organization as a way of thinking in daily operations. (Slack, et al., 2016)

There are many definitions of Lean as the concept has become so broad. For this research, we understand the concept of Lean as continuous improvement, better known as Kaizen. Kaizen can be defined as follows:

> *"Kaizen is normally translated into "continuous improvement". […] Kaizen is a Company wide program for Everyday, Everybody, Everywhere, Improvement."* (Imai, 2012)

Kaizen principle is used in company X's daily activities. By having a critical point of view and asking yourself how to improve daily tasks, you can eliminate unnecessary waste. Being a factory that produces manufactured goods, other more traditional aspects of Lean are implemented into the production and supply chain management as well. This reflects especially in the inventory management and Make-to-order-production concepts which will be discussed later.

2.2 Just in time

Just in Time (JIT) is a wide spread technique used in lean environments. As the focus of lean thinking is to reduce waste just in time is a tool that helps to achieve that goal. Global competition has forced many companied to reduce costs, increase quality and meet the needs of the customers. (García-Alcaraz, et al., 2016)

Since company x is a global player in the international economy it has to face the same challenges of reducing waste without losing quality. Therefore just-in-time approach has been adopted there as well. Of all the possible definitions of JIT the one by Singh and

Garg (Singh & Garg, 2011) is the one that in the author's opinion is the most comprehensive.

> *"JIT is described both as a material flow management in industries to reduce inventory levels at each stage and a measure to simplify the manufacturing system to quickly identify problems and solutions."*

This definition emphasises the fact that JIT is used for both inventory reduction and optimization and to simplify manufacturing systems. In case of company X both these principles have been implemented and are worth looking at separately as they have a deep impact on final availability of goods and therefore customer satisfaction.

With JIT principle stock levels are in general cut. The first immediate benefit of this kind of solution is less costs due to less inventory and less money tied to inventory. Organising the production according to JIT principles means that components and raw materials are regularly delivered just in time to the production unit. While the benefits of this system are great as they free resources for the company, they bare some risks as well.

In order to have an efficient JIT system in place there has to be a high level of trust towards the suppliers. The downside of eliminating stock and having a smaller safety stock is that, in case of complications or interruptions in the supply chain, the company is more exposed to the risk of not having enough materials to fulfil all the orders. (The Economist, 2009)

When talking about global companies that have big portfolios of products, there are many considerations to be made as the there are many parties involved. The supply chains for their products as a result can be complicated and require constant monitoring and attention in order to keep the whole process running smoothly.

This brings us to the second major effect that JIT reduction of stock has: It helps to identify bottlenecks, criticalities and bad practices that the company is adopting. Many like to describe this as the river analogy: as long as the water level in the river (seen as stock level) is high the process will not suffer any shortages. It will be more costly to

operate and it will drastically increase risks. As all the rocks in the river are hidden by the high level of water, the high stock levels hide all the unsolved problems.

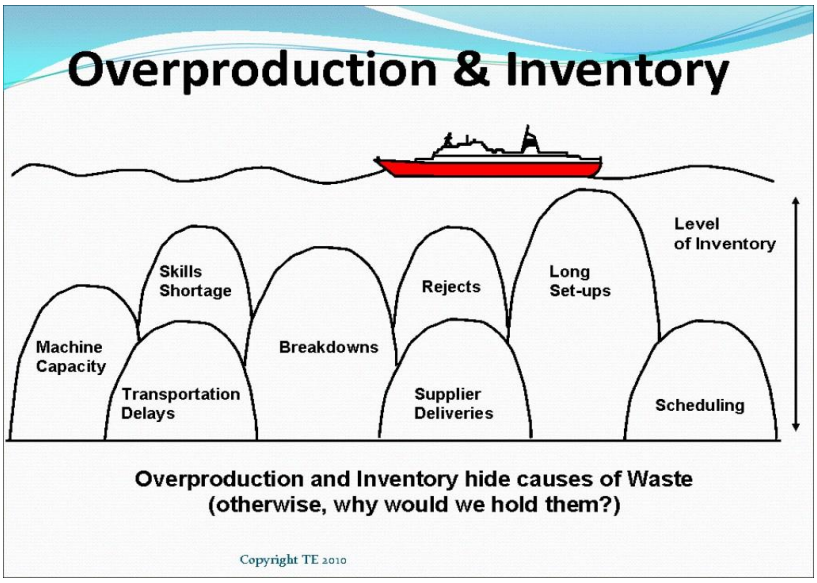

Figure 3 Just in Time overproduction and inventory hide stock waste (Tony, 2016)

If the stock level is suddenly decreased it will bring out the "rocks" from the river that symbolize problems that are the cause of the high stock levels. The problems exposed can be of different nature. Only by exposing them, the company can take action and try to correct them and have a more lean process with a lower safety stock level. This is illustrated in figure 3.

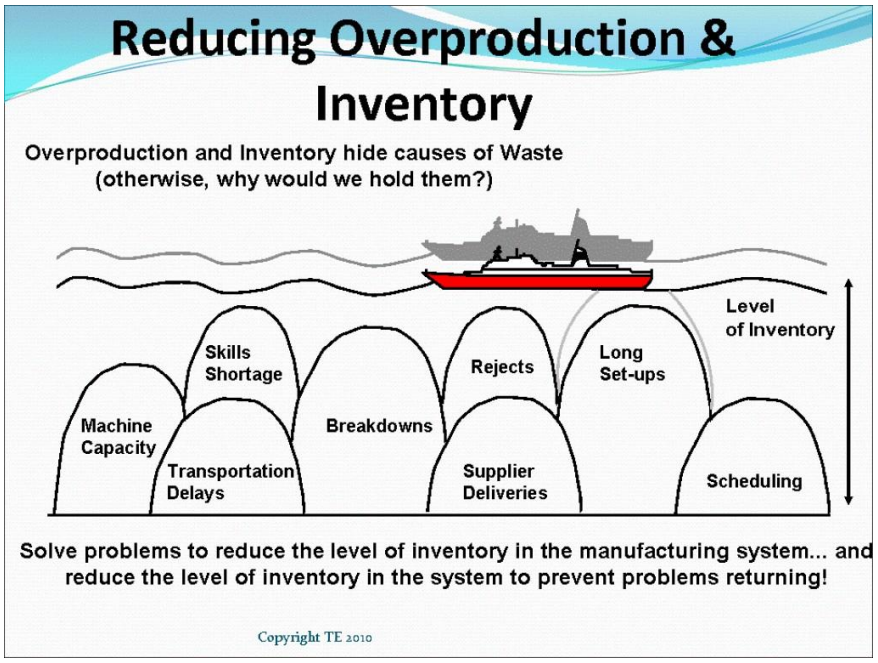

Figure 4 Just in Time diminishing stock levels (Tony, 2016)

Figures 3 and 4 give a graphical illustration of this concept. The lower the level of inventory is the more rocks appear out of the river. Ideally if all problems are solved the stock level can be kept at a minimum level. With the JIT approach the way to measure or monitor the process is decided and then the impact that this decision has had is looked at. This never-ending process brings continuous improvement and creates a sustainable competitive advantage. (Dear, 1988)

As every model and theory, JIT has some known weak points of which it is good to be aware of. First of all adopting a JIT is a complex matter. The whole supply chain and workflow needs to be analysed to eliminate waste. It is true that this will bring great benefit in the long run, but for this system to succeed it is paramount that all the parties involved are committed to change and to improvement. This goes beyond the mare scheduling of orders but touches nearly every aspect of the business including topics like supplier quality acceptability, machinery quality and maintenance, more accurate forecasting, etc. (Williams, 2017)

In JIT process is structured so that every little aspect that might cause delays or shutdowns needs to be analysed and improved. (Giordano & Schiraldi, 2013) Transition

to this sort of system is not impossible but needs to be thorough and carefully planned to avoid sudden stock outs and consequences of bullwhip effects.

