



Possibilities of Finland-China Railways to Finnish Companies

Case Valmet Technologies Oy

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Abstract

The entire world's trading system, trade relations and global supply chains have faced problems that have led to global supply chain disruption. The attitudes in society have changed and the public is more environmentally aware where companies are shifting their operations in the same direction. Hence, Finnish companies have increased interest towards rail transportation as an option in addition to road, ocean and air freight modes.

The objective of the research was to assess what opportunities and limitations the utilization of the Finland-China railways offers to Finnish companies. The research adopts a qualitative approach and was carried out as a case study. Primary data was collected by interviewing two Valmet Oyj experts, and secondary data was collected from the company's website and annual reports. The theoretical framework presented in the literature review guided the design of the interview questions. The research questions guided the analysis, coding and interpretation of the empirical research results.

The findings reflect both the opportunities and issues faced by Finnish companies when utilizing the Finland-China railways. Moreover, the findings underscore the need for strategic considerations and collaborative efforts to overcome limitations and maximize the potential advantages offered by this evolving freight transportation mode. By using, rail transportation Finnish companies can gain a competitive advantage compared to other European companies through shorter transit times, cost-effectiveness and reach the targets of more sustainable supply chain operations.

Keywords/tags (subjects)

competitive advantage, supply chains, rail freight, Belt and Road Initiative

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Tiivistelmä

Koko maailman kauppajärjestelmä, kauppasuhteet ja globaalit toimitusketjut ovat kohdanneet ongelmia, jotka ovat johtaneet maailmanlaajuisiin toimitusketjujen häiriöihin. Asenteet yhteiskunnassa ovat muuttuneet ja ihmiset ovat yhä ympäristötietoisempia, joka on saanut myös yritykset muuttamaan toimintaansa samaan suuntaan. Tästä syystä suomalaisten yritysten kiinnostus rautatiekuljetuksia kohtaan on lisääntynyt lisänä maantie-, meri- ja lentorahti-kuljetusmuodoille.

Tutkimuksen tavoitteena oli arvioida, mitä mahdollisuuksia ja rajoituksia Suomi-Kiina-rautateiden hyödyntäminen tarjoaa suomalaisyrityksille. Tutkimus oli kvalitatiivinen ja se toteutettiin tapaustutkimuksena. Primääridata kerättiin haastattelemalla kahta Valmet Oyj:n asiantuntijaa ja sekundääridata kerättiin yhtiön verkkosivuilta sekä vuosikertomuksista. Kirjallisuuskatsauksessa esitetty teoreettinen viitekehys ohjasi haastattelukysymysten suunnittelua. Tutkimuskysymykset ohjasivat empiiristen tutkimustulosten analysointia, koodausta ja tulkintaa.

Tulokset heijastavat sekä mahdollisuuksia että ongelmia, joita suomalaisyritykset kohtaavat hyödyntäessään Suomi-Kiina-rautateita. Lisäksi havainnot korostavat tarvetta strategisiin päätöksiin ja yhteistyöhön rajoitusten vähentämiseksi ja tämän kehittyvän rahtikuljetustavan tarjoamien mahdollisten etujen maksimoimiseksi. Rautatiekuljetuksia käyttämällä suomalaiset yritykset voivat saada kilpailuetua muihin eurooppalaisiin yrityksiin verrattuna lyhyemmillä kuljetusajoilla, kustannustehokkuudella ja saavuttaa tavoitteensa kestävämmistä toimitusketjuista.

Avainsanat (asiasanat)

Kilpailuetu, toimitusketjut, rautateiden tavaraliikenne, Belt and Road -aloite

Muut tiedot (salassa pidettävät liitteet)

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1 Introduction

1.1 Background

According to World Trade Organization (2021) in 2020 the Covid-19 pandemic dropped the global gross domestic product by 3.3% but economies adapted quicker to the situation than during the global financial crisis in 2008. The entire world's trading system, trade relations and global supply chains faced problems that have led to global supply chain disruption. Sheffi (2021) stated that demand for certain products rose when medical equipment was needed and people shifted to remote work needing technology devices, furniture and items for free time activities. Manufacturers had a vast gap between demand and supply because they faced issues with shortages of material and labour, the unavoidable closures of the production units and delays in shipping.

The freight transportation sector experienced strict restrictions early into the pandemic since the movement of personnel was restricted by quarantine orders (Sheffi, 2021). The aviation sector had to answer the global requirement to prevent the Covid-19 spreading which according to OAG Schedules Analyser (2021) led to the decrease of weekly flights among the global airlines by 69.9% from January 2020 to the beginning of May 2020. Carriers were not able to respond to the needed capacity when the sea- and airports were congested and containers waiting to get back into circulation which led to rising interest towards rail freight between Asia and Europe (Uygun & Ahsan, 2021).

The time of pandemic has proven that global value chains are more vulnerable to cut-offs and shocks but at the same time offer resilience, adaptability and possibilities to share information and solutions to fight these factors causing the disruption (WTO, 2021). According to Sheffi (2021), the supply-demand equilibrium has stayed unreachable which is caused by the government's policy trying to revive the economy.

Belt and Road Initiative

Belt and Road Initiative (BRI) is an investment program and transcontinental long-term policy that aims to develop infrastructure and enhance the economic integration of countries along the Silk Road historic route. President of China Xi Jinping established One Belt One Road in 2013 which was renamed to Belt and Road Initiative in 2016. BRI's official outline was issued by the People's Republic of China National Development and Reform Commission, The Ministry of Foreign Affairs

and The Ministry of Commerce on March 28, 2015, with the authorization of the State Council (Belt and Road Initiative, n.d.). BRI was established to improve the connectivity of Europe, Africa and Asia. Great investments in infrastructure need to be made if the enhancement of world trade is the objective and BRI is one of the most potential strategies for doing it (Martikainen, 2018).

BRI consists of six economic corridors but the three corridors that are designed to improve the trade network to Europe are the most important ones for this thesis. Below Figure 1 presents six corridors and the economic target area.

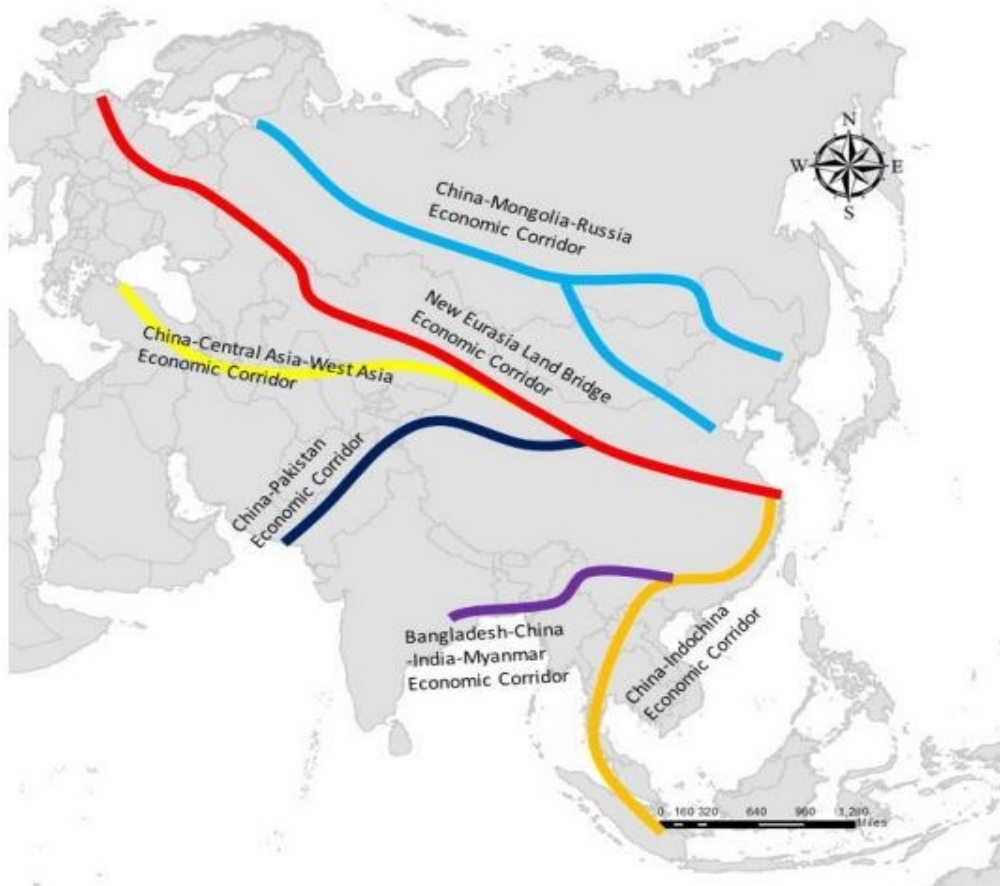


Figure 1. Six corridors of the Belt and Road Initiative (Derudder et al. 2018, p. 9)

The three most important corridors for the European Union (EU) are the China-Mongolia-Russia Economic Corridor, New Eurasia Land Bridge Economic Corridor and the China-Central Asia-West Asia Economic Corridor. According to Rodrigue (2020), these corridors have the existing infrastructure of railroads, terminals and ports and the development of those is one of the main targets of the BRI. The Trans-Siberian railway was completed in 1916 from Moscow to Vladivostok and it was mainly used for inland trade, but the Soviet Union offered the trade route for the West Europeans in the 1960s'. Rodrigue (2020) highlights that the political issues limited the adaptation of the

route and the collapse of the Soviet Union in the 1991 decreased the investment in the existing facilities which postponed the adaptation of the route for the West Europeans. The existing rail roads are called the Eurasian Landbridge and the entirety of it can be seen in Figure 2 below.

