Rockwool Warehouse Analysis

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Oskari Soinola

Abstract

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Rockwool Warehouse Analysis **Rockwool Warehouse Analysis**		
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Name, title and organisation of the client Juha Noukkala, Logistics Manager, Rockwool Oy Finland		

Abstract

The purpose of this thesis work is to analyse the warehousing operations of Rockwool Finland. The main objective is to find out how the warehouse could improve their operations by themselves.

The work is divided to a theoretical section as well as an empiric section. The theoretical section consists of sources and information that are then utilized in the empiric section.

The results will provide information to Rockwool Finland Oy on how they could improve their own operations. Suggestions will also be made on how to improve the product flow of the warehouse.

Keywords

Supply chain, warehousing processes, distribution centre

Contents

1 Introduction

1.1 Background

The topic of this thesis is to analyse the current operations and processes on Rockwool Finland's warehouse. By researching methods and solutions that could aid the organisation, empiric data will be gathered from the employees operating at the warehouse, based on the methods and solutions found earlier.

The Rockwool Finland's warehouse is currently having issues with inventory and space management. The warehouse is currently used to store goods for other companies, as they utilize the self-collection orders and, in some cases, self-collection orders may stay at the warehouse for several months. With limited space at the warehouse, the self-collection orders take space from other goods. This limits the possibility of adding new products when self-collection orders are taking unnecessary space from the warehouse.

The topic has value for the organisation as they will receive information about their operations. The company has several warehouses in different countries. By analysing one, there might come up similar challenges with the other warehouses. The work should help the whole warehouse in Finland to perform better via better warehouse management. It will provide information about how the warehouse functions. The management will then be able to make changes based on what will be the best for the company. The thesis might ease the operations of the employees by reducing the time to carry out one task.

1.2 Research question and theoretical frame

The research question will be: How to improve the warehousing process in the warehouse? This question will provide a good base moving forward with the thesis. Rather than focusing on one small detail, the objective is to focus on the larger scale of things. This should be better as it leaves more options open moving forward.

The objective is to find out how the warehouse currently operates with incoming and outgoing goods. By conducting interviews with the employees who handle the incoming- and outgoing traffic as well as warehousing, it should become easier to pinpoint current problems. By understanding the problems, solutions will be easier to come up with. One of the main objectives is to make the work of the employees more efficient by reducing the potentially unnecessary steps in the warehousing process. The results should provide information about the current situation to the managers, so they make the necessary changes.

By analysing the current stock levels and procurement methods, some solutions should rise to ease the operations. The warehouse is currently performing well, and all tasks are carried out daily. The purpose is to find options to improve the operations by better utilization of the space available. The main theory utilized in this thesis is Supply Chain Inventory Management.

1.3 Research methods

Qualitative Research

Qualitative research can be divided into three parts. The process begins with conducting interviews to the target group, the data received is then analysed and finally reported or presented in a specific method. Interviews are still one of the most common ways of gathering qualitative data. They engage the interviewees to conversations and can bring up information that would otherwise be unavailable. The popularity of interviews is also largely increased by the fact that people see interviews everywhere. They are used all over social networks in the news, articles, and radio. (Packer 2011)

Qualitative research will be chosen as the research method for this study. With the small scope size quantitative research was ruled out as an option. The method used for data collection will be interviews. These will provide more accurate answers and therefore more specific data.

Quantitative research

Every quantitative research starts with a question that needs to be answered. After the question has been found, relevant data then needs to be gathered regarding the topic. This data can be acquired in several different ways. Finding the best method is often affected by the type of the question that needs to be answered. The data accessed is often possible to analysis on a numerical way. This enables the data to be analysed statistically and therefore the conclusions can be drawn by recognizing patterns within the sample. (Fallon 2016, p. 3-4)

Content analysis in one of the methods recognised as quantitative research. It is conducted by analysing data sources linked to a certain topic. The sources can range from scientific research to things like pictures, news paper articles and tv-shows. By analysing similarities within the sources, the researchers can draw conclusions of how certain topics affect the results. (Fallon 2016, p. 4-5)

Primary data collection collects the data directly from people rather than analysing data sources. This type of data collection can consist of surveys, experimental methods, and observations. Surveys are used to collect data from large audiences quickly. They can be carried out online or in person. Both methods have their strengths and weaknesses. Online surveys can be dealt out to large groups of people quickly. Their downside is that people may not be willing to answer them. Conducting surveys in person can yield a higher answer rate but the total amount of answers tends to be lower as one cannot conduct a lot of surveys quickly. (Fallon 2016, p. 5)

Experimental data collection is often linked together with observational data collection. By experimenting with what causes a certain effect, researchers can then make observations based on the results. The cause effect can be manipulated to see what reactions it will cause in the target group. Due to the nature of this method, best results are usually achieved in controlled environments such as laboratories. (Fallon 2016, p. 5-6)

Research plan and analysis method

The current plan is to interview the current employees, with at least six months of experience. The process will be started with the most experienced ones and moving on to the ones that have started recently. This should give different insight of the situation and still value the experience of the long-term employees.

Interviews were chosen as the research method as they will provide better data than questionnaires with a small target group. Semi-structured interviews will be used, as the conversation may bring up some other topics that were not planned beforehand. Each employee will be interviewed individually. Group interviews were considered to find other perspectives, but due to employees sharing same work-tasks it would be difficult to conduct.

For analysing the result, a thematic analysis will be used. With a small target group, the task of analysing the data to find out similarities should not take a lot of time. This method will connect the similarities that could rise within the answers. If certain topics would rise among the different answers, attention should be paid to find solutions to these themes. The thematic analysis should work well in this research due to the small target group and the ease to bring up the problems.

All data and information will be gathered from Rockwool Finland’s warehouse. Access to use the inventory data will be asked from the management and questionnaires will be conducted to the current employees. The questionnaires will be done using Google Forms.

1.4 Limitations and delimitations

To limit the topic, the focus will be on Rockwools operations. The research will not be focusing on outside factors such as the incoming traffic and the truck drivers. Empiric data will be gathered from Rockwools employees. The focus will also be on the inhouse operations. By analysing the processes that the warehouse can affect, improvements can be made to further increase its performance. Calculating the inventory turnovers and ordering points will not be done due to the amount of time they would take. One or two examples can be given but the whole calculating process could be a topic for another research. With these delimitations the work should remain within a reasonable range.