2.3 One piece flow

The other concept that is a direct consequence of implementing JIT Lean theory is the one piece flow concept. This concept takes the ideas of waste reduction that is paramount in lean and applies it to the production line. By processing one unit at a time the total throughput time of the goods is reduced. Figure 5 gives a graphic example of how one Piece flow is actually implemented. Moving to this kind of production system has some great benefits reducing the overall lead time and the downtime of machinery. Ideally with this system there should be a 100% uptime in all parts of the process giving a greater output in a shorter time. (Dolcemascolo, 2016)

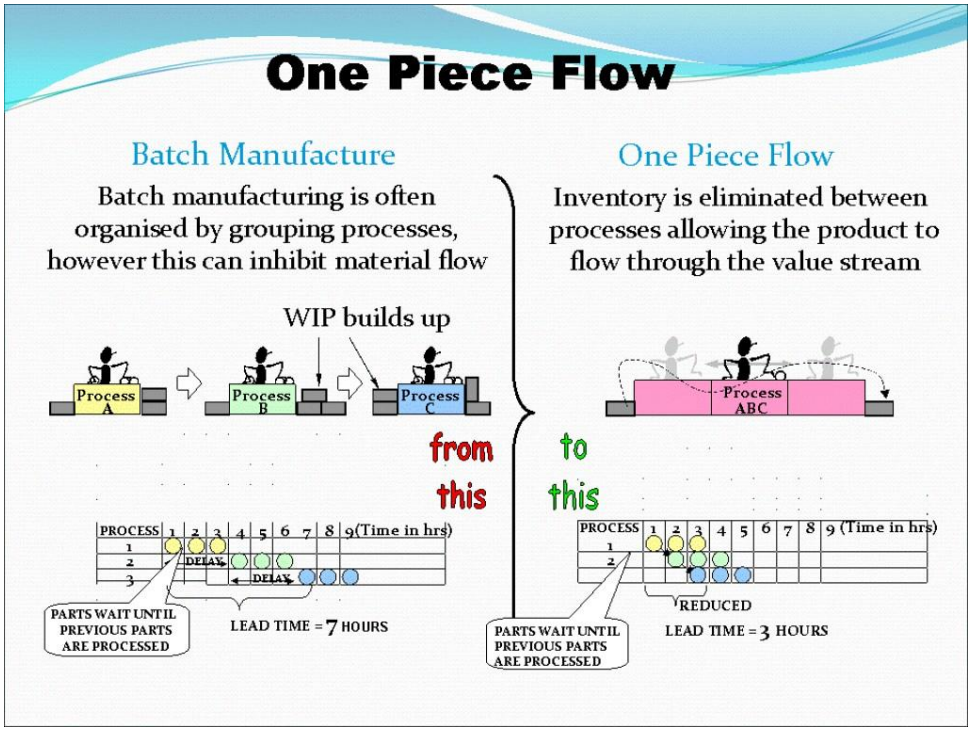

Figure 5 One piece flow principle (Tony, 2016)

JIT production is especially effective when the type of manufacturing is a repetitive one and orders are done regularly. (Raju, et al., 1997) The other great benefit compared to batch manufacturing is that this system allows for more space to personalize and configure products according to customer's needs. Production of one piece at a time, enables each station a variety of modifications in an easier way than with a batch setup. A more flexible setup without sacrificing capacity is one of the strongest points of the JIT one piece flow setup. Flexibility in manufacturing enables a higher degree of customization for the goods which directly increases customer satisfaction. (Singh & Singh, 2013) JIT approach is important nowadays because of increasing global competition which requires companies to be more reactive to changes in market conditions while, at the same time the costs of set-up and customisation of products should remain low.

2.4 Production strategies

The way orders are planned and goods are produced in companies like company x will be shortly explained. The nature of the goods leaving from company x's factory is particular because these products are usually specific for one client. Therefore there cannot be any stock premade in advance but items are assembled only when an order has been placed. (Lean Manufacturing Japan, 2017) This concept is known as Make to order. Manufacturing starts only when an order has been received. This is a typical example of a pull supply chain when operations start only when order is received. There are some different types of make-to-order-systems. Each one is determined from the starting point of operations. In case of company x the assembly-to-order (ATO) model is used. This means that ready components are bought and the final assembly takes place in the production line which adds the required modifications to meet the industry-specific customer needs. This kind of production system works well with JIT process as they are both pull systems.

2.5 KPIs

The basic definition of KPI is:

> "*a measurable value help managers and employees gauge the effectiveness of various functions and processes important to achieving organizational goals*." (Reh, 2017)

KPIs are linked to the firm's strategic goals and are a tool used my managers to help to assess if a certain target is being met or not. KPIs are vital for a company so that they will make the right decisions. KPIs can even be misleading if the data analyzed, is not correctly filtered and only the relevant data is extracted. Mostly KPIs are defined according to what the use and benefit will be. For the purpose of this research Reh's definition of "Leading and Lagging Indicators" was chosen. Reh categorizes KPIs into two groups:

1. Lagging indicators: they simply tell you how you have performed and have no value in predicting the future.
2. Leading indicators: offer guidance on future results. (Reh, 2017)

It is worth noticing that KPIs usually remain as a numeric and measurable value that often uses historical data to measure performance. Due to this fact it has some limitations that we need to be aware of in order to properly interpret the findings. (Pidun & Felden, 2011)

In this thesis, leading Indicators were mostly used as the focus is on timeliness of delivery and goods availability. Leading indicators is the analysis and the context that will be given to each set of data analysed so that it can be used to highlight some points of improvement that can be further developed from the other students in other parts of the order to delivery process.

The main KPI that is used for the scope of this research is On Time Delivery (OTD), and it is defined as follows:

> "*a measure of process and supply chain efficiency which measures the amount of finish goods or services delivered to customers on time and in full.*" (LeanManufacture, 2017)

3 Analysis of the case study

The analysis described in this chapter is based on interviews, personal observations and data analysis done by the author. All the information was gathered directly from company X's ERP system and from subject matter experts through interviews (see Appendix 1). Therefore all the figures in this chapter without a reference have been created by the author.