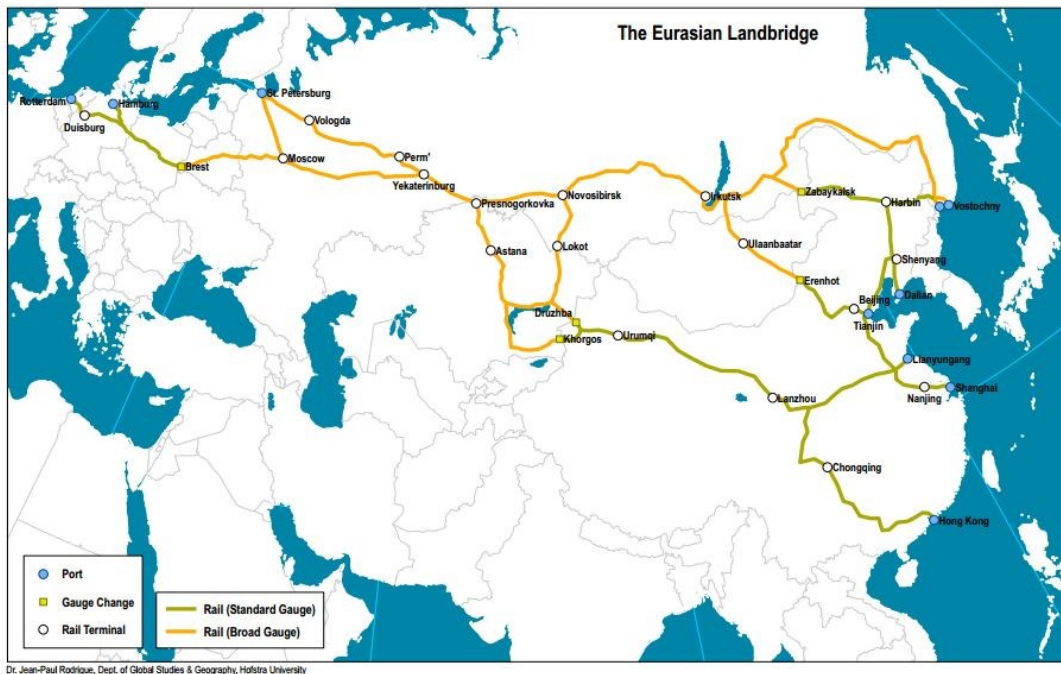


Figure 2. The Eurasian Landbridge (Rodrigue, 2020)

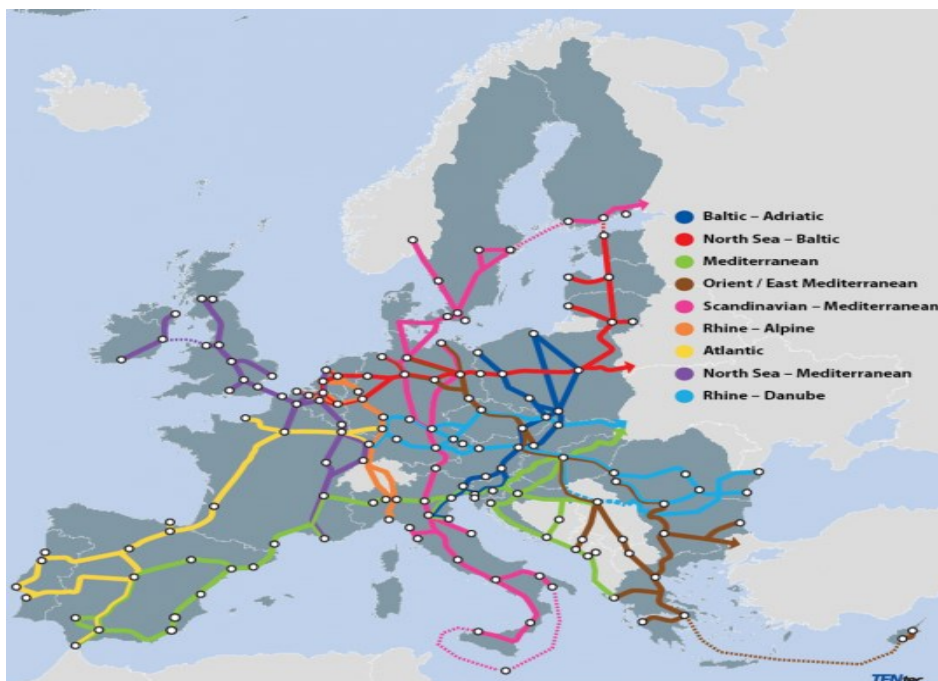
As Figure 2 illustrates the multinational Eurasian Landbridge has two different rail gauges: a standard gauge which is 1.435 m and a broad gauge 1.520 m. This creates a technical problem where the cargo needs to be reloaded at the border where the width changes. For example, cargo going from Hamburg to Beijing requires reloading twice during the journey which creates delays and additional costs even if the throughput facilities work efficiently transloading the containers from trains located side-by-side. From Finland to China the route is easier since it needs to be reloaded only once during the transportation. (Rodrigue, 2020)

Trans-European Transport network

Trans-European Transport Network (TEN-T) is the European Union's initiative whose policy is based on Regulation (EU) No 1315/2013. The objective of the TEN-T is to develop the infrastructure and enhance the economic, social and territorial integrity of the European Union (EU) in both passenger and freight traffic while eliminating bottlenecks and contributing to a sustainable standpoint and the EU's law on the environment. The target is to improve the usage of the infrastruc-

ture, its safety, reduce its environmental impact and improve its energy efficiency. These improvements are sought from digitalization, innovations and emerging technologies which the initiative is supporting (European Commission, 2021).

The network is dual-layered: the core network and the comprehensive network. The core network is planned to be ready by 2030 and the comprehensive network by 2050. Comprehensive networks consist of all the existing and planned infrastructure of TEN-T and the core network consists of the most strategically important parts of it (Regulation 1315/2013.) The core networks are divided into nine corridors which are the backbone of the initiative coordinating the development. The European Rail Traffic Management System (ERTMS) and Motorways of the Sea are two horizontal operators that support the Core Network Corridors. The European Commission has nominated the corridors two supporting operators, a European Coordinator, who oversees the development of the initiative in the particular corridor (European Commission, 2021). Finland is part of the Scandinavian-Mediterranean corridor but is also in relation to the North Sea-Baltic corridor despite this most of Finland is not part of any corridor. (see Figure 3).



Note: the nine TEN-T core network corridors are based on the CEF and TEN-T Regulations (1315/2013 & 1315/2013); they have been created as a coordination instrument to facilitate the completion of major parts of the core network of strategic importance.

Source: European Commission, Directorate-General for Mobility and Transport, TENtec Information System

Figure 3. TEN-T core network corridors (Eurostat, 2018)

Scandinavian-Mediterranean corridor ends at the border of Russia in Vaalimaa (road) and Vainikkala (rail). Regardless the core network corridors do not cover Finland widely the European Commission has categorized the Finnish core and comprehensive network. According to the Finnish Transport Infrastructure Agency (n.d.), the core network in Finland consists of:

- Approximately 1100 km of road network
- Approximately 1360 km of rail network
- The Saimaa Waterway area
- The Helsinki and Turku hubs
- Helsinki and Turku airports
- The ports of HaminaKotka, Helsinki, Turku, Naantali
- The Kouvola combined road and rail transport terminal

These two initiatives have a close relationship since both the EU and China have interests in the usage of these routes but also The Eurasian Economic Union (EAEU) has made an input to decrease the customs regulations between the member countries Armenia, Belarus, Kazakhstan, Kyrgyz and Russia which has improved the trade through the whole Eurasian Landbridge (Rodrigue, 2020).