1.5 Presentation of case company

Rockwool is a Danish based company that is the leader in the field of producing rock wool insulation. The company was formed in 1909 and the first factory to produce rock wool insulation was opened in 1937 to Hedenhusen, Denmark. Nowadays the company has two factories in Denmark, from where it spread first to Germany, then to the rest of Europe. Eventually it began operating across the globe. Rockwool has currently operations in 39 countries and has over 11, 000 employees in its 47 facilities. (Rockwool Meistä 2021)

The warehouse operates currently with seven employees. Three of them are taking care of the loading and unloading of the incoming and leaving trucks. The other three are taking care of the inhouse logistics. The last employee is monitoring SAP and serving the customers.

The employees outside are operating with forklifts that use 240cm forks. The forklifts inside are slightly smaller and are equipped with 120cm forks. Both forklift types have a lifting capability of four meters. The longer forks make loading and unloading easier as trucks are typically 240cm wide. The shorter forks used inside make manoeuvring between the shelves easier.

Besides the incoming and leaving trucks the warehouse operates also as a pickup point for smaller customers. They place their order via a hardware store or by calling customer service directly and are then able to come and pick up their order. The employees operating inside take care of these customers as quantities are typically lower.

As we can see from the image below, the layout of the warehouse is challenging. With only one entrance and exit that the forklifts operating outside can use efficiently, the time driving in and out of the warehouse adds up through the day. Orders that need to be collected and packaged, are effectively on the other side of the warehouse. This causes unnecessary traffic inside that increases the risk of accidents. Rockwool is currently renting the warehouse from a private landlord and cannot make large changes without the permission of the landlord.

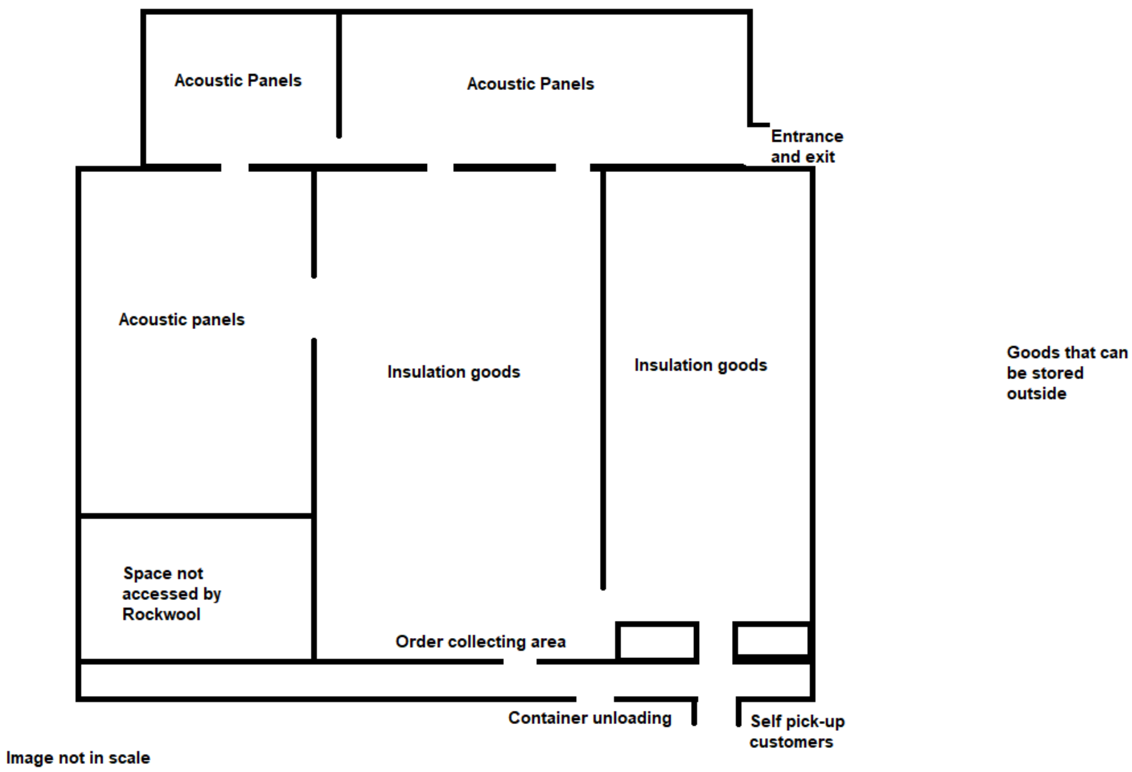

Figure 1: Rockwool Warehouse Layout (Soinola 2022)

2 Logistics and warehousing

2.1 Logistics theory

Logistics can be defined as the movement of materials, -information, -income, procurement, production, distribution, and recycling. Paired with warehousing, distribution, and customer services, it forms a large entity. The main point of logistics is to create value to the customer. This is seen as the value chain within logistics. Each step through the process adds more value to the product or service. By speeding up each process through the chain the customer will receive the products faster. Customers have different values, and some may see production speed as one. Other customers may value quality over quickness. In these cases, it is vital for companies to find balance in their production and distribution. (Karrus 2005, p. 14-15)

The main value that efficient logistics add to the value chain is more efficient warehousing and distribution. This can be seen as savings in both space and time. With better warehousing you save space and reduce the size of your inventories. By better distribution, the products move faster through the chain. This enables companies with short distribution times to get paid sooner. Small stops in the chain cause the product to lose some of its potential value. This is because the company does not benefit from the product being stuck in the warehouse. Efficient logistics try to reduce the unnecessary time that products spend in the supply chain. Having large inventories is not beneficial if there are no purchases made for these products. (Karrus 2005, p. 26-27)

The concept of value chain was created by Michael Porter, who distinguished the chain as a competitive advantage. Porter claims that companies are built on value functions. These functions are the cause of the expenses of the company. The functions are also what make the value for the customer. Porter divided these functions to two classes, the main operations and supporting operations. The main operations consist of; incoming logistics, production, departing logistics, sales & marketing and maintenance. The supporting operations exist to back up the main operations. The supporting operations consist of activities such as procurement, research & development, human resource management and infrastructure. According to Porter all these operations should work together in order to produce value to the product or service. (Sakki 2009, p. 5-6)