3.1 Order-to-delivery process between factory and Italian LSU

In chapter 1.3 the various customer segments to which Italian LSU is catering are introduced. That information is relevant for better understanding of the results of the analysis. In this chapter, we start from looking at how the order-to-delivery process looks like in company X. We will then utilize the elements introduced in this chapter to explain how the main KPI's were calculated and how overall performance can be measured.

Figure 6 describes the three main phases of the order-delivery process. As introduced in chapter 1 the focus of this analysis was mainly on order placement and order confirmation. Each of the steps of the order process can be summarized as follows:

1. Order Placement: Local Sales unit places the order into ERP System
2. Order confirmation: Production unit does the availability check and confirms back the confirmed delivery date
3. Order Fulfilment: Production unit produces and delivers the goods

Figure 6 company X order process

During the order-placement phase the LSU receives the request from the end customer and proceeds by inserting it into the ERP system of the factory. At this point there are two relevant data sets that can be collected for the KPI analysis; Order creation date and Wished delivery date. When the order is created, a wished delivery date must be requested. If the customer has requested a specific delivery date LSU order handler can feed that information to the system. If there is availability for production the ERP system will confirm that date to the order handler. If there is not availability for the wished delivery date the ERP system will confirm the first available delivery date according to availability or ordered product. The steps of this process can be seen in Figure

In Figure 7 we can see the main dates that will be used later when analysing performance and KPIs.

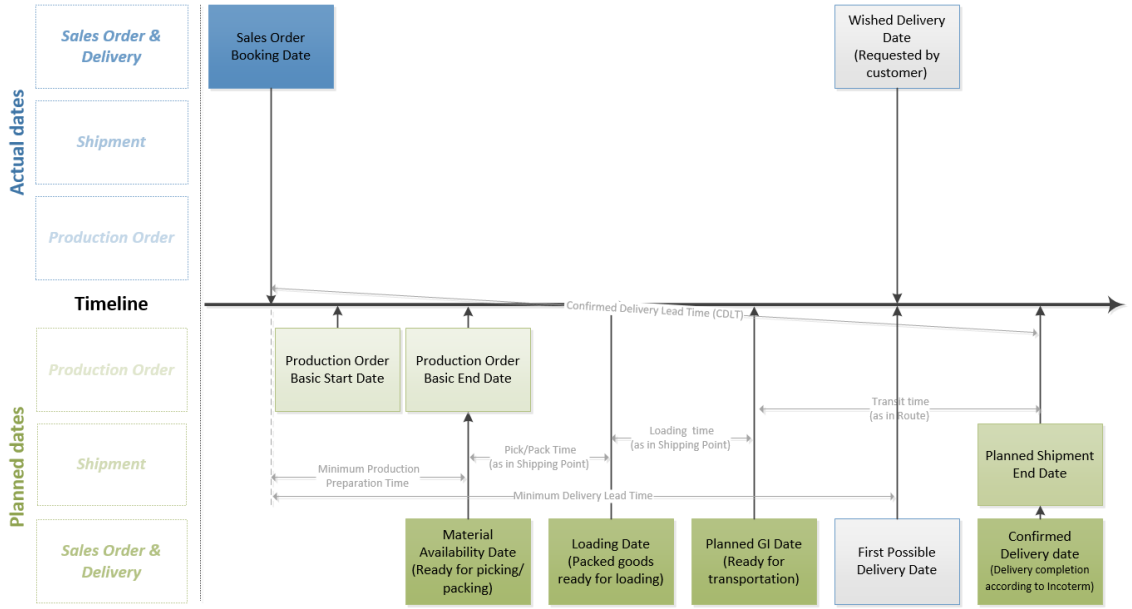

Figure 7 Main steps in Order delivery process (Company X, 2017)

As most of the raw data analysed for this research comes from the ERP system there is need to make many assumptions for relevant KPI's. Here is a brief explanation of the terms used in Figure 7 as well as some key terms that will be used later during the analysis of KPIs and evaluation of the factory performance.

- Net working days: number of days between two dates not counting weekends and Finnish Holidays (for a total of 14 public holidays in 2016 and Q1 of 2017 that is the timeframe in which the data has been analysed). This value can be used as an excel function called=”NETWORKDAYS” to have a measurable value which enables comparison of different timeframes in a realistic way.

- Booking Date: Is the date on which the order is created. This value will be used as day 0 for many of the calculations later used.

- Loading Date: is the planned dispatch date from the factory of company x. It is calculated according to availability. It is simply the date in which the goods are ready to be shipped, that is confirmed to the LSU from the factory once the order has been approved for production.

- Actual Goods Issue Date: is the actual dispatch date from factory. It is very useful as we can compare it to the planned dispatch (Loading Date) date to monitor factory performance.

- First possible delivery date: is the estimated time of arrival at the end customer site that the factory confirms to LSU when the order is confirmed.

- Wished delivery date: is the requested delivery date set by the customer. This date in some cases can be unrealistic (set too close to the order creation date depending on incoterms) and will be used for analysis in chapter 3.2.3.

- Actual shipment end: is the actual delivery date at the agreed destination that gets recorded after the shipment is delivered.

3.2 LSU Interaction between the factory and the Italian

The interaction between factory and LSU was analysed at first. LSU is responsible for typing in all the orders in the ERP system. These orders are then handled by order handling team of the factory that checks product availability and confirms a delivery date back to LSU that is based on product availability and order size.

LSU should type in the orders into the ERP system as soon as possible and inform factory in case of demand peaks or new big customers to reduce the risk of delays and material shortages. Once the order has been created if it contains all the information needed and does not have any special conditions such as discounts, different transportations type requests or is not ordered as express, it will be handled by the automated system and is confirmed according to the requested delivery date. In case there is no availability for the requested date, the system will allocate the first available production slot. The system will also send a message to the person that has inserted the order that the wished date could not be met and a new delivery date has been allocated. If the order contains special conditions or some not standard aspects, the order will be sent to the operations

customer service team, where the person responsible for the country that has inserted the order (in our case Italy) will handle the order manually.

The factory must provide updates on latest production capabilities, changes in products, and all relevant information that enables LSU to give a better service to the end customers. Most of this information is kept and updated by the factory in a web portal where LSU can access all the information it needs and can download needed documentation regarding the products. In case extra documentation is needed, the factory will provide extra support to meet end customer needs in a timely fashion.

3.2.1 Main KPIs: On-Time-Dispatch and On-Time-Delivery

Keeping track of overall performance is an important function that can sometimes result into especially tricky situations considering the scale of operations and the amount of data available. Keeping track of the correct KPIs gives a picture on how the company is performing in the tracked segment. As already introduced in chapter 2.5 the main KPI that is analysed in this research is OTD.

This KPI if put in context can be used as a starting point to identify bottlenecks along the supply chain. In the case of Company X, given the fact that their system records a huge amount of data, it is often difficult to make sense of all of it as each product family and order type should be analysed separately to give a more detailed picture. On top of that the needed data gets recorded in different ways and there are many different measures that can be used to describe an aspect of the process. The data need to be analysed with different tools and assumptions to have a more realistic picture of the whole process and of its performance.