1.2 Motivation of the research

According to Hillman (2018) railway services between Europe and China have grown rapidly during the past ten years. The primary leader for the development has been China with their Belt and Road Initiative (BRI) which has provided subsidies and state media promotions for the development of transportation connections focusing on rail and ocean. Their target has been to connect China with the world by building new infrastructure and coordinating new trade agreements and policies for the transportation in different areas. Other countries have been endorsing these new routes despite the hesitance about the BRI project and its underlying objective.

The use of intermodal transport has increased and its growth is a prerequisite for the growth of rail freight. Rail's competitiveness is composed of the trend of environmental awareness, the reduction of carbon dioxide emissions and urbanization. In society, these factors are broadly identified and will change the competitiveness structure of the industry (Logistiikan Maaailma, n.d.). Carbon dioxide emissions created from transportation are the second largest source of emissions in

the EU and the EU has stated in 2011 that it must reduce them. Transportation is crucial for society and trade, but solutions to reduce emissions need to be found (Bask & Rajahonka, 2017). For the industry, the primary question is what would need to change so that more companies would choose rail and become regular users of it (Hillman, 2018). This research is aiming to understand the underlying challenges that stand in the way of needed change.

Since the attitudes in society have changed and the public is more environmentally aware companies are shifting their operations in the same direction. Freight transportation is one sector where companies can make more environmentally friendly decisions and make it to their competitive advantage (Bask & Rajahonka, 2017). From the company's perspective competitiveness of the rail comes from lower freight prices than air and faster than maritime. It provides an option between these two. (Hillman, 2018).

As presented in the previous subchapter 1.1, the Covid-19 outbreak has raised interest in rail freight transportation. When air freight transportation possibilities were significantly reduced, companies needed to consider other methods. Rail freight from and to China has been benefiting from the outbreak since they have been able to offer faster services than ocean freight and cheaper than air freight (Tardivo et al., 2020). A survey conducted in Finland by Hilmola et al. (2020) supports the statement that there has been a change in the transport mode choices and rail has had an increase in the volumes of freight.

These findings indicate that companies are interested in the rail freight transportation possibility but still hesitant to fully utilize the opportunity. Companies will benefit from this research because it will clarify the status of the rail freight transportation between Finland and China and research about the challenges that exists.

I have had an academic interest in logistics and how logistics actions contribute to a company's competitiveness and overall business. Through my position in the case company as a forwarder, I have deepened my knowledge of supply chain, logistics and transportation practicalities. By conducting the research, I expect to grow academic and professional knowledge which will be useful in the field.

1.3 Research approach and the structure

As described in the two previous subchapters, the disruption of the world trade and supply chains has raised interest in rail freight (Hilmola et al., 2020). However, the problem is that the rail freight has been in minimal use despite the existing railroad between Finland and China. The research objective is to understand the opportunities that the usage of the railway would bring to Finnish companies and detect the current issues around it. Since the objective of the thesis could be viewed in various perspectives, the focus of this thesis is declared with the research questions. The thesis is focusing on two research questions on the setting of the case company Valmet Technologies Oy.

- “What kind of opportunities will the Finland-China railways bring for Finnish companies?”
- “What kind of issues there are yet to be resolved?”

In order to be able to answer the research questions empirical study will be conducted and the nature of the research will be qualitative. The data will be collected by analysing relevant secondary data and conducting semi-structured interviews with industry professionals working with the supply chain in Valmet to obtain the status of the rail freight usage and the issues. According to Baxter & Jack (2008), the qualitative approach allows the topic to be viewed from different perspectives since data is collected from various sources and the contrast of these can be discussed which suits this research well. Data will be encoded and analysed based on the coding. Validity and reliability will be considered by using triangulation in the data collection.

Structure of the thesis

This thesis consists of five chapters. Chapter 1 “Introduction” discusses the background, motivation, research approach and structure of the thesis. Chapter 2 reviews relevant literature from the fields of business, supply chain management and logistics related to the research question and objective of this thesis, consolidating existing research data and critically develop understanding about the cohesion of these topics to this research. In the chapter 3 “Methodology” the research approach, data collection and analysis methods are explained and argued. Chapter 4 “Results” attempts to answer the research question by presenting the findings of the secondary and primary data collection. These findings in Chapter 4 are reflected in the Chapter 5 “Discussion” linking the

findings with the literature, discussing the limitations of the research, and finally giving recommendations for future research.

2 Literature review

Literature review was conducted in systematic way by defining key words and critically evaluating the relevant academic literature which was searched by using the key words in online data base searches. Analysis was made after further review of the literature and the results reported in this chapter. The chapter consists of three main topics: supply chain management, logistics and factors affecting the choice of transport mode. Topics are discussed separately in subchapters below (see chapters 2.1, 2.2, 2.3). Subchapter 2.4 presents the theoretical framework adapted from academic literature used for discussion and interpreting of the collected data.

2.1 Global supply chain management

In the world supply chains are everywhere, and we are dependent on global supply chains and logistics. Supply chains are co-operative and coordinated networks that work on towards the same objective of customer satisfaction. Supply chain is a series of activities and organizations along the way of the materials moving from the initial supplier to the end customer (Hsuan et al., 2015). It is controversial and depending on the associate how logistics and supply chain management (SCM) are defined, or are they perceived as the same. In this research SCM and logistics are defined as two different closely related activities that support each other and pursue the same target. SCM is about the relationships, linkages and strategy of the whole supply chain supporting the view of logistics where products and information flow through the organization creating and delivering customer value (Christopher, 2016).

There are three different activities through which the materials move in the supply chain. Organizational activities are in the middle and upstream activities supply materials into the organization from the initial suppliers. Downstream activities move materials outwards from the organization to the end customers. All these three activities are usually complex processes. For a company to produce their product or service several suppliers are needed to supply the material required in the production. Usually, the suppliers have already processed the material themselves and needed

raw materials to produce their output. Downstream activities can also consist of many stages for a raw material to achieve its final use (Waters, 2009).

According to Hugos (2018) companies in any supply chain need to make individual and collective decisions in the five areas of action. By doing so a company can have an internally efficient environment where the organization gets a return on assets such as investments in inventory and through this find ways to lower the costs of sales and operating expenses. These five areas and the linkages are illustrated in Figure 4 below.

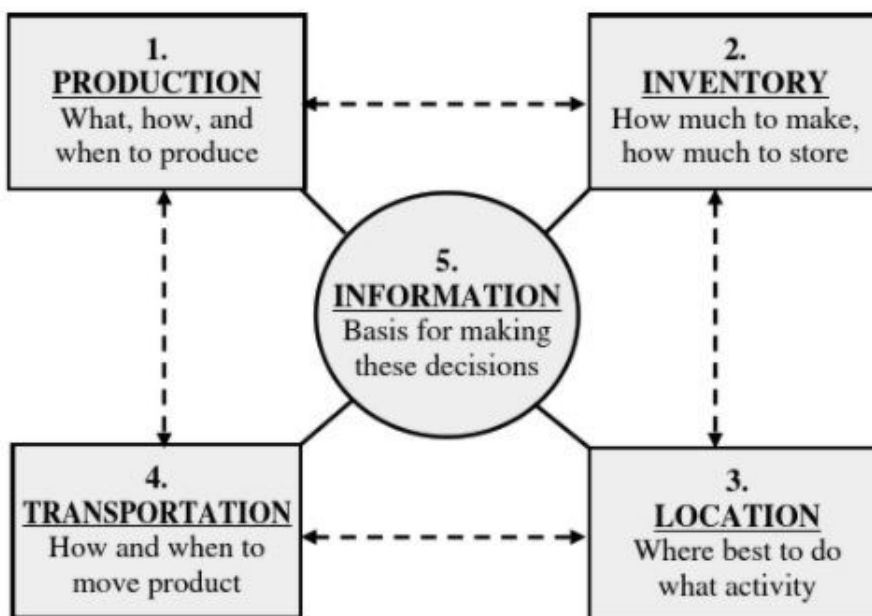


Figure 4. The five major supply chain drivers (Hugos 2018, p. 17)

Decisions in these areas will define the company's supply chain's capabilities and efficiency. When the decisions are made, the company can utilize them to the supply chain strategy (Fisher, 1997).

The concept of SCM still suffers from the deficiency of generally accepted definition even though the operations have been there for centuries. It is not astonishing since the term has become prominent in the 1990s (Hsuan et al., 2015; Hugos, 2018; Mentzer et al., 2001). Stevens wrote in the 1989 about SCM and pursued to explain the importance of SCM and adduced the benefits of integrated supply chain (Stevens & Johnson, 2016). The core idea is that with SCM we can influence the behaviour of the supply chain.

As earlier stated in this research SCM is seen as more than the logistic activities which are reviewed later in the chapter. SCM focuses on the relationships inside the supply chain and to the

effectiveness of the supply chain to deliver customer satisfaction rather than to individual actions effectiveness in the supply chain (Prater & Whitehead, 2013). SCM acknowledges all the logistic activities and supports those while pursuing performance improvement of the supply chain (Hugos, 2018).