2.2 Warehousing Industry

The current trend for warehousing industry has been positive for the past few years. The industry has seen steady growth between six to eight percent per year. The steady rise has been largely contributed by the growth of China and India. (Minutehack 2020)

The overall trend among consumers has also switched from the traditional shopping to more online focused. The large expansion of online stores has been a rising trend during the last decade. The corona pandemic also encouraged people to spend more time online and therefore the online retailing went also up by a lot. This has led to the change that companies need to keep more goods in stock as customers are expecting a large variety of products. (Minutehack 2020)

Globalisation has also led companies to open more warehouses through their newly laid out supply chains. With products moving between continents the need for warehouses has increased. Some of these are owned by large logistic companies that take care of transporting globally and warehouses work as storages for customs and tariffs. (Minutehack 2020)

The current situation within the market shows no signs of slowing down. People are turning more towards online shopping and ordering. New markets are opening as internet access is spreading in countries that have lagged in development. Digitalisation has also been pushing the field forward. With new programs to help the processes, the product flow within warehouses that utilize these programs, has increased rapidly. With the help of digitalisation and internet access being more available, the need for warehouses will keep rising steadily. (Minutehack 2020)

2.3 Warehouse operations

Traditional warehouse operations consist of receiving goods, storing the goods, collecting and packaging, sorting, and finally shipping the goods onwards to the end client. With the upcoming of digital services and electronic resource planning systems (ERPs), return operations can also be added to this list. Along with these steps warehouses and factories may have their own procedures that are necessary for a specific product or supply. (Kembro 2018, p. 892)

In the receiving process goods are unloaded from the carrier and checked that they match the delivery information provided, if any is used. After the inspection is done the goods are unloaded directly to a designated area to wait loading or if further storing is needed, moved to a place where this is possible. (Kembro 2018, p. 892)

After the receiving of goods or supplies is done, if they cannot be immediately placed to their storage location or moved forwards to the customer, they must be stored for later use. With good planning the goods will have storage locations that reflect their overall consumption within the warehouse. Goods with low consumption rates can be stored away further back in the warehouse, but so that they can still be accessed efficiently when needed. High consumption rate goods should have priority to quick access storage locations. This can mean that they are stored near the entrances of the warehouse or close to loading points if goods can be stored outside. (Kembro 2018, p. 892)

Collecting and packaging the goods can sometimes be combined to a single step. In large warehouses where a pallet of goods is the smallest unit, packaging is usually left out as it is more convenient to move the pallets separately. At smaller places where products can be collected by hand or by machine packaging comes into the equation. To make collecting easier in both situations goods should be easily accessible, so that time is not wasted trying to get to the goods that are needed for the delivery. If goods are sold in smaller sizes than pallets, the ones that are picked should be on ground level. If this is not possible and some products need to be stored in shelves, necessary equipment should be provided and used when dealing with such goods. By simplifying the process of collecting the amount of time can be significantly reduced and spent more efficiently on other processes. (Kembro 2018, p. 892-893)

Once the orders have been collected and packaged, they are ready to be shipped to the end customer. Orders that have been collected and sorted will be loaded to carriers taking the goods to the end customer or in some cases a larger distribution centre. (Kembro 2018, p. 893) Shipping is nowadays the step that is carried out by a 3rd party logistics provider. By turning to a company that is focused solely on transportation and distribution, companies can save large amounts of money by not having capital invested to transport vehicles and services. By moving the transportation away from you own business companies can focus more on providing better products and services. The negative side is that after the deliveries are in the hands of the 3rd party company, the original provider loses control over the goods and cannot be sure that they will be delivered on time. (GEP 2022)

2.4 Warehouse layout

A warehouse layout is used to best utilize the space currently available at a specific warehouse. Organisations that can build their own warehouse should plan beforehand what kind of layout they will be using in their day-to-day activities to minimize the unnecessary time goods spend at the warehouse. With a good design the flow of the warehouse will improve significantly. (Learn Hub 2021) Companies that cannot afford to build their own warehouse and must rent the facilities need to pay even more attention to this. With no control over the original layout of the warehouse they must spend time finding the best layout to be as efficient as possible with the given facilities.

With a good layout, productivity can also be increased as every step in the warehousing process can be more efficient. By reducing the time employees take to carry out their tasks, they can get something else done that they otherwise could not, due to a bad layout decision. This enables the employees to either do more in the same amount of time or focus more on keeping the warehouse clean. (Learn Hub 2021) If during the unloading process forklifts operating outside must deliver the goods to a certain spot within the warehouse, the unloading time per truck increases significantly. Alternatively, if they could unload the goods close to the entrance of the warehouse the time would be naturally reduced. Inhouse forklifts would then proceed to put the goods away to their designated spots.

2.4.1 Types of warehouse layouts

The three types that are widely recognized are the U-shape, I-shape and the L-shape Each of the layouts have their strengths and weaknesses but they all have a few things in common. The incoming and outgoing traffic are separated to minimize the bottlenecks that would emerge with traffic using the same exit. (Learn Hub 2021)

The U-shape is the most beginner friendly of these types and therefore best for new organisations that are getting into the warehousing market. The incoming and outgoing traffic are separated at both ends of the warehouse. This ensures that the goods can be unloaded, storaged and shipped efficiently as none of the steps should intervene with each other. Both the entrance and the exit are also on the same side of the building so space needed outside of the warehouse can also be minimized. (Learn Hub 2021)

The I-shape is mostly for larger corporations that have the capability to move large amounts of products through the warehouse daily. In this type of layout, the main benefit is the straightforward route through the warehouse. It can be seen as a tube where the goods flow from top to bottom. The entrance and exit are at the opposite ends of the warehouse, so risk of confusion where to go is also minimal. The downside to the U-shape is the extra space needed outside the warehouse to be able to operate at both ends. (Learn Hub 2021)

The L-shaped layout is most used at warehouses that reassemble the letter L. It can be seen as a combination of both the U- shape and the I-shape. It shares the benefits with the other types and adds a few things of its own. Entering and exiting are once again made simple with them being at the other ends of the warehouse. The challenging part in this layout is the interior where the storage space may be limited with the incoming and outgoing space needed. The space needed outside is also efficient with the entrance and exit nearby each other but still clearly separated. (Learn Hub 2021)

3 Warehouse management

3.1 Principles of warehouse management

Warehouse is often a building or space that companies use to store their products into. Warehouses need to be supervised and managed. Otherwise, there would be no clear idea what the warehouse consists of and the number of products currently warehoused. There can be several reasons for companies for warehousing. These can range from:

- Momentary warehousing
- Uncertainty of suppliers
- To ensure better customer service
- Minimizing ordering costs
- Financially better production cycles.