On-Time-Delivery measures how accurately goods are delivered to the end customer according to the promised delivery date. It does not tell anything about the causes though as the timeliness of a delivery can be affected by many different factors during the whole Order-to-delivery process. There might have been issues in the production unit or transportation issues that have caused the order not to be on time. Another thing that has to be considered is the analysed time frame. To be able to calculate the on-

time-delivery there is the need to set the time as 0 when the order is inserted into the ERP system (order creation date). By doing so, the time between order creation and each step of the process from there onwards can be measured so that comparable values for each order are provided. These can highlight not only the performance, but even eventual critical points and bottlenecks in the process from order creation to the delivery to the end customer.

Delivery to the end customer after order creation can be broken down into production and delivery of goods. These two phases can be measured better measured if on-time-delivery is compared to on-time-dispatch in order to have a better picture of actual factory performance and delivery performance. Therefore these two KPI will be defined as follows utilising the terminology introduced in chapter 3.1 and in figure 7:

1. On time dispatch: analyses the performance by comparing the planned Loading date that was set when order was confirmed and the actual goods issue day that is registered by the system when the items are ready for shipping.

2. OTD at destination: compares the planned delivery date that was confirmed when creating the order and the actual delivery date that is registered in the system when the freight forwarder delivers the goods.

To have a more realistic view of the on-time dispatch and on-time delivery, and to properly calculate them, the first step is to create a way which compares the main key dates to each other in a measurable way. To do so the order creation date is used as a base and compared to planned goods issue, actual shipment day, confirmed delivery date and actual delivery, so that these create a series of measurable numeric values.

Comparable measures were created by using the Excel formula "Net working days between order creation and actual loading date – Net working days between order creation and planned goods issued". Having created comparable numerical values from the ERP data, the resulting values can be effectively compared to have a quantifiable measures. In this case the result of comparing order-to-actual-delivery-date and order-to-planned-delivery-date can highlight not only how many orders were delivered on time but even how many were delivered early or late and by how many days. Resulting from

this formula is a numerical value that will be 0 if order is delivered on time, <0 if it was early or >0 if it was late. When considering OTD delivery percentages throughout this analysis order that were on time or early will be considered on time. A more detailed analysis of order delivered earlier than planned is conducted in the next chapter 3.2.2.

In the same way OTD to the final customer was calculated by comparing the confirmed date of delivery to the customer and the date the customer received the goods. This analysis does not for now consider the wished date as it is an unreliable measure if it is not analysed separately. Both KPIs show the performance in relation to the dates the Factory has confirmed to the customer when handling the order.

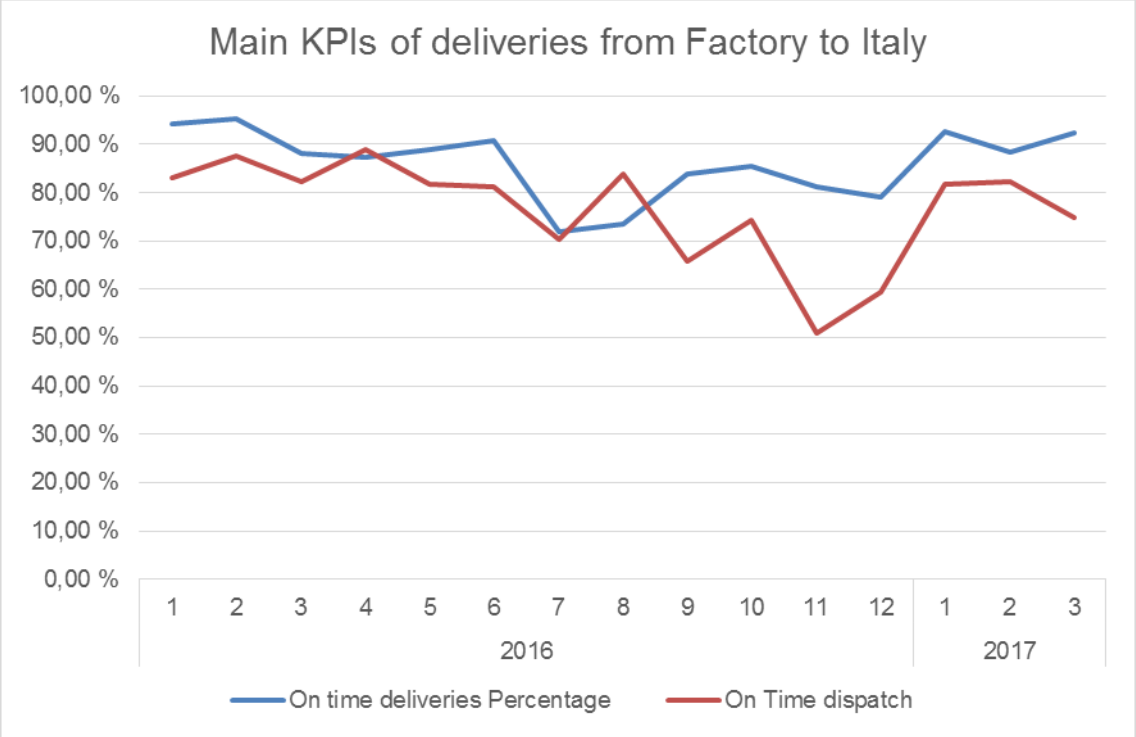

Figure 8. On-time delivery and on-time dispatch in 2016 and Q1 2017 From Factory to Italy

In Figure 8 we can see the results of applying the earlier mentioned formulas to the data provided. If both KPIs were not analysed in the right context, they would be considered as lagging indicators. (Reh, 2017) Based on the information gained by interviewing subject matter experts and the author' own experience, these KPIs can be put into

context which will turns them into "leading indicators". Figure 8 was used as a starting point for a deeper analysis.

3.2.2 On-time Dispatch and delivery in context.

As was seen in figure 8, it is noticeable that there is a difference between on-time-dispatch and on-time-delivery. The monthly on-time-delivery and dispatch can vary greatly. One of the main reasons for that is the availability of products. Ideally if everything goes as planned, there should be no difference between these two values, both KPIs should have the same percentages of on time orders. This is not the case as can be clearly seen in figure 8. When calculating the estimated delivery time, planned transportation time is added to the estimated Loading date as in the following formula:

Loading date + Route (7 working days default to Italy) = Estimated delivery date.

If an order is late for dispatch, it should be late for delivery as well if no transportation mode changes are executed. This is not the case as there is a significant difference between on time dispatch and on-time-delivery. This means that in many cases a shorter delivery time was applied and has helped to correct the situation allowing a higher percentages of on-time deliveries at the customer.

Looking at the same data from another angle can help to better understand why there is such a difference between dispatch and delivery times. By analysing the difference of net working days between planned and actual delivery dates we can see that many orders are delivered before the scheduled time.