Strategy decisions can be considered as the most important decisions that are made in the company. The purpose of strategies is to guide the company in the long term and support the company to accomplish and retain their competitive advantage within the industry (Porter, 2004). Strategic decisions are made at the various levels of the company. Mission and vision give a direction and generic purpose to the whole organization. Company to reach its mission and vision they need to designed corporate strategy which will propound how the corporate functions operates co-operatively and describes the level of diversification and marker position. Inside every corporate function is then designed business strategy which will guide the function more precisely to contribute to the corporate strategy (Waters, 2009). SCM strategy is considered as one of these business strategies. For example, logistics under the SCM functions will have functional strategy to contribute to the business strategy of SCM.

Various things need to be considered when designing a strategy for the company. First companies need to consider their secondary operations and think if they want to produce those in-house or outsource (Waters, 2009). If the operation is important from the customer or the function in the operations is critical, for example from the quality point of view, it is not recommendable to outsource. Rather, the focus should be on that core function. Since SCM is about relationships it is important that the relationship between the supplier and the company is reliable and beneficial for both parties in the case of outsourcing (Prater & Whitehead, 2013).

The supply chain is part of the operational strategy and when a company wants to be competitive in the global markets it needs to make decisions regarding their competitive strategy. These decisions will then directly contribute to the operational strategy and the operations in the supply chain (Prater & Whitehead, 2013).

Porter (2004) accumulates supply chain activities into the value chain framework. The framework represents primary activities: inbound logistics, operations, outbound logistics, marketing and sales and services. Procurements, technology development, human resource management and firm's infrastructure are supportive activities for the primary activities. Total value is the total

amount that buyers are willing to pay counter to the provided product. Total value consists of margin and value activities. Previously mentioned activities are the value activities which the firm uses to produce the product. Margin is the value that is provided for the buyer but does not consist of the costs of the value activities. Figure 5 below illustrates the framework.

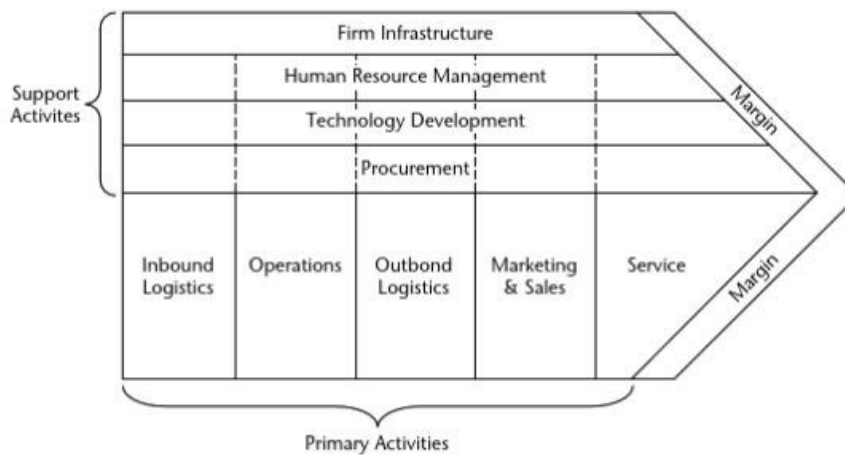


Figure 5. The Generic Value Chain by Porter (Hsuan et al. 2015, p. 17)

A firm can create a competitive advantage by identifying the value of these activities and performing them better than its competitors. To perform these individual activities collectively Porter introduced the horizontal and vertical linkages of the organization. These linkages are important when a company is performing strategy of their choice because the advantage can only be achieved by coordinating the activities and in that way obtain performance improvements (Porter, 2004).

According to Vickery et al. (2003) Porters vertical linkages can be perceived one of the early ideas of supply chain integration strategy because the vertical linkages can extend to the whole supply chain. Stevens' article from 1989 introduced the idea of supply chain integration as a clear strategic model and how it is developed. Stevens stated that the activities should not be managed independently with differing strategies, rather have the activities integrated and managed as part of SCM. Target was to encourage companies to a more cohesive management of the supply chain (Stevens & Johnson, 2016). These observations are much the same as Porters. Figure 6 by Stevens & Johnson (2016) illustrates the process of the supply chain integration where at the baseline the activities are independent functions and from there the integration process goes through the stages of functional integration and internal integration to the external integration.

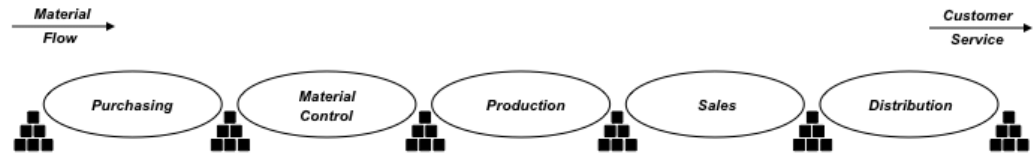
Step one: Baseline**Step two: Functional Integration****Step three: Internal Integration****Step four: External Integration**

Figure 6. Stages of Supply Chain Development (Stevens & Johnson 2016, p. 21)

The integration process should ensure the functioning of two premier activities material flow and customer service while reducing operating costs and inventories. This integration idea is nowadays part of today's mostly used demand driven SCM strategies, but a lot of knowledge has built up around these basic strategic frameworks since the world has become more complex and companies must correspond worlds turbulence (Stevens & Johnson, 2016).

The supply chains have transferred to be global during the past 30 years. When companies are competing in the global market, there are naturally many more opponents in the market. Globalization has made markets more and more customer driven and since the delivery of customer satisfaction is the main target of the supply chain, complex global supply chains need to be controlled more carefully (Mentzer et al., 2006). Effective SCM at the global level can offer solutions to compete in those global markets.

2.2 Logistics

Every organization must move materials and logistics is the function responsible for all the aspects of moving and storing these materials and the journey from supplier to the end customer. (Waters, 2009). Products are traditionally described as goods or services but according to Waters (2009) products are a complex combination of these two that an organization supplies to its customers.

There are two main logistics strategies, lean and agile, which are used to optimize the supply chain to serve the customers. Lean and agile paradigms have been spread through the organizations which can be seen as leanliness or agility of the whole organization. When conducting lean strategy, the organizations focus is to reduce waste and use fewer resources by maintaining customer service on a reasonable level (Waters, 2009). Usually, leanliness is used in a business environment which is predictable, and the products are low variable and produced in high volume (Christopher, 2016).

Value is in the key role when conducting leanliness. As earlier stated, value plays a crucial role in the supply chain and is the driver of it. According to Harrison et al. (2014) the end customer should not suffer from time and quality loss or costs that originate from the waste of the supply chain. At every stage of the process, the waste should be eliminated and perfection pursued (Figure 7).

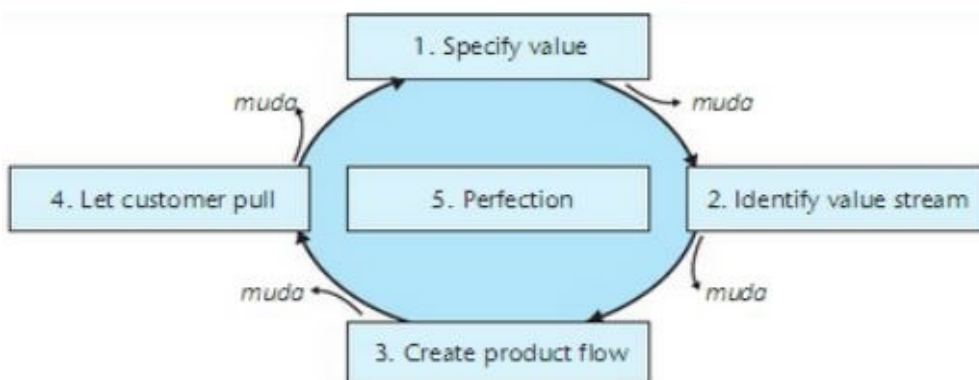


Figure 7. Lean thinking principles (Koski 2016, p. 26)

For example, in logistics the waste can be in the product flow. If orders are waiting for the next operation, the product flow is not efficient and that creates waste. By adjusting the product flow to be efficient the waste can be removed.

Agile strategy is used in sensitive markets, and it is about flexibility and creating customer satisfaction. Usually when conducting an agile strategy, the company has a demand-driven approach where the supply chain is capable of reading and responding to the real demand. Electronic data interchange (EDI) and algorithms collected from the customer behavior enable this process (Christopher, 2000).

According to Christopher (2016) in the agile strategy the company needs to manage the number of functions of the supply chain and ensure that the functions are responsive to each other's demand which is originating from the customer. With inventory-based business model information technology solutions and data collection offers the data to be shared between the whole supply chain. This requires the supply chain to be integrated and that the network is compact (see Figure 8).