Warehouse management takes care of the distribution and supervising of products. It can be seen as one of the basic methods in logistics. Companies use warehouses to store products that have varying consuming patterns. Certain products can be season bound and are otherwise rarely purchased. In some cases, companies may buffer their inventories to prepare for seasonal rises in demand. This causes the inventories to vary between seasons. Therefore, companies need to understand when to buff up their inventories and when can they keep the volumes low. This requires understanding of the field they are operating in to prepare in advance. (Karrus 2005, p. 34-35; Logistiikan maailma 2021)

Most cost-efficient way to operate a warehouse is to ensure that all orders can be delivered but at the same time to ensure that the amount of product in stock will not be too high. Typically, companies have several products that they offer. The demand of the products varies, and the inventories need to be adjusted accordingly. If some products are included in every order, naturally their inventories need to be higher than for products that are not sold so often. (Karrus 2005, p. 35-36)

Using ordering points companies can estimate when to order more stock. When the current stock goes below the ordering point, the company should order more of the product. Ordering points need to consider the time for the products to arrive to the warehouse. Tight schedules might cause shortage if something were to happen during transportation for example. The ordering point can be calculated when the average consumption of a product is known within a specific period, and the delivery time and the current stock level is known. (Sakki 2014, p. 84)

Dividing the warehouse into usage stock and safety stock helps to understand the need of the products. Usage stock holds an amount of product that will most likely be purchased by a customer. Safety stock is used to prepare for outbursts or quick demand of products. The quantity of the safety stock should not exceed maximum inventory size. With inventories too large the costs ramp up quickly as the products are not moving, and in worst cases need to be destroyed as they are not usable anymore. The number of products in both usage- and safety stock need to be determined. Management needs to analyse the demand of the products and adjust the limits accordingly. This ensures that each product has a specific limit. (Karrus 2005, p. 36-37)

3.2 Formulae used in warehouse management

To achieve better solutions in warehouse management, many people have started to use mathematics to help their processes. There are formulae to calculate the Economic Order Quantity (EOQ), which tells you how much of a certain product you need to order to fulfil your customers orders. EOQ is calculated by multiplying the yearly demand and ordering expenses together and then again by 2. This result is then divided by the cost of warehousing of the specific product to find out the optimal ordering amount. This specific formula should only be used with products that have a steady consumption rate, as you need the yearly demand to calculate the ordering amount. Items with a low consumption rate, should not be used with this formula as the results may be varying. (Koivisto E. & Ritvanen V. 2007, p. 34-35)

$$EOQ = \frac{2\mathrm{RC}}{\mathrm{H}}$$

H = Cost of warehousing for one product
R = Yearly demand
C = Order cost / order

Another important formula is the inventory turnover rate. This tells the user how fast the products are moving through the warehouse or if some of them are not moving at all. The rate can be found out by dividing the yearly usage or sales price with the average procurement price of the products. One must also remember that even if certain products have low turnover rates, but their profit margin is higher, the low turnover rate is not necessarily a problem in certain situations. Both formulae are used to ensure low inventory levels and that the stock levels of products remain good. (Koivisto E. & Ritvanen V. 2007, p. 36–37)

$$Inventory\ turnover = \frac{Cost\ of\ goods\ sold}{Inventory\ value\ (average)}$$

When calculating the inventory turnover, the principles of the calculations should be acknowledged. Calculations need to be done using the same values. When calculating the value, the calculations should be done in monetary units. The formula above works the best in cases where the turnover rate is focused on raw supplies. When calculating the turnover of finished goods, the formula below works better.

$$Finished\ product\ turnover = \frac{Cost\ of\ production}{Inventory\ value}$$

Following the average turnovers might be challenging and therefore the turnover is usually calculated with the value at a specific time. This value tells the user the average time that goods spend within the warehouse.

$$Turnover\ rate = \frac{365(d)}{Turnover}$$

The turnover rate tells us how many times your inventory rotates during a specific period. When calculating the yearly rate, the information can be found from company's financial statement for the year. (Sakki 2009)

As discussed earlier, companies can use ordering points to determine a stock level when an order needs to be made. With the necessary information available the formula to determine an ordering point is the following:

$$T = DL + B$$

T = Ordering point

D = Average consumption

L = Time of delivery

B = Current stock

4 Inventory management

4.1 Inventory management theory

Inventory management is used to understand the current situation and movement of products through a warehouse. Formulas mentioned above can be used to help managers to keep track of inventories and plan operations ahead of time. Making orders is also closely tied to inventory management as the re-ordering points can be utilized in the re-ordering process. (Krichen & Jouida 2015)

One of the main problems in inventory management is the fact that it requires information from several sources. These sources are the suppliers, retailers, and customers. Therefore, companies need to study the current market situation to understand the current need of supplies. Wrong calculations and assumptions could lead to too large or small inventory levels. Inventories should be matched so that the current orders can be delivered, but at the same time trying to keep the inventory levels as low as possible. Low inventory levels translate to a higher inventory turnover rate as goods are moving through the warehouse faster. (Krichen & Jouida 2015)

To ensure that inventories do not get too large and that orders are being delivered, the stock levels need to be reviewed on a timely basis. If neglected, there may arise problems in deliveries as some goods may not be in stock when they should. By reviewing the inventories, orders can be placed on time to ensure that the delivery rate remains at a high level. (Krichen & Jouida 2015)

While making orders it should be taken to account that the goods should be at the warehouse a few days before they are needed. This eliminates the risk of not having the goods in stock if something would have happened to the delivery for example. Planned deliveries with the goods arriving at the same day might be problematic as there could be delays with the transportation. (Krichen & Jouida 2015*, p. 57-58)*