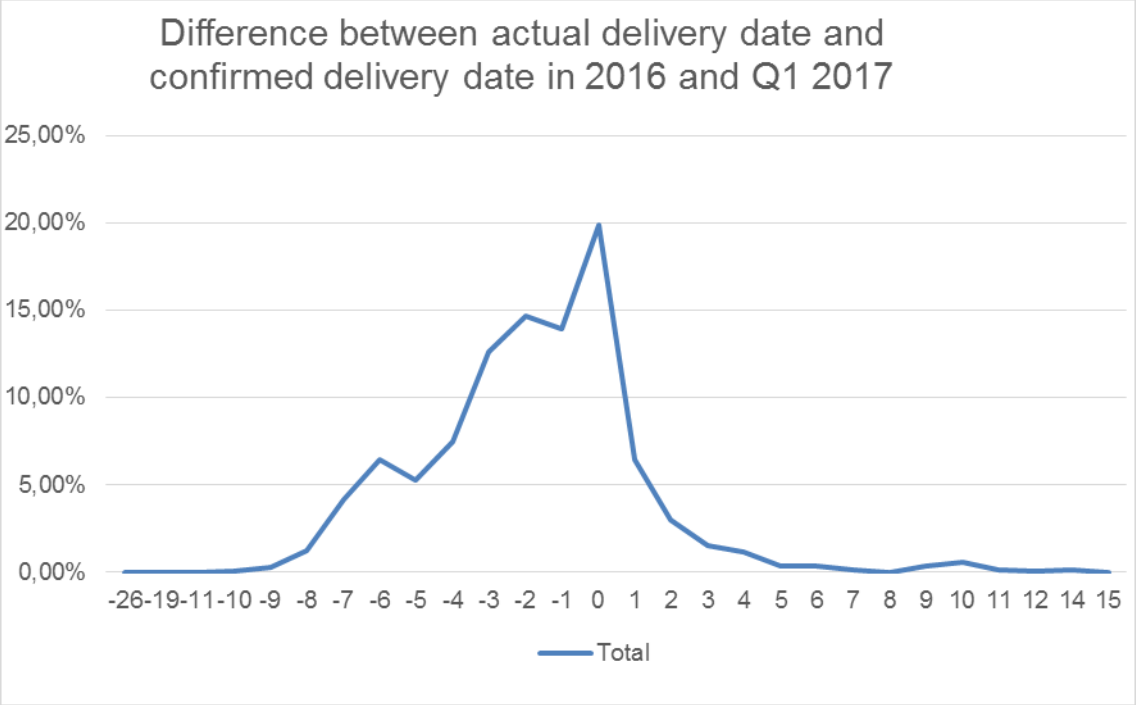

Figure 9 Difference between actual and planned delivery times as percentage of total orders placed

Figure 9 highlights the fact that there are many orders that have been delivered earlier than scheduled. One of the explanations is that when the ERP system confirms an order, it does not change the route according to its weight or size of the order but keeps the default set 7 days as transport time. When a shipment is small in size, it is usually sent via airfreight (1 day lead time) or courier truck that usually takes 3-4 days depending on the weight and size of the whole shipment after it has been packed.

Figure 9 confirms the analysis of Figure 8. About 66% of the orders have been delivered to the agreed address before the scheduled delivery date. The trend of earlier shipments is confirmed by the "peak" in figure 9 around -6 as it is the difference between the original route (7 Days) and the air route (1 Day) and the second steep increase appears around -3,-4 which is the exact difference between original route and the express economy route (3 to 4 days).

3.2.3 Realistic and unrealistic orders

In chapters 3.1 and 3.2 the concept of unrealistic orders and wished date was briefly introduced. In this chapter, these two concepts are explained and analysed in more detail.

Having defined the on-time delivery as the difference between confirmed and actual delivery times, the actual date that the customer requested has not been taken into consideration yet. In chapter 3.2.1 on-time dispatch and on-time delivery were calculated based on what the factory had set as confirmed date versus what was the actual delivery date at the end customer. When LSU inserts an order into the ERP system they must set a wished date for the goods. This is the date when they would like the goods to be delivered to the end customer. This is where a distinction between realistic and unrealistic orders should be made:

- Unrealistic order takes place when the wished date is set earlier than the promised factory lead time plus the net confirmed days of transportation.

- Realistic order takes place when the wished date has been set far enough from the booking date so that the factory should be able to handle and produce the order without problems after they have received the information about the order with enough time to properly adjust their availability.

The distinction between these two groups had to be made in order to make a realistic analysis of wished-delivery date. If this analysis was done out of context, it would give wrong information as some of the orders had been placed with an unrealistic wished date. This means that the delivery date, that the LSU had requested, was too close to the order creation date. In these kinds of orders the wished date is not taken into account and the confirmation is given according to the first possible production slot available. Only when wished date is realistic and it is set well ahead of time it is taken into account and order confirmation is given according to it.