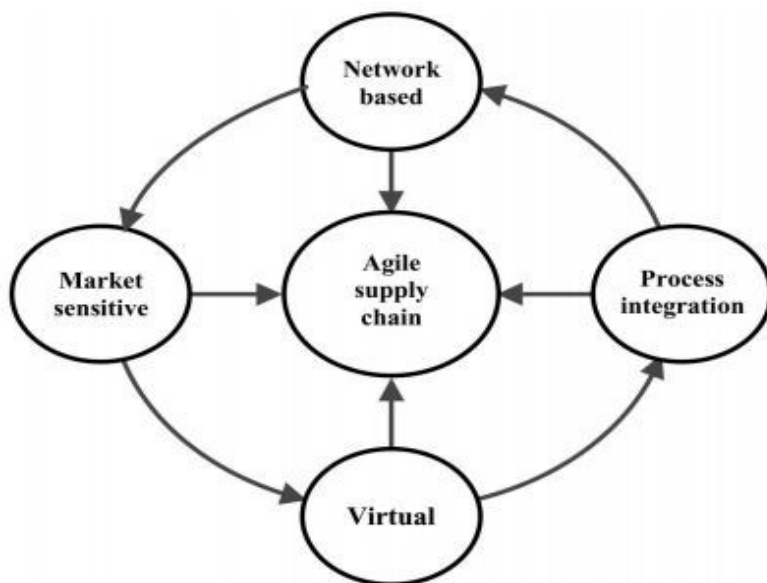


Figure 8. Principles of agile strategy (Christopher & Towill, 2000, p. 209)

To create agile logistics, it is important that the logistics can respond to the customers' needs rapidly, detect and forward the information virtually, have the processes integrated for continuous operations and receive responsiveness from the network. (Christopher, 2016)

When the company has its strategy in place, they can start adapting their logistics process to respond to the strategy. Inbound logistics are the operations moving the materials from the supplier into the organization (Waters, 2009). The terms of supplier's outbound logistics and organization's inbound logistics are defined on the purchase order (PO). The contributing factor is usually inco-

terms which is a trademark of the International Chamber of Commerce established in 1936. Incoterms rules offer harmonized practices, legal interpretation and general global guide for imports and exports (International Chamber of Commerce, 2019). With the incoterms the parties can agree which one is responsible for which actions in the shipping process.

According to Waters (2009) material management covers all the movement actions inside the organization: receiving, warehousing, stock control, material handling, order picking and packing. The company has the possibility to arrange the material management process in a few different ways. The company can have a private warehouse where they run their own operations or outsource these services from a provider of public or contract warehousing where the provider is liable for material management. Christopher (2016) presents that servitisation has been a growing trend in the logistic industry since companies are keen to find service providers with solutions for a more efficient logistic process. Servitisation model brings performance and the outcome of the service to the core of the followed results rather than the efforts and output that the service provider is delivering.

On the receiving process, the materials are unloaded, inspected and confirmed that they match to the PO. The warehousing function transfers the material to storage since it is responsible for storing the inventory correctly, offering appropriate conditions for the materials and assure the material is available when needed. Waters (2009) highlights that warehousing function must work closely with stock control and material handling since it is necessary to optimize the inventory for investment and customer service point of view. Efficient and optimized material handling offers fewer possibilities to make mistakes and damage as well as saving time and costs.

Customer orders have a planned dispatch date and that should trigger the warehouse to pick and pack the order. Order picking locates the inventory and identifies the correct materials and amounts. Packing ensures that the materials are not damaged during transport and that the package has appropriate identification and shipping documents for the receiver and for the freight forwarder. The package has now gone through the organization's logistics process in the warehouse and ready to be loaded and continuing to the outbound logistics and physical distribution which moves the ordered materials to the customer. The details regarding the Incoterms must always be done also for the outbound logistics so that responsibilities are clear to the parties of the trade (Waters, 2009).

2.3 Factors affecting the choice of transport mode

This chapter will discuss more specifically theoretical factors that affect the choice of a transport mode. Three main categories of transport considering the element they are operating at land, air and water. In this thesis, the modes under discussion are road, rail, ocean and air. Pipelines and inland waterway shipping have been left out due to characteristics of the case company's products. Multi- and intermodal transportation combines different modes within the same route. This is needed almost always when the main mode of transport is rail, ocean or air and often with road freight also. The journeys before and after the main carriage are called per-carriage and on-carriage. The container system which is the fundamental basis of the transportation sector, is the main reason for multi- and intermodal transportation. The difference between these two are that in intermodal transportation the goods are loaded into the container or trailer and transported in it the whole journey. Multimodal transportation can require single loads which are loaded and unloaded from the container or the trailer during the journey (Rushton et al. 2017). Rushton et al. (2022) emphasized how substantial role International Organization of Standardization (ISO) standardized containers and pallets play in the transportation industry. These standards allow intermodal transportation anywhere in the world.

Road freight is the most common mode of transportation since it is suitable for various kinds of goods from liquids to special industrial parts. According to The World of Logistics (2022) 90% of the goods are delivered by truck. Road freight is often used as pre-carriage and on-carriage transportation to and from the ports. Pre-carriage is the journey to the port of the main carriage departing and on-carriage is the journey to the delivery location from the main carriage arrival port. The main carriage is usually air, ocean or rail over long distances and intercontinental transport. There is a possibility of full truck loads (FTL) and less than truck loads (LTL) depending on the goods and time constraints. In FTL the cargo space is used for the specific shipment only and LTL combines partial loads from different customers. LTL is usually slower since the goods can be reloaded during the journey. (Marttila, 2019; The World of Logistics, 2022)

Maritime transport, also referred to as ocean freight on this paper, handles 90 per cent of the world's international trade. The main characteristics of ocean freight are usage of containers or break bulk and cargo with high volume with longer lead times. In ocean freight the main operation parties are shipping line, ship's agents, freight forwarders and their agents. Pre-carriage and on-carriage are needed to and from the ports. When utilizing container, the shipper can choose from

Full Container Load (FTL) or Less Than Container Load (LCL) and from two sizes of container: 20-foot ISO shipping container (TEU) or 40-foot ISO shipping container (FEU). Material that cannot be containerized is called break bulk cargo. FTL cargo is usually unloaded at the receiver's premises, if that is not possible it is possible at the arrival terminal where the LCL containers are unloaded. (Rushton et al. 2022)

Air freight includes all the transportation that is operated with cargo and passenger airplanes. When measuring the unit cost, air freight is the most expensive form of transport but the quickest of all long distances. Pre-carriage and on-carriage are needed with air freight due to the limitation that airplanes can only fly between airports. These slow down the process because the shipments need to be security checked and handled at the airports (The World of Logistics, 2022). Unit load devices (ULD) are used in air freight. ULDs are containers designed specifically for aircraft. By loading small shipments inside the container, the handling of the goods is easier. ULDs also enable temperature sensitive goods to be shipped via airfreight (Baxter & Kourousis, 2015).

High-capacity goods have moved medium and long distances by rail for a long time. Rail freight requires pre- and on-carriage if the infrastructure does not reach from and to the destination. Rail freight has been considered a slow and unpredictable mode of transportation because of the compatibility issues of the infrastructure across the continent of Europe. Rail-rail trans-shipments are needed when the gauge width changes. Smaller consignments and delicate goods are rare because often consignments need to be transferred due to earlier described issues and this creates opportunities for loss and damage of the goods. Without ISO standards it would not be efficient to do trans-shipments. In rail freight, the main operation parties are the rail company, railway terminal agent, freight forwarder and their agents (Rushton et al. 2022). According to Rushton et al. (2022) the safety of rail freight is high for example with hazardous goods and many hazardous goods do not require as extensive safety packaging as for air or ocean freight. As stated by the International Energy Agency (2019) rail freight is the least carbon-intensive and the most energy-efficient mode of transport which can be seen as a significant advantage in today's world. This creates great interest in the utilization of rail freight.

According to McKinnon et al. (2015) sustainability means actions that support the development into the present but does it in a way that does not eliminate the future generations' possibilities to do the same. Since the world has experienced the effects of climate change the focus on sustainability has risen, which means that also companies need to consider these factors. Nieminen (2016)

stated that every organization's level of sustainability is equivalent to their supply chain's sustainability. The EU's green deal has a target to be the first climate-neutral continent by 2050 which will require great efforts from the transportation sector to achieve that. As stated in European Commission's (2020) factsheet the deal aims that by 2030 EU achieves at least 55% reduction of greenhouse gas emissions and 90% reduction by 2050. The key takeaways from the green deal to the freight transport sector are that the dependency on fossil fuels needs to decrease which will be achieved by zero-emission cars, trucks and larger aircrafts entering the market by 2035. The rail freight and the short ocean shipping increase will be ensured by creating infrastructure for those and freight transportation is planned to be paperless. The deal also pushes to a pricing model which will ensure that the cost of the emissions will be visible at the price of the mode by 2050. This last takeaway is important from a company perspective since it will directly appear at the freight cost.