4.2 Types of inventories

Inventories can be furthermore divided into different sections based on the type of product or goods they consist of. Raw material inventories are the first type of inventories, they consist of supplies used to produce certain parts of the finished goods or the finished product itself. The amount of inventory of these goods may wary based on the total production of the warehouse or factory. (Veeqo 2020, p.11)

The second type of inventory is the goods that are still in the process of being manufactured, so called work-in-progress inventories. Not all goods are finished immediately and sometimes they need to be stored for a while to wait a different process to be ready. Once they are ready to be moved onwards, they go to the next step of production and storing. (Veeqo 2020, p.11)

The third type of inventory consist of the finished goods that have been produced or moved to a warehouse for storage. The size of finished goods inventories varies between the types of facilities they are stored at. Factories that produce the finished good usually tend to move the goods forward to distribution centers and warehouses to wait further deliveries to end clients. (Veeqo 2020, p.11-12)

The last two inventory types are not directly linked to the finished goods but serve more as utility inventories, aiding in the production. The first one of these utility inventories is made up from the machines, repair tools and operative products such as clothes and computers. The second and last type of inventories is the packaging materials used to package the finished goods. These can be things like cardboard, bubble wrap and different types of tapes. One thing common with all these different kinds of inventories is that their size varies a lot based on the facilities. (Veeqo 2020, p.12)

4.3 Inventory management

ABC inventory management system is an enhancement of Vilfredo Paretos 20/80 theory. Pareto found out during the 20th century in England that 20% of the inhabitants contributed around 80% of the income. This theory has been used widely by other mathematicians and they have come to the same conclusion within their research. Therefore, with the usage of this theory, we can conclude that:

80% of products bring around 20% of net sales

- 20% of the products bring 80% of the profit
- 20% of the products make up 80% of the warehouse
- 80% of all returns and delivery problems come from 20% of the products.

These numbers do not necessarily reflect the whole truth and they are just examples. In most cases they are still closer than the 50/50 split.

The implementation of the 20/80 theory can then be followed with the ABC method. There are five different classes that the products are placed in depending on their value for the company and customers. The five groups are:

- Group A = Products that make up 50% of the sales
- Group B = Products that make up 30% of the sales
- Group C = Products that make up 18% of the sales
- Group D = Products that make up 2% of the sales
- Group E = Products that have no sales or consumption.

A good time to categorize each product into groups is either during the end of the year or during a sales season. To understand the demand of the products within the warehouse, this categorizing should be done at the end of the year. When categorizing these products, it is important to remember to categorize individual products and not product groups. When each product has its own category, one can clearly see which products require more attention and which ones can be moved down on the importance line. (Sakki 2009)

The group status of each product needs observing after a specific period. This needs to be done to keep the warehouse operating smoothly. With the observations made the products can then be moved from group to group, depending on their demand for the period. Products in group E that have not seen movement for longer periods should be re-evaluated, whether to keep them in stock at all. (Sakki 2009)

The ABC method gives data about past demands. It should not be relied on too heavily when planning things for the future. It gives companies an easy-to-follow structure that can be helpful to plan orders in advance if the demand is expected to remain the same. (Sakki 2009)

4.4 The bullwhip-effect

When monitoring inventories, there is usually fluctuation to be seen among the goods. This is caused by the uncertainty of customer orders and the current market situation. In some cases, companies may order large amounts of goods and thus the warehouse needs to adjust their stock levels accordingly. If the warehouse does not realize that this fluctuation is caused by some seasonal rush or a sales campaign, they might increase their stock levels too high. This causes the stock to move up and down as there is never a certainty of how the customers are going to react. If the warehouse is hoarded full of goods, it can take several months for the situation to even out. (Sakki 2009)

The bullwhip-effect is usually a result of lack of communication within the chain. Companies are focusing on themselves and do not communicate their situations with each other. This information does not need to be anything significant, just a heads up for each other how the situation will be for the upcoming weeks or months. There will never be a situation where all the stock is perfectly balanced, but with communication with business partners the potential delivery issues can be dealt with beforehand. (Sakki 2009)

4.5 Purchasing and ordering methods

There are several different methods organisations can use in their purchasing or ordering process. The method used should be determined by the consumption of products and adjusted accordingly. Products with low demand should not be ordered in large quantities and goods that have regular orders should not be ordered in small amounts. These methods can be divided into three main groups that most ordering styles fall into.

The first style is ordering goods and supplies in bulk. This method is great for companies that know there will be movement for the goods, and they will not store them for long periods of time. Bulk orders will allow the company to save money in transportation costs, as the need to order goods specifically on order is minimal. The negative side of bulk ordering is the case that your goods become undesirable for the customers. This results to large inventories that tie up a lot of capital that could be spent elsewhere within the company. (Veeqo 2020, p. 20)

The other style of ordering is called dropshipping. This method is suitable for organisations that do not have warehouses of their own but are able to deliver goods to clients with agreement made with 3rd party organisations. Orders form the clients are forwarded to the suppliers holding the goods and deliveries will be carried out by the supplier. This style contains low initial investment but good negotiating skills to strike deals with the suppliers to carry out your orders. The downside is that the supplier could easily push you out by starting to take the orders directly from the customer. Another flaw with this style is that the control over the deliveries is non-existent because a 3rd party organisation is handling them. (Veeqo 2020, p. 20-21)

The third and last method is the just-in-time order style. The main purpose of this method is to ensure low turnover times at the warehouse. In an ideal case goods would be arriving and leaving on the same day or within a couple days of the arrival to the warehouse. When carried out efficiently this method can produce good results as goods are not spending unnecessary time in the supply chain. The size of inventories can also be lower as goods would not be needed to be stored for long periods of time. A drawback of this style is that it requires a lot of monitoring. If ordered goods are not leaving within a few days of the arrival, they end up taking space from the warehouse that could have been utilized more efficiently. Small disruptions in the supply chain will also cause problems as deliveries will be late and the goods cannot get to the hands of the customer on time. (Veeqo 2020, p. 21)

4.6 Forecasting and understanding demand

Forecasting and demand observing have played important roles in the manufacturing process from the beginning of factories and production. The importance of understanding how much you are expected to produce is a key factor in doing business. Digitalization has brought ERPs to help with better understanding the need of products as well as the amount of goods to be produced. In the 21st century with many different parties contribute to the end-product, communication between these parties has become one of the main factors. To help with communication organisations are using shared platforms that all the parties have access to. This way each party in the supply chain has access to the necessary information. If problems would arise, the time to react is lower as the information is available more widely. (Avittathur & Ghosh, 2020 p. 19-20)