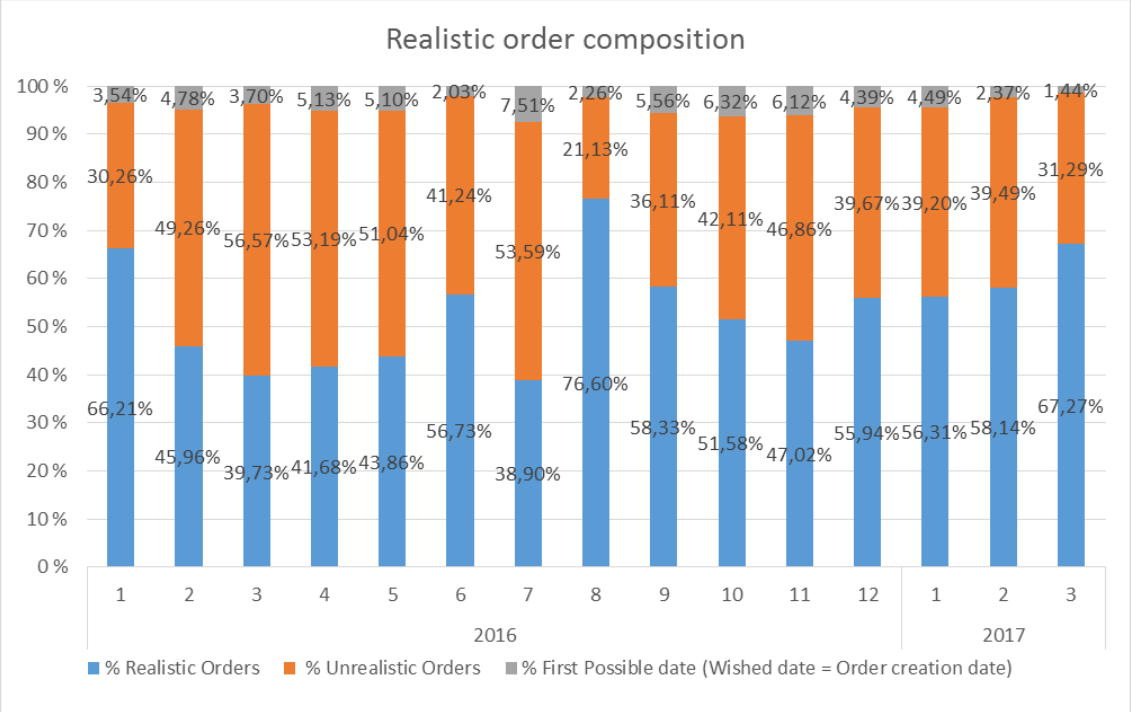

Figure 10 Realistic and unrealistic order composition

In Figure 10 the composition of how orders are placed is described. As can be seen a relevant part of the orders are unrealistically booked. Figure 10 also highlights the fact that Italy LSU does not set a realistic wished date when placing the order. Utilising just wished-delivery date instead of planned delivery time to calculate on-time delivery without making any distinction would not give a realistic description of the timeliness of delivery. Making this distinction between realistic and unrealistic orders is important as in this was the requests made from the customers can be taken into account. After this distinction is made it is possible to filter all the orders received and see what is the on-time delivery KPI of realistic orders compared to actual delivery date and wished date.

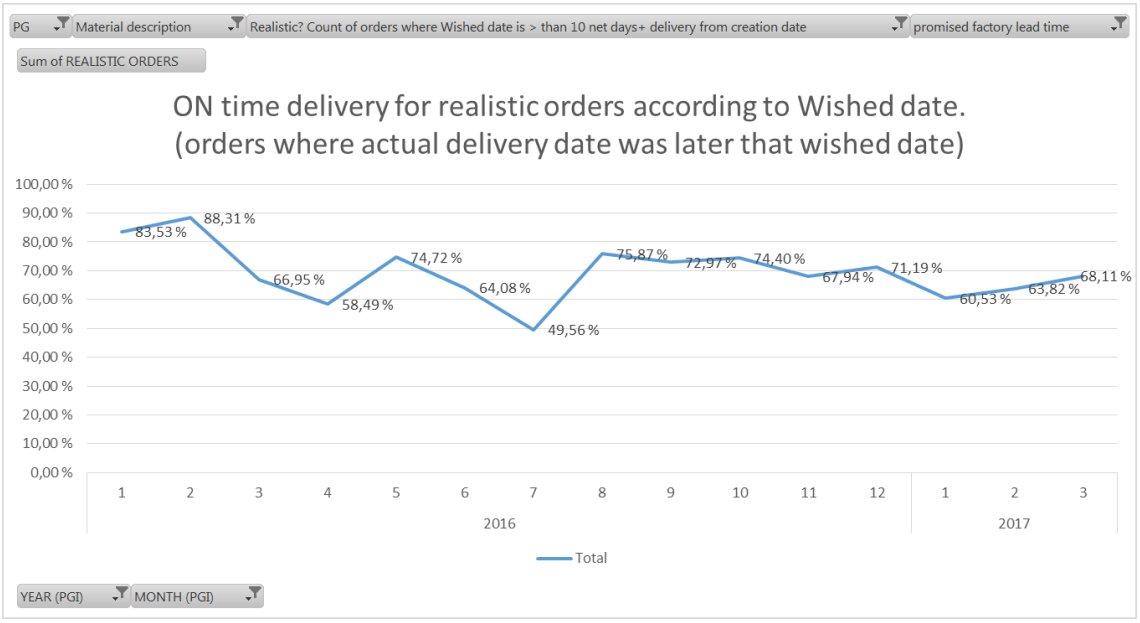

Figure 11 On-time delivery for realistic orders

Figure 11 shows interesting results. Even though these orders should be the ones which are placed “ahead of time” and where the requested delivery date is reasonable and should be met with normal product availability, the percentage of on-time deliveries is well below the ideal 90-100% target level which is expected for these kind of orders. This might be an indicator, that availability needs to be improved or a more realistic target has to be set with a longer standard factory lead time.

Another benefit of this distinction is that now unrealistic orders can be analysed separately. Unrealistic orders are the ones that get produced and delivered as soon as possible. Sometimes the LSU sets a wished date too close to the order creation because they do not have a specific date for their request but they just want the first possible production slot. Setting the wished delivery date as the day after the order creation they can be sure that the system will allocate the first possible production slot. Unrealistic orders can be defined as the orders that need to be produced as soon as possible. If we examine on-time dispatch and on-time delivery of unrealistic orders, the response time of the factory can be analysed. When confirming the unrealistic orders the factory itself decides when the goods can be delivered. This makes the analysis of those kind of orders particularly relevant because by comparing that to the actual delivery and actual dispatch dates to the planned ones a more detailed view of performance and on how well the factory can adjust to shifting demand can be made.