As previously mentioned, Incoterms are globally used with business-to-business trade. In accordance with The International Chamber of Commerce (2019), Incoterms 2020 is the latest publication of these 11 terms which each one has differing obligations to the buyer and the seller regarding delivery, cost and risk. Of the 11 terms, four are only suitable for ocean shipping (see Figure 9 below).

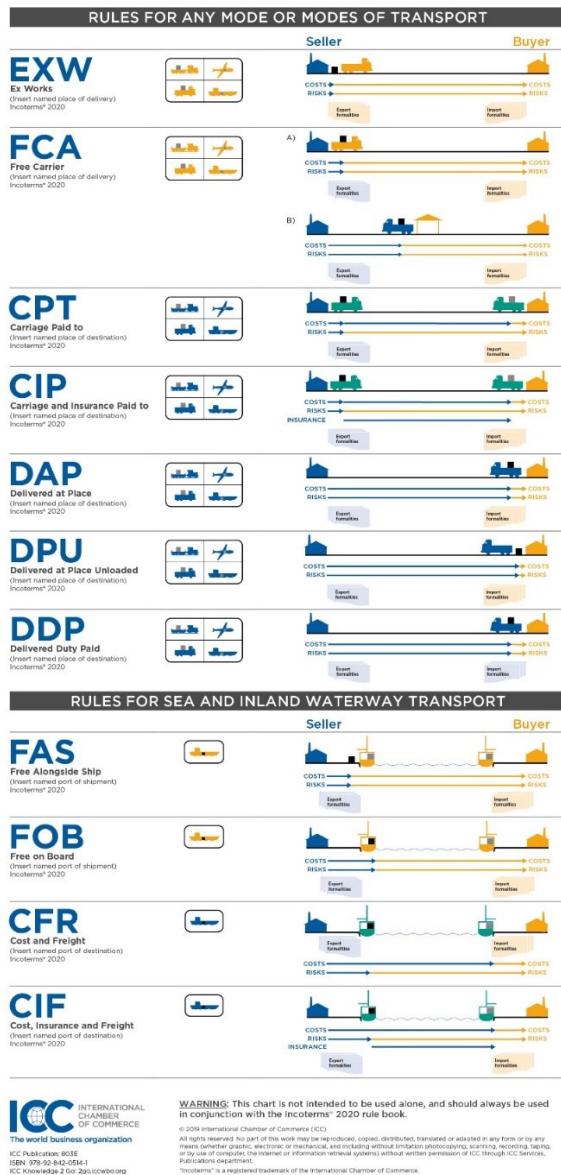


Figure 9. Incoterms 2020 (ICC Switzerland, n.d.)

Excluding EXW and DDP, the seller is obligated to carry out and pay for export clearance and required formalities. The seller must also assist the buyer with import documents or formalities which are the buyer's obligation to carry out and pay. The buyer is also obligated to assist the seller with the export if needed. (International Chamber of Commerce, 2019)

As stated by Rushton et al. (2022), the leading reasons for the mode choice are the size and characteristics of the shipment, the agreed delivery time and the distance between the seller and the buyer.

2.4 Theoretical framework

Considering the evidence from the reviewed studies the process of choosing the suitable transport mode can be challenging because of several differing factors that need to be carefully considered. According to Negulescu (2014) and Marttila (2019) following a decision-making process can benefit in the process. Both authors presented seven step decision making process model which can be used universally to different kinds of decision.

The model's first step is identifying the issue and defining the problem that needs to be solved. The second step is to gather information and identify possible limiting factors which lead to the third step where the possible alternatives are identified. In the fourth step one should evaluate the alternatives and then in the fifth step choose from the identified and evaluated alternatives. The sixth step is to act and implement the decision and after that it is important in the seventh step to review the decision in furtherance to detect was the decision good or not. This is important for the development of decision-making skills in different scenarios. (Marttila, 2019; Negulescu, 2014)

Every step of the procurement process requires undergoing the full decision-making process. The previous step has an impact on the success of the next step which is why the analysis and careful decision-making process needs to be applied in the procurement decision process. Figure 10 below illustrates the procurement process by Nieminen (2016).

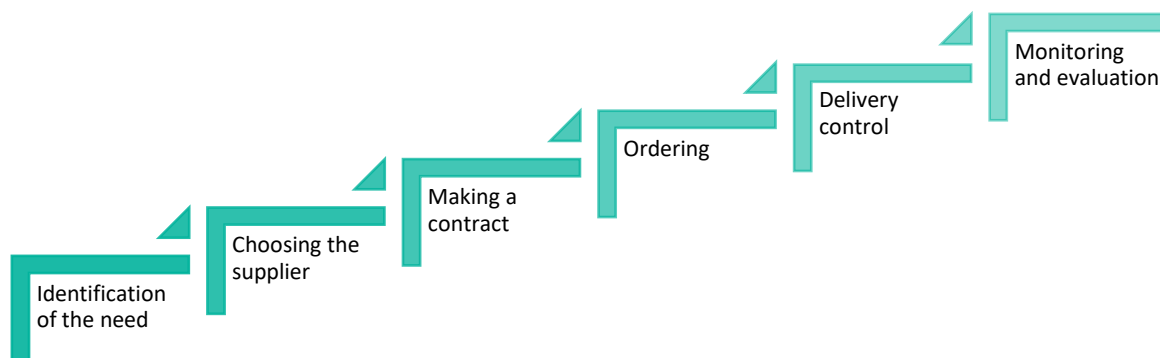


Figure 10. Procurement process (Nieminen 2016, p.53)

Figure 10 represents the simplified procurement process step by step. Considering the topic of this thesis the focus is on the procurement process of logistic services. Identification of the demand is marginally more difficult for services than it is for products. According to Nieminen (2016) the

most important factor that needs to be identified is the required result and the quality that is expected. After that suitable suppliers can be reached on the market or chosen from the existing supplier network.

The process can be done in stages where pre-qualification criteria are used to determine potential suppliers. A preliminary request for quotation (RFQ) is sent to the potential suppliers for determination of possible suppliers and after that detailed RFQ can be sent. Nieminen (2016) highlighted that on the RFQ it is important to declare the service requirements and unit to be priced. When quotations are received from the suppliers, those needs to be carefully assessed. The quotation should correlate with the RFQ in order that the quotations are comparable but with multiple suppliers this is not possible. In these cases, additional information needs to be gathered to be able to compare the quotations. Further negotiations are possible with two to four the most potential suppliers to reach the most desirable agreement. The choice is usually formed by giving a weighted score for different selection criteria and based on that find the best offer overall (Nieminen, 2016).

The contract is created when an affirmative response has been given towards the quotation. The contract framework is always based on the conditions of the contract and legislation. The contents of the contract must include agreed matters in it to be legal. Most importantly the contract determines the rights and obligations of the parties and division of the risks. Conditions of the contract have two elements: obligations and consequences for negligence of those. Longer and extensive contracts require negotiations and careful consideration whereas in a one-time order process PO can be sent directly to the supplier and it will act as a contract between the parties. Companies usually create general templates for these kinds of situations to ensure efficiency of the daily business. (Nieminen, 2016)

The one-time order process simply follows the PO whereas with longer contracts the ordering process needs to be completed to specifically indicate to the supplier what is needed in which point of time. In logistics services, this is usually the point where the transportation is booked for new shipments. Nieminen (2016) stated that the contract making and the ordering processes are incontrovertibly communication. Good communication and operating with respectable contract manners creates trust and avoidance of conflicts.

Delivery controls daily activity is to detect and solve problems which occur during the delivery process. According to Nieminen (2016) the basic requirements are monitoring of quality, quantity, prices and delivery times. These monitoring activities can be made by using methods of a differing kind but usually with ERP data reports and signals. Delivery control allows claims to be reported to the supplier and helps with monitoring the development.

Monitoring and evaluation support consistent development, transparency and motivation which targets for more successful business. Nieminen (2016) summarizes the targets of the procurement process that it should ensure the best possible price for every purchase. This develops and secures 'the successful business and stable cooperation of the stakeholders.

When making decisions the factors contributing to it can often contradict, which makes the decision process difficult. Rushton et al. (2017) approached the method selection with four key stages which are illustrated in Figure 11 below.