To understand the need of forecasting, the organisation needs to understand how they want to approach their production. Whether they are preparing in advance by ordering large inventories or preparing goods by orders, impacts the forecasting and demand understanding processes. By producing large quantities of goods, the forecasting is not that important as you are continuously filling your inventories as products leave. This could cause certain goods to stack up heavily if they do not see any movement. This method should need inventory monitoring to avoid products of being ordered while there are no orders for the products. (Avittathur & Ghosh, 2020 p. 19-20)

The other method focuses more on producing goods to order. This ensures that the goods do not sit on the shelves of the warehouse for too long. The trouble with this method is the forecasting as you can not foresee all the customer orders beforehand. The positive side is that the goods move quickly through the warehouse as goods are not heavily stocked up. A lot of forecasting and communication between customers is needed to understand their needs. As already discussed earlier the deliveries need to be scheduled to the warehouse a few days before the delivery to the customer. When conducted efficiently this method provides low inventory levels with high inventory turnover rates. If correctly done the size of the warehouse could also be lower as the need of shelf places would be lower. (Avittathur & Ghosh, 2020 p. 19-20)

5 Digitalization

5.1 Challenges of Digitalization

Electronic Resource Planning systems (ERPs) have become the standard in the field of logistics. They provide a central database of the operations within the company. Employees have access to the data of the whole chain to help them troubleshoot possible problems. The problems that come with the ERPs is that many companies have their ERPs tailored to their own needs. This may cause challenges as the same things may be coded differently between business partners. In some cases, even the departments of a same company might have different codes. This causes unnecessary problems that could have been avoided by setting standards to follow. (Haapanen et al. 2005, p. 79-80)

With new technologies being developed every day, it is hard for the managers in companies to decide which programs and tools should be used in their own processes. If the field is having heavy competition, staying on top of digitalization can be necessary to remain at the top. This may cause companies to spend large amounts of money on services that may not be fully operative and cause more trouble with the troubleshooting needed. (Sardar 2020, p 51-52)

5.2 Opportunities of Digitalization

The most valuable benefit of digitalization has been the implementation of ERPs. The centralized database works nowadays as a base for most organization day-to-day use and most tasks are carried out using ERPs. Depending on the ERP in use, the ease that all departments have the same information accessible, is a significant time save compared to the days where everything had to be communicated via phone, mail, or email. Nowadays companies are starting to add and provide services to their suppliers and customers so that they too can access the order data necessary to them. This has made the communication between parties a lot smoother compared to what it used to be before the integration of these systems. (Sardar 2020, p. 57-58)

Artificial intelligence (AI) and the implementation of block chains have provided companies means to further connect their processes. When paired, the results have been an increase from where the ERPs left. They have further improved the transaction speed, communication, data transferring and by the same time made the supply chains better managed. (Sardar 2020, p. 60-61)

6 Research Method theory

6.1 Research methods background and tools

Theory's impact on qualitative research is obvious and therefore it is necessary to conduct successful research. Theory is used to back up the methods, the ethic of the research and the reliability of the research. Typical data collection methods in qualitative research are interviews, questionnaires, observing, and knowledge based on documents. These methods can be used separately or linked together to achieve a broader view on the topic. (Tuomi & Sarajärvi 2009)

Empiric data will be gathered by conducting interviews for the current employees to find out their opinions. This will be done as a qualitative interview as the number of answers would be too low for quantitative research. The research tool used to conduct the research, will be Google Forms to aid data gathering. This should be an easy-to-use platform together with the possibility to analyse the data efficiently.

The main usage of qualitative questionnaires is to find out the experiences and perspectives of the target group. By encouraging people into conversations, the conductor of the questionnaire can get more information out of the participants. Main advantage of qualitative research over quantitative is the fact that you can recognize problems better. With large groups it might be hard to receive specific information. By conducting the research by yourself you can affect the outcome of the questionnaire. (Oxford Academic 2016, p. 498–501)

6.2 Interviews

Interviews provide better insight than questionnaires as the interviewer can achieve better answers when knowing what to focus on. The quality of answers may vary as there are employees with different amounts of experience. The structure of the interview can vary depending on the situation. Some cases require a highly structured interview, where in some cases it is better to have a looser interview with conversation flowing more naturally. Interviews are commonly arranged with the interviewee to ensure that they have time to answer to your questions and thus provide a better quality of data for your research. In certain situation they can also just happen by accident if you meet someone with a lot of expertise on the topic by accident. (Saldaña 2011, p. 32-33)

Choosing the right interviewees is vital to achieve relevant data necessary to your topic. If the interviewees are lacking expertise on the topic, they cannot provide relevant information for the research. Understanding what you need to know and from who is necessary when conducting interviews. Time has a heavy influence on how many interviews can be conducted. Interviews take longer to conduct than questionnaires but can provide more accurate data when done well. The downside to interviews is the limitation of how many people one can interview. Questionnaires can be dealt out and receive a lot of answers, but in interviews the target group need to be decided and limited. The more answers one will receive during interviews the better the data becomes with a broader range of answers. More answers are better, but limitations need to be made to save time. (Saldaña 2011, p. 33-34)

A good preparation and well thought interview questions will make the data collection process more efficient. The place should be selected and agreed on beforehand, if possible, to ensure that both parties feel comfortable in the situation. A quiet space with no distractions is usually recognized as the best to ensure good results. The questions asked should also be thought on in advance. They should be prepared in a way that the interviewee cannot answer yes or no. This way the answers will have more information to them, and the conversation will be better between the parties. The time agreed upon beforehand should be respected to not draw out the interview for too long. (Saldaña 2011, p. 34-35)

6.3 Qualitative research analysis

Thematic analysis is used as an analysis method when certain topics are expected to come up from the data. These patterns can be similar answers that are tied to a specific problem or objective. Similar kinds of behaviour or attitudes towards certain things can also be analyzed through the usage of thematic analysis. The interviewees can also be asked if they agree on themes that have risen in the earlier parts of the research to further validate gathered data. Backing up the findings with facts from the data makes the results more trustworthy better accepted. (Merriam & Grenier 2019, p. 222-223)