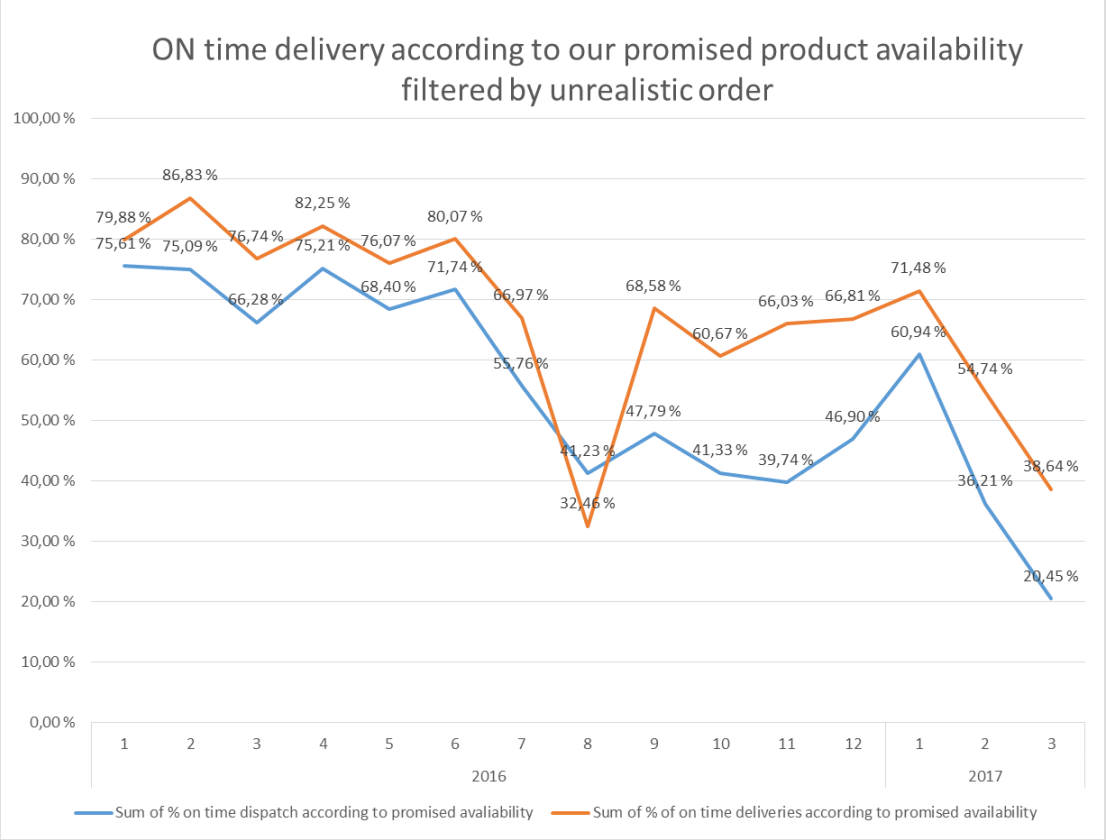

Figure 12 On-time delivery and dispatch of unrealistic orders

Figure 12 gives a more accurate view on how availability affects orders. The origins of the negative trend will be analysed in more depth by the other students in the other sub-projects. As for the scope of this research, this graph gives us confirmation of what was seen in Figure 8; that shorter transportation time than what was scheduled enables to give a better timeliness of the deliveries.

3.3 LSU and end customer interaction

After having analysed the factory perspective, the interaction between LSU and end customers is analysed in this chapter. After assessing customer needs LSU sales representative makes a sales contract for the needed products. After that LSU inserts the order into the ERP system of the factory and once it is approved, it is communicated to the end customer with the estimated delivery date of goods. The LSU utilises as a guideline what the factory has communicated to them as standard availability of the

products so that the sales representative, when making an offer to a customer can give an estimation of when the goods will be delivered. Ultimately everything is based on availability of goods.

The availability of some factory goods does not always match what was promised to the LSU. As has been seen throughout chapter 3.2, LSU tries to push the factory to deliver within a time frame that is considered acceptable by end customers. For example between 2 and 4 weeks from order placement can be considered as normal delivery time for a specific product. If the Factory can deliver before the 2 weeks mark, it will be considered exceptional. On the opposite when delivering later than 4 weeks will be considered a shortcoming from company x's side. Everything in-between will be considered as standard time and in line with the expectations. These are referred then as being according to the industry standards. In this chapter on-time delivery was compared to the minimum and maximum boundaries of expected delivery times and to promised average availability. Customised minimum and maximum boundaries have been set for each product group. In the following analysis the results are the average availability for all product groups as a more detailed analysis for each product group is one of the limitations of this research as explained in chapter 1.2.

3.3.1 Customer expectations

End customer expectation vary greatly in each customer group. After conducting the interviews, it became clear that there are 3 main customer needs that the end customers expect from company x.

1. Quality: the most important aspect for the customers is being able to rely on the goods they order. This means that not only the goods have to be flawless but also assistance has to be available and timely in case something goes wrong.

2. Timeliness of deliveries: customers want to receive goods on time and with a maximum lead time according to industry standards.

3. Price: Cost of products has to be in line with similar products offered by competitors.

In this research the focus was mainly on the availability and delivery times. Due to time and size constraints it was not possible to gather information from each end customer or customer groups. For this reason material that was already collected by LSU was analysed and used for this part of the analysis. Industry standard Lead times were used as discriminator for this kind of analysis. By comparing company x's own delivery times to what is generally expected as acceptable delivery time frame, a precise picture of the performance of company x was drawn and it can be used to determine the scale of the interventions that are needed in order to improve performance and create a better competitive advantage.

3.3.2 KPI analysis according to Industry standard

Similarly to the assumption that was made when analysing realistic-unrealistic orders in chapter 3.2.3, an assumption had to be done to separate those orders with a wished delivery date close to the order creation date from the ones placed well in advance that will be called in this research "Informed orders". If the number of working days between the order creation and wished date exceeds the longest acceptable lead time according to industry standards the order is considered as "Informed". For these orders, as they were placed well in advance, factory should be able to plan production and delivery accurately. It is worth pointing out that the term forecasted cannot be used as forecasting occurs usually on a longer time frame and is used to build product availability. Informed orders are simply orders that are placed well ahead of time and that should ensure that they get delivered on the wished delivery date.

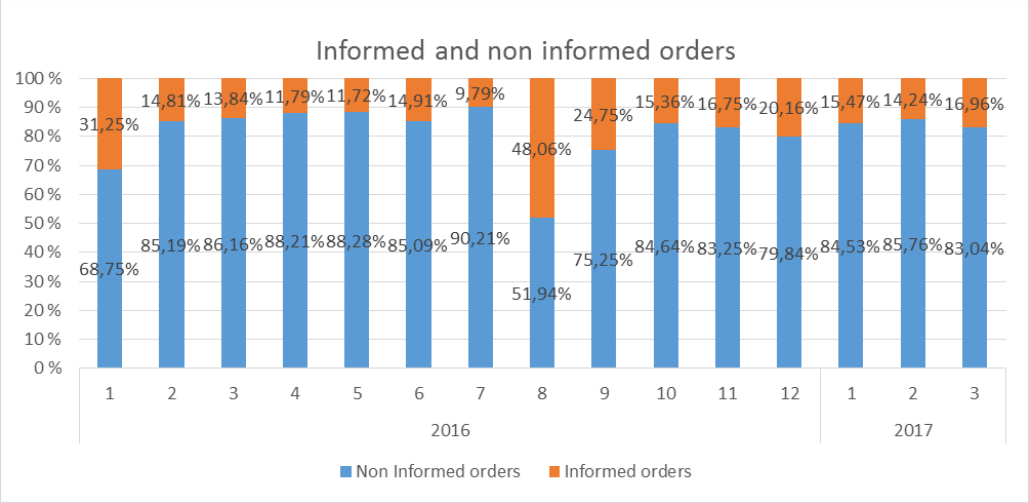

Figure 13. Order composition of informed and non-informed orders

Figure 13 shows how many orders per month are placed as “Informed” orders. As expected the biggest part of the orders are placed with a wished total lead time shorter than the longest acceptable lead time in industry standards. By doing this distinction the focus can be put on the non-informed orders to which the factory needs to react more quickly.

3.3.3 Non informed orders and performance compared to industry standard

When comparing minimum and maximum lead times according to the industry standards against the promised factory lead time of non-informed orders, a clear picture is formed showing how the factory’s own goals are being met in respect to industry standards. Utilising the same set of KPIs that have been utilised throughout this thesis, the percentage of on time deliveries related to the shortest industry standard, promised availability and longest acceptable delivery time were analysed.