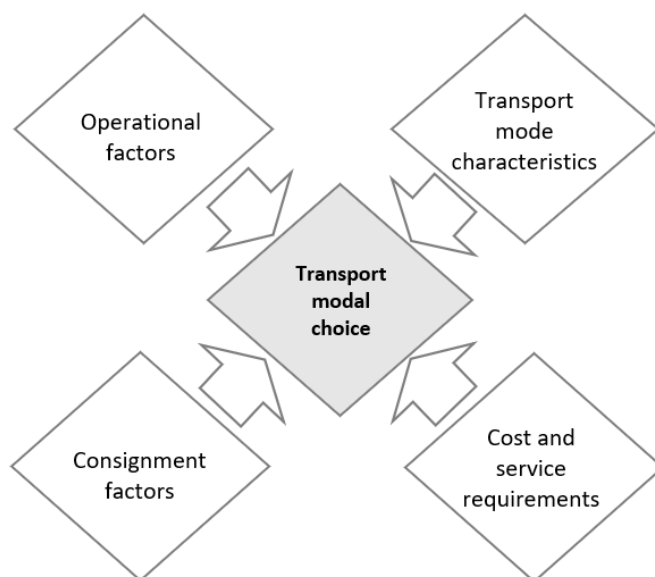


Figure 11. Modal choice: selection process (Rushton et al. 2017, p. 426)

Rushton et al. (2017) includes external factors, customer characteristics, the physical nature of the products and other logistics components to operational factors. Included in the external factors are existing infrastructure, laws, regulations, taxation, trade barriers, financial aspects and economic conditions, communication systems and culture. Rushton et al. (2017) pointed out the infrastructures' role when particularly discussing rail freight. Infrastructure plays an exceptional role since if the infrastructure is not accessible rail would not be chosen. Laws, regulations, taxation

and trade barriers need close examination already before selling but also at the point of transport since these factors can increase overall costs and create obstacles with transport. The financial aspects and economic conditions of the trading partner can affect the choice because inflation and drastically changing economic conditions could require faster delivery. Communication system problems can create delays if information flow is not steady and cultural difference can accelerate tension if the partners are not valuing the same aspects of the process.

In the model by Rushton et al. (2017) customer characteristics consist of service level requirements and agreements, customer importance, the terms of sale and order size preferences, credit ratings and delivery point constraints. Service level requirements and agreements have an exceptionally considerable effect on the mode choice since the delivery dates can already be agreed in the agreement and the seller could be fined if delays occur. Rushton et al. (2017) highlighted that customer importance creates pressure to serve the A classed customer the best way possible. If delays occur earlier in the supply chain, freight mode selection can be the factor in reaching the agreed dates. The order size preference of the customer impacts on the mode selection because different size orders require different mode selection if cost-effectiveness is wanted to be maintained. There can be benefits from high volumes and bigger order sizes for the seller since they can receive better freight prices with high volumes.

Rushton et al. (2017) stated the terms of sale, as already earlier discussed in the previous chapter, Incoterm has a significant impact on the transport mode selection since the Incoterm will define for example will the sender or the receiver decide the transport mode. The credit rating of the customer is an important fact to consider at the point of sale because there is a possibility to make commercial arrangements with the poor credit rating customer. According to Hinkelman (2009) the letter of credit (LC) is a letter where a bank guarantees the buyer's payment to the seller if the terms of the LC are fulfilled. The issuing bank opens the LC on behalf of the buyer in one country and the advising bank in the other country will receive it which represents the seller. The LC does not allow free choice of the transport mode at the point of shipping because this is agreed in the LC when it is issued and the seller must fulfil the earlier agreed terms and send the documents through the bank in order to receive the payment.

The physical nature of the product is the last category Rushton et al. (2017) includes in the operational factors. Tangible characteristics create the physical constraints that the transport mode choice can have. Volume to weight ratio declares the relative cubic volume taken by a given

weight and it determines if the freight will be charged by the volume or the weight. Rushton et al. (2017) pointed out that this is a significant factor because different transport modes have different ratios. One tonne in ocean freight takes up one cubic meter whereas in the air freight it takes six cubic meters which is directly seen in the freight price. Value to weight ratio can make the relative cost of the transport irrelevant. This applies for example to microchips which are high in value but low in weight. The fragility, hazardousness and time sensitiveness of the products are in the category of special characteristics which is part of the physical nature aspect.

Rushton et al. (2017) specified that consignment factors and the physical nature of the product are slightly overlapping factors, but consignment factors consider also routing and distance, quantity and unit load utilization, priority and regularity of the shipments. Consideration of routing and distance is important since different physical factors of the consignment, the geological and political factors of the world can deprive some options. For instance, the war in Ukraine has initiated to the political sanctions and closure of many countries' airspace from Russian aircraft. As a countersanction, Russia closed their airspace from many Western countries' aircraft. This has forced the Western airlines to cancel flights and find alternative routes to Asia (Russia's invasion of Ukraine is driving up air cargo costs, 2022). Quantity and unit load utilization needs to be considered and the possibility of containerization and consolidation explored because these can be more cost effective and bring security to the handling of the shipment. Regularity of shipments can bring cost-effectiveness if there is a possibility to negotiate freight costs for the regular routes with certain transport modes (Rushton et al. 2017).

The transport modes road, ocean, air and rail differ substantially from each other. This was discussed in the previous chapter when evaluating the modes individually, but Rushton et al. (2017) highlights the importance of the relations that these individual characteristics have with the other factors and characteristics of the model. Availability, the possibility of damage and delays rose as one of the most important factors in this stage of the choice process alongside the individual characteristics. Consignment and operational factors set the standards for the transport mode but the possibilities and restrictions inside the mode can influence the final choice.

Cost and service requirements is the last stage of the decision process which culminates in the decision between the cost, the service level and the speed of the delivery. Rushton et al. (2017) presented a model by Rushton for this which portrays the volume or size of the load and the distance

of the delivery as a theoretical concept. For heavy and bulky loads and long distances air is excluded because of the physical possibilities of aircraft to carry loads with these physical features. The options that are left are ocean or rail and the factors that are considered between the two options are the service level, the speed and the cost. It is good to remember that smaller companies have bigger logistic costs since the economies of scale usually benefit large companies.

The empirical study aims to answer in which circumstances Finnish companies could utilize rail freight, what are the benefits and which of the considered factors still require development. Rush-ton et al. (2017) model enables the assessment of the process of choosing suitable transport mode and the business benefits from it.

3 Methodology

In this Methodology chapter, the discussion is about the research approach, research context, data collection, data analysis and verification of the results. The objective of the research, as stated before in chapter 1, is to understand the opportunities that the usage of the railway would bring to Finnish companies and detect the current issues around it. The qualitative research approach is used to answer two research questions “What kind of opportunities will the Finland-China railways bring for Finnish companies?” and “What kind of issues there are yet to be resolved?”.

3.1 Research approach

According to Saunders et al. (2023) the author may choose quantitative, qualitative or mixed-method approach when designing the research. A quantitative approach focuses on numerical data which are usually adopted for example from statistics and questionnaires whereas processing non-numerical data is the characteristics of the qualitative approach. A qualitative approach adopts data, for example from interviews, videos and pictures. The author may use both quantitative and qualitative methods which is called a mixed method approach.

Qualitative studies are often conducted in natural research settings where access to in-depth understanding is reached through trust and participation. The inductive approach is used when the objective is to develop existing theories or create new ones by observing empirical data and de-

ductive approach tests an existing theory. Abductive approach is a mixture of the above-mentioned approaches. Classification of gathered data is needed when non-probability sampling techniques are used (Saunders et al., 2023). This research uses a mono method qualitative approach which in other words means a single data collection technique. The chosen qualitative research design with the inductive mono method approach is suitable for this research as the objective is to gather empirical data to find answers from the collected primary data. Another justification for choosing qualitative study is that quantitative data would not answer the research question. Qualitative study allows us to study the decision-making process and study the opportunities of rail transportation compared to other transportation modes.

Conducting in-depth research into the topic in real-life context is called a case study approach. This approach allows the author to answer questions about what and why. The study is cross-sectional and single case study as the study period is short and one case company is used (Saunders et al., 2023). Case study strategy allows appropriate methods to be used to understand the rail freight usage in the context of Finnish companies and the surrounding issues.

3.2 Research context

This subchapter introduces the research contexts which will be used as the context in the empirical study and to where the result and discussion will be applied. In this research the context is Valmet Technologies Oy.

Valmet (n.d.a.), is the leading global developer and supplier of technology, automation and services for the pulp, paper and energy industries. Valmet's roots extend to 1750s but on its current form Valmet was established in 2013. Valmet serves pulp, paper and energy industries in four main business lines: technologies, services, automation and flow control (valves). Business lines and geographical areas handle their own supply chains but Valmet's target is to optimize, centralize and consolidate more of the supply chain operations to improve the performance and sustainability of the whole supply chain. (Valmet, 2023.) Wide product and service portfolio's inevitable result is that the characteristics of the shipment vary widely.