Comparative analysis as the name implies, compares two perspectives against each other. Comparative analysis is mainly used when analyzing theories and the differences and similarities between them. It can also be paired with thematic analysis if there have been made at least two or more interviews or data gatherings. Being clear about which topic is being compared to another topic is vital, while making a comparative analysis. By providing examples between the differences of the two data sources, the analysis becomes clearer to the target group. The results of the analysis should provide recommendations and an informative conclusion about the analyzed topic. (Merriam & Grenier 2019, p. 223-224)

Documentary analysis is analysis conducted on a source of information. The source can range from books and articles to pictures, programs, or recordings. In most cases sources are secondary sources that have already been analyzed by someone else but are further inspected and utilized when analyzing certain topics. When deciding which documents to utilize in the analysis, it is important to be modest, so that the range of data does not get too large. If choosing a too large database, the process of analyzing the data can become too large. By setting limitations the analysis does not get too wide and thus provides more specific and better results. The access to internet has provided a lot of good sources but also the problem of spreading the data sources too wide. Making necessary limitations will provide better results rather than spreading the scope too large. (Merriam & Grenier 2019, p. 225-228)

7 Data collection and analysis

7.1 Conducting the interviews

The research will be done by conducting interviews to the current staff working at the warehouse. Combined with the analysis of the current situation at the warehouse and understanding what takes unnecessary time, solutions can be made. For ethical purposes all the interviews will be conducted anonymously. This will encourage the employees to be more open. Permission to conduct the interviews will be asked from Rockwool.

In total five of the current employees were interviewed for this research. Not all the current employees were interviewed as some of them have been with the company for a short period of time. Therefore, a limitation of minimum six months of experience at the warehouse was made for the interviewees. The target group consisted of employees operating both inside and outside at the warehouse. The interviews were conducted following a semi-structured interview method to make the data collection process more natural.

7.2 Data analysis

All the interviewees agreed on that the warehouse is currently operating well. Arguments for this were that orders leave the warehouse with a high percentage and only rarely orders need to be cancelled due issues at the warehouse. Another reason that also rose in the answers was the experience of the employees, combined with good communication ensured the good operating of the warehouse. (Appendix 1., Question 1)

When asked what changes the employees would like to make if given the opportunity, the ease of access to the goods and moving the collection area closer to the exit were the two main points that stood out. Currently forklifts operating outside need to travel inside of the warehouse to collect certain product groups. These goods need to be stacked in a specific way to ensure that they meet their maximum stock level. Mainly the employees operating outside wanted to see a change in this. What all the interviewees agreed on, was moving the collection area closer to the entrance and exit. This would reduce the driving that the large forklifts need to do inside the warehouse and reduce loading times. (Appendix 1., Question 2 & 3)

The process that takes the most amount of time for the employees was divided whether the employee operated inside or outside. Employees inside stated that storing of arriving goods was the step that took the most amount of time. Employees outside listed loading trucks with orders from the inside and unloading acoustic panels as the most time-consuming processes. Paired with the next question about opinions on the loading and unloading process, the most problematic part is the loading and unloading of goods inside the warehouse. The theme with answers to this question was the need for a specific unloading area. Currently arriving goods are scattered around the warehouse which takes time for the forklifts outside. (Appendix 1., Question 4 & 5)

The strong- and weak points of storing involved about proper ordering of goods and the space limitations providing challenges. The main point was that if orders are done properly the goods have enough space to be stored at the warehouse. The problems begin when incoming goods exceed their maximum stock levels. Product groups that cannot be stacked require more space and product groups should also be kept separated according to the interviewees. (Appendix 1., Question 6)

The inventory management question divided the answers to the ones working inside and outside of the warehouse. On the outside of the warehouse the situation was good since the production country of the goods was changed recently. On the inside self-collection orders were causing a lot of issues. Customer sometimes forget their orders at the warehouse and certain special goods can remain at the warehouse for months or years. These orders take up space from other goods that are moving through the warehouse quicker. The ABC management method did not affect the employees at all, most of them didn’t even know about it. (Appendix 1., Question 7 & 8)

The problems that the employees were facing can once again be separated in to the inside and outside group. On the outside, the problem that took the most amount of time was the movement of goods during the transport. The pallets need then to be unloaded one at a time and corrected manually. This could be avoided with proper tying of the transportation. On the inside the most problematic issues were too closely stacked pallets and bad shelves for the goods at the warehouse. Too closely stacked pallets can cause unwanted contact with the other pallets and in a worst case even damage to the goods. The shelves in some sections are not suitable for all the goods that need to stored utilizing shelves. They are either too wide or too narrow depending on the type of goods stored in them. (Appendix 1., Question 9)

When asked about digitalization all the employees listed things such as tablets or scanners for each truck, and the reduced amount of paper needed in everyday actions. The tablets could reduce the mistakes done in collection and loading processes. The reduced amount of paper is just more environmentally friendly and removes the storing of the documents at the warehouse. (Appendix 1., Question 10)

Strengths, weaknesses, opportunities, and threats (SWOT) analysis is a way to analyse data gathered from several sources. It functions more as guidance rather than something organisations need to follow directly. (Investopedia 2021) To visualize the answers from the interviews a SWOT table was made. The table sums up the answers gathered from the interviews and presents them in a clear way.