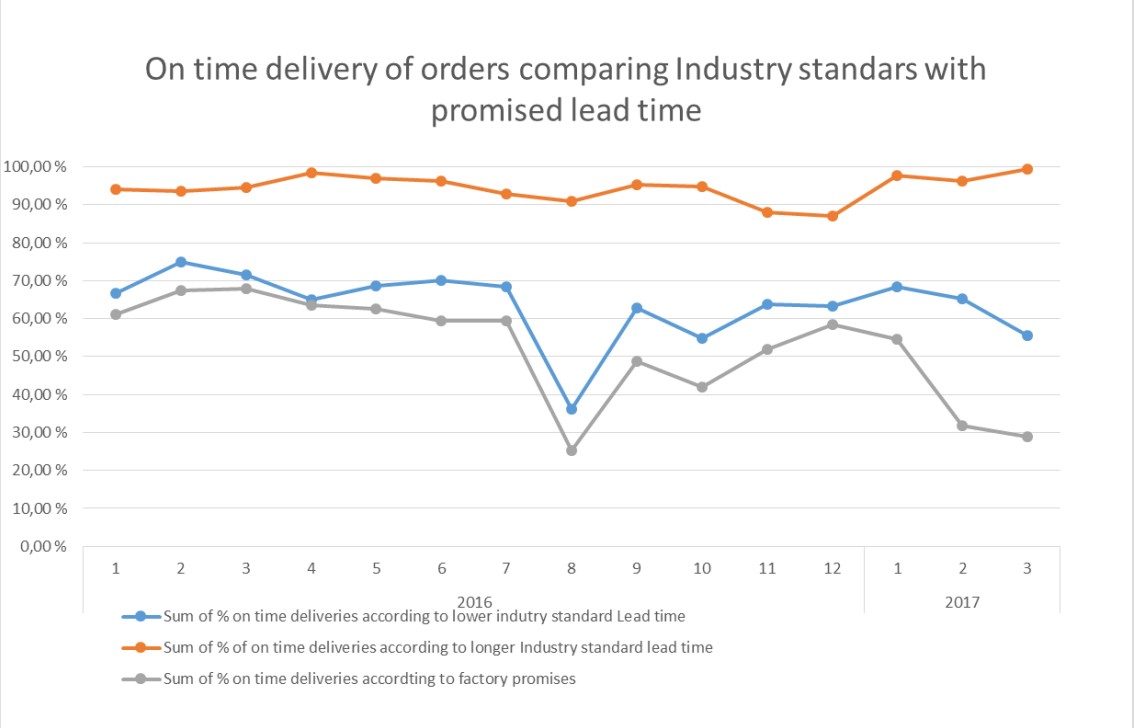

Figure 14. On-time delivery according to industry standards and factory target lead time

Figure 14 shows the factory performance if we compare it to the minimum and maximum industry standard lead times. On average nearly all the orders get delivered within the acceptable timeframe. However it can be seen that the amount of on-time deliveries according to the factory target average lead time is not satisfactory as targets are not met.

4 Conclusions and improvements suggestions

4.1 Conclusions

This thesis through the theory and the case study analysis, shows how difficult it is in a company of the size of company x to implement and sustain any change. A company is a synergy of all its different divisions and teams. Changes and improvements have to be properly planned and carried out throughout the all the departments otherwise there is a risk of creating new problems directly caused by the implementation itself. Not all the effects of a change are easily quantifiable, some of them such as customer satisfaction can be impacted by the changes implemented now but measured only in a medium long period of time. In the case of company x, implementing a change such as the introduction of leaner production concepts has had an impact that is difficult to quantify. Changes have to be constantly monitored to avoid these extra risks. This is where the development and usage of the correct set of KPIs is important, they can help not only with keeping track of different parameters but also, if the right context is set, they can aid in better decision making.

Throughout this research KPIs have been used as a starting point for developing the analysis and identifying some points of action that will be studied further by the other students to improve the order-to-delivery process. The main KPIs utilised in this research, on-time delivery and on-time dispatch needed a lot of context to be properly understood. They have been used as starting point to highlight and quantify some of the known issues regarding product availability and timeliness of deliveries that have come up during the interviews with subject matter experts.

The fact that company x, due to its scale, operates in different countries utilising Local sales units to keep contact with end customers can sometimes create unwanted issues. Outsourcing the actual sales process to LSUs is the most efficient way to operate as each one of them has a greater insight on the market conditions and cultural norms of each country and can form stronger partnerships with end customers. The main disadvantage of this system is that the factory can be sometimes out of touch with customer needs. End customers see company x as one entity from the outside: they buy goods and

services from it but do not know and are not that interested in the internal structure of company x. This is why information flow and better communications are really important for the global success of the company. Factory and LSUs need to work in synergy to prevent delays and deliver a superior customer experience.

As previously mentioned this research is the first part of the larger project that aims to overhaul the order-to-delivery process in company x. The target of assessing the current situation and how in the last year it has changed has been met. Customer expectations could have been analysed more in depth by gathering more information from end customers but due to mainly time constraints and the elevated number of customers that company x has in Italy the author decided to use expertise from LSU to determine industry standards and analyse performance in relation to that. The results of this work have been used by company x to take some immediate actions to improve overall availability while implementing the needed changes to have a leaner process.

4.2 Improvement suggestions

As a result of this research three main improvement suggestions can be given:

The first improvement suggestion exposed in the KPI analysis, is the difference between on time dispatch and on time delivery. This has highlighted that the average order size is small as many orders get sent through courier rather than normal line haul trucks that are slower but cheaper. Consolidation of orders could be a solution to cut some costs generated by the higher usage of express delivery.

The second improvement suggestion that the KPIs revealed is the knowledge level of factory processes by the order handlers of Italian local sales unit. When analysing realistic order composition was analysed it was shown that many orders are placed with an unrealistic expectation. A better understanding of factory processes and in general a better communication can help in setting a more realistic target for the factory that they can actually meet.

The third and last improvement suggestion noticed is the need for availability improvement. As was seen in chapter 7 customers want goods to be delivered on a specific date or usually as soon as possible. They are satisfied if the goods are delivered in what is accepted as industry standard. By improving the availability generally and trying to meet own targets of the factory for each product group, a superior customer experience can be delivered.

This thesis alongside the other three ones by the other students has been commissioned as company x noticed the need to analyse and improve its own performance. This is the kind of action that makes company x leader in its field of work. Continuous improvement is a core principal that is followed throughout the whole company. Only by always analysing critically its own performance the company can continue improving and keeping the advantage it has over competitors. As a global company x has many stakeholders that require different targets to be met. Sometimes these targets might seem in direct contrast with each other such as delivering a better customer experience and decreasing costs of production by eliminating waste. Only by applying a continuous effort towards improving and having a companywide focus on the shared objectives, these targets can all be met. On this front company x is a world class leader and is on the path to success.

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Appendix 1 Interviews with subject matter experts

1. Customer service manager November 2016
   Topics: general explanation of how order process works and what are critical points.

2. Area sales manager responsible for Italy January 2017
   Topics: interaction between factory and LSU

3. Sales manager from Italian LSU January 2017
   Topics: Main criticalities, explanation of interaction between LSU and End customers, industry standards in Italy.

4. Major customers account manager February 2017
   Topics: Interaction and sales process with bigger customers and business partners.

5. Business analyst and business controller February 2017
   Topics: explanation on how to use data collected from ERP system.