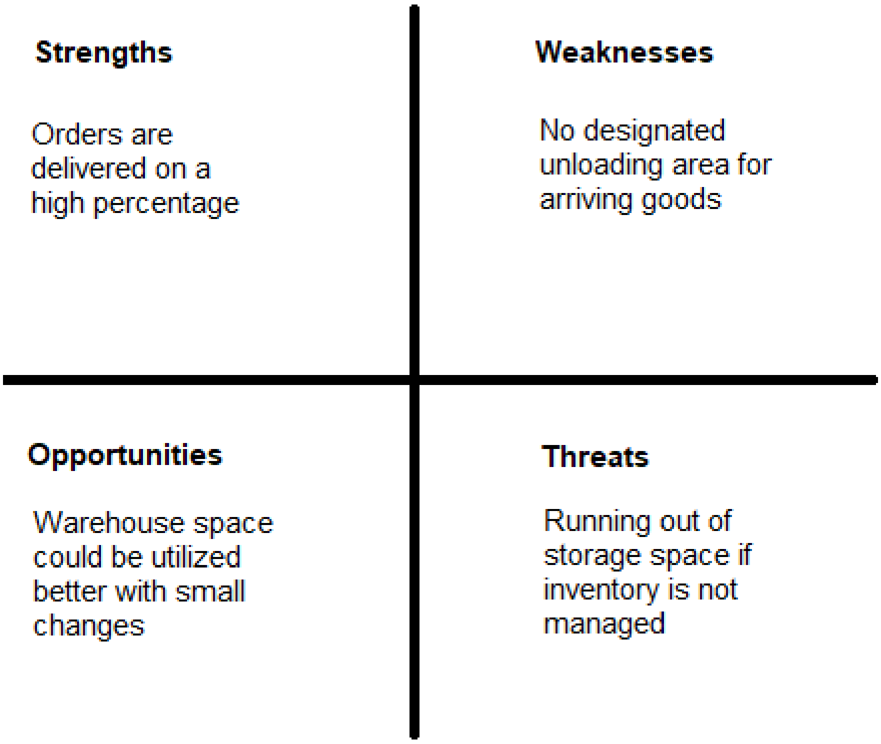

Figure 2: SWOT Analysis based on interviews (Soinola, 2022)

8 Conclusion

8.1 Proposed changes

To answer the research question and based on the interview answers and own experiences, the collection area could be moved closer to the entrance and exit. This change could reduce the loading times of goods that need to be retrieved from the inside. The acoustic panels would also be moved away from the place that gathers most dust, so the packages would also be in better condition and shape. Gaining access to the one corner of the warehouse could also ease the situation as more space could be utilized and product groups could be kept separately, as seen from the table below.

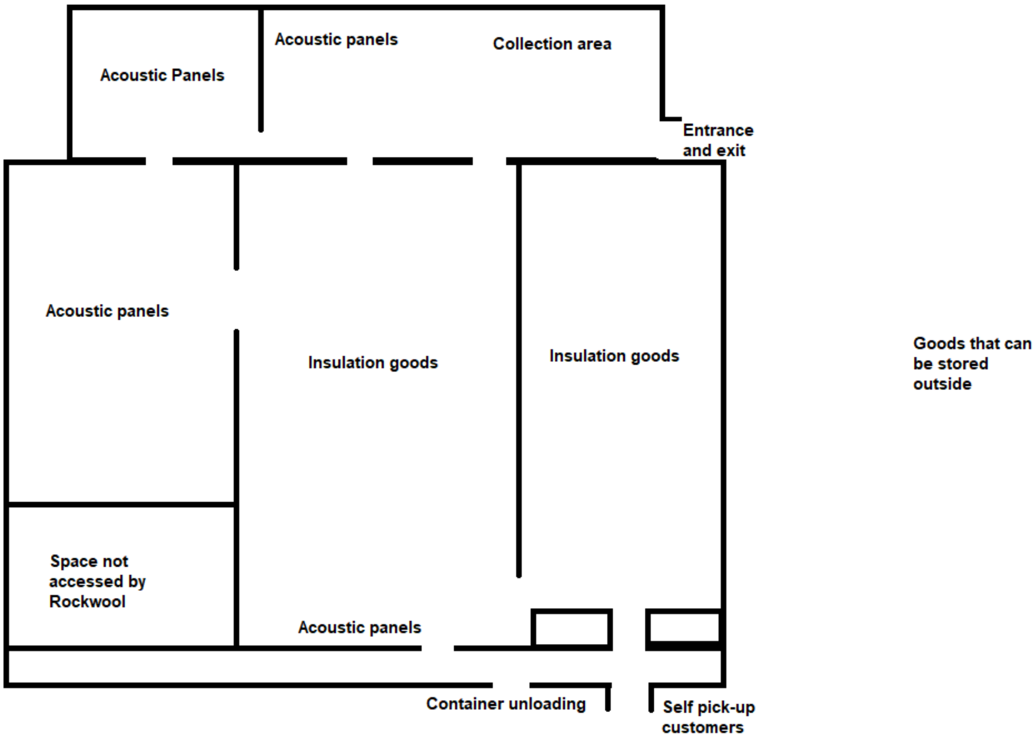

Figure 3: Rockwool Warehouse layout with proposed changes, (Soinola 2022)

The downside of the current warehouse layout is the fact that it only has one entrance that also operates as an exit. This causes all the traffic to go through the same door which is slower than having access to a separate entrance and exit. Currently this is not quite possible with the nature of the layout. Therefore, with the proposed changes, the time that trucks spend at the warehouse could be reduced and the loading process made faster.

8.2 Final thoughts

Overall, the warehouse of Rockwool Finland is operating well. Based on the interview results the employees feel the same way. Orders leave the warehouse on a high percentage and incoming goods can be stored relatively well. The problems lie currently within the warehouse layout itself. With only a singular exit that also operates as the entrance for incoming and outgoing goods, traffic at the warehouse can get hectic. The lack of a specific unloading area causes extra work as the goods need to be placed in certain areas for the storing process. This combined with the collection area for orders being at the other side of the warehouse causes a lot of unnecessary traffic inside the warehouse.

Rockwool Finland Oy should also monitor their stock more frequently to ensure that goods do not stay at the warehouse for too long. Deadstock should be cleaned away at least once a year to open space for new goods and product groups. With better stock monitoring the orders for new goods can also become more efficient and follow the maximum stock levels placed for them in the ERP. By conducting these few steps, the warehouse should be able to function better at the inside where space is already at a limit.

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Appendices

Appendix 1. Questionnaire for Rockwool Finland employees

1) How is the warehouse currently functioning in your opinion?

- if well, why?
- if not, why not?

2) What are your thoughts on the current warehouse layout?

3) If you had the opportunity, what changes would you implement to the current warehouse layout?

4) What process takes the most amount of time?

5) What are your opinions on the current unloading and loading process?

6) What are the current strong points in storing the goods?

-What about the weak points in storing?

7) What are your thoughts on the current inventory management?

- Are products spending little time at the warehouse
- Is there a lot of deadstock that does not see movement?

8) How is the current ABC – stock management carried out in your opinion? Is it clear enough?

9) Are there any problems currently that slow your daily operating?

10) What benefits could digitalization bring to the warehouse?