Already in 2019 before the pandemic Valmet has been piloting the rail freight route between the Nordics and China. According to Valmet (2023) in 2022 Valmet's net sales to China were €829 million which is 16% from Valmet's overall net sales. The interest in Valmet has been strong to reduce

air freight usage, have better filling rate of containers by consolidation and piloting of more light-weight packaging solutions (Valmet, 2020). In 2022 Valmet's upstream and downstream transportation and distribution created overall 120 000 tons of carbon dioxide. This figure does not include Valmet Flow Controls data due to the acquisition of the business during 2022. (Valmet, 2022)

Valmet's climate program is targeting to reduce 20% supply chain carbon dioxide emissions by 2030. Valmet is for example aiming to centralize the spending to selected suppliers which offer low carbon transportation solutions and continue to develop freight planning (Valmet, n.d.b.) As many companies, also Valmet has global transportation agreements that guide the company's freight usage. It allows continuous partnership, targeted services and large volumes give benefits in specific pricing models (Valmet, 2020).

3.3 Data collection

According to Saunders et al. (2023) in the context of case study approach primary data is collected for the purpose of the research. Primary data is for example interviews, questionnaires and observation. In this research, interviews with case company professionals are the source of primary data. Saunders et al. (2023) highlighted that the key for relevant primary data is gaining access to appropriate sources. The case company for this research was selected due to the author's professional linkage to the company and the mutual interest towards the topic.

Saunders et al. (2023) listed that the nature of interviews can be unstructured, semi-structured or structured. The methodology literature supports the usage of the semi-structured interview for this research approach. In semi-structured interview, the author has questions for the interview, but the questions can be presented in a different order and there is room for discussion and additional questions. The interview is recorded with notes and audio recording. The interview questions designed for this research can be found in Appendix 1.

The interviews were held on the 9th of November with two professionals from Valmet. The interviews were conducted in English to support the primary language of this thesis. The interviews were held in Microsoft Teams and both video and audio recorded for the purpose of proofing. The interviews were transcribed with Microsoft Office automated transcription and proofed by the author afterwards. The first interview was conducted with a specialist in logistics (Interviewee 1) and the second with manager who has personal experience of the rail freight usage in Valmet (Interviewee 2). First interview lasted 20 minutes and 59 seconds and second interview lasted 15

minutes and 8 seconds. Both interviewees got the interview questions in advance to get prepared for the interview.

Usually, secondary data is the second source of data in case studies. It is collected for other research but can be applied to this research. Secondary data is derived for example from publications, books, journals, surveys or documentaries and it can be quantitative or qualitative. (Saunders et al., 2023) In this study the secondary data sources were Valmet's website and their corporate publications such as annual reports.

3.4 Data analysis

In this chapter, the analysis of the primary and secondary data is conducted. The raw data was collected from the interviews described in the previous chapter. To analyze the raw data, it was collected also as text form by using the transcript extension on Microsoft Office. After the data collection, the text was proofread by the author.

The data analysis is theory driven. Thematical analysis is used to process, categorize the data. In thematical analysis the data is coded and collective themes recovered from the codes. The analysis process was conducted by using Microsoft Excel. Corbin et al. (2008) describes the process of coding as mining data. It is not only pointing out the surface level findings but comparing and asking questions about the data.

The author used memos and Excel as tools for structuring, gain understanding and coding the data. The codes are abbreviations derived during the coding process for detected positive factors and issues (see Table 1 below). The codes were then used to structure the primary data to categories and interviewee statements linked to the codes. A sample of the analysis can be seen found the appendix (see Appendix 2).

Table 1. Codes and explanations

Code	EXPLANATION
P1	Emission reduction
P2	Reliability
P3	Tracking, GPS
P4	Infrastructure, same gauge width
P5	Suitable for wide product catalogue
P6	Effective transit time
P7	Dangerous goods
P8	Many operators in the market
P9	Cost effectiveness
CODE	Explanation
I1	Politics/War
I2	Only FCL
I3	Lack of suitable containers (overall/open top)
I4	Limitation on weight per meter
I5	Delays, if booking rates are low
I6	Cannot be used with Letter of Credit
I7	China regulations on import to dry ports

With proper analytical thinking tools, the author's mind can be stimulated, and deep understanding of the data gained. After this detailed exploration and contemplation of the themes can be conducted and the final findings of the research reported. (University of Jyväskylä, 2010)

3.5 Verification of the results

Validity

Saunders et al. (2023) refers to validity as the data collection methods appropriateness for the intended purpose and measuring the intended variables. Internal and external validity need to be considered to reach an appropriate level of validity. External validity can be measured with the question: Can the findings be generalized? In this research, the findings can be generalized with companies that have a similar product portfolio than the context company of this study. The internal validity of this research has been considered by carefully choosing the participants from different parts of the organization, using the theoretical framework as the guide for interview questions. The author derived the theoretical framework by reviewing academic literature and

publications. The theoretical framework was used as foundation for data collection, structure the findings and finally answer the research questions collectively with the empirical data.

Reliability

In this research both primary and secondary data were used from the case company's sources. The primary data was collected by interviewing two professional working in Valmet. Both can be seen as reliable source due to their professional backgrounds regarding the topic. Especially on the characteristics of different transport modes and the usage of them in Valmet. The secondary data was collected from the company's databases from their website such as the annual report and articles. External organizations audit the company's official reports which create additional reliability.

Objectivity

As stated in chapters 1 and 3 the objective of this research is to answer the research questions with reliability, accuracy and validity. It is acknowledged that there is a possibility for subjectivity when interpreting the data and presenting the results. According to Corbin et al. (2008) it is important for the author to distance themselves from the personal experience which in this research can create issues with objectivity. Corbin et al. (2008) courage's to sensitivity with the data and intellectual interpretation of it. That drives the author towards objectivity. Due to selected data analysis and literature review techniques the author can note that similar findings should occur and be provided by another researcher from the data collected and analyzed for this research.

Ethicality

Ethical issues were considered since the beginning of the research process. Agreement of conducting and publishing this thesis was made between the author, the academic institute Jamk and the commissioner Valmet Technologies Oy. With the agreements the confidentiality, data management and publishing the thesis were agreed. A data management plan was created to ensure that the collected data is handled ethically, and participants were clearly informed how the data was used and stored. Ethicality was considered when informing the participants about their consent to take part in this research, rights related to anonymity, recording the interview and publication of the thesis.

4 Results

In this chapter the facts and results of the empirical study will be presented under two main sections. This supports the two research questions of this study. The first section will present the positive factors and the second section will present the issues detected from the collected data. Previously collected secondary data was also used to support the primary data results.

Opportunities

This first section will present results in the consideration of the main research question: “What kind of opportunities will the Finland-China railways bring for Finnish companies?”. The empirical study revealed nine different positive factors that usage of rail has. (See Table 1.)

Table 2. Detected positive factors from the data

Positive factors
Emission reduction
Reliability
Tracking/GPS
Infrastructure/same gauge width
Suitable mode for wide product catalogue
Effective transit time
Dangerous goods
Many operators in the market
Cost effectiveness

As presented in Table 1 above emission reduction was detected as one of the positive factors that could be utilized in Valmet and reach the goals of more sustainable supply chain. Especially compared to air freight, rail offers both emission reduction potential and emission efficiency. This supports Valmet’s targets by 2030 to reduce the supply chain CO² emissions by 20 percent Valmet. (n.d.b.). In 2022, the key achievements were to reduce air freight by 12 percent and rail had been

used over road (Valmet, 2023). Valmet's representative address this by confirming increased the usage of rail freight in the United States.

Interviewee 1 had experience of reliability of the rail freight.

"I think the rail is quite reliable, so at least in the ocean there has been this kind of port congestions et cetera."

Transportation industry's characteristic is that sometimes problems and delays come and this was also noted by the representatives with rail freight. Tracking and usage of GPS was also seen as benefit when tackling the issue of delays. The representatives had experience with GPS trackers where the shipments could be traced through the journey which gave knowledge and data how long unexpected delays took and how long for example border control procedures took time.

Existing infrastructure and the same gauge width with Finland and Russia was seen as important positive factor. The loading could be done in Finland, most of the time in Vuosaari, and the container need to be reloaded in the border of Russia and China only once. In relation to other corridors as presented in the chapter 1 the transit time is more efficient when multiple reloading's are not needed due to change in gauge width. The experience of interviewee 2 was positive in the favour of the Finland-China route.

"...it was very convenient, it was fast and we could get the goods in three weeks from China to Finland or vice versa."

Valmet's wide product catalogue creates opportunities for the usage of rail freight. Later the detected limitations regarding this are presented but since the product characteristics vary from small and light items to large and heavy the variety of needed services are wide. Rail is also seen as a positive option for dangerous goods which are heavily regulated in air and ocean freight. According to the Valmet representatives mostly the classifications of dangerous goods are lithium batteries, gas springs and chemical substances for different stages of machine and end use production.

The interest towards rail freight had increased before the Covid-19 pandemic and had drawn new operators to the market. According to the interviewee 2 this resulted as cost and service competitive markets.

"...in the beginning it was much more expensive than sea, but then then there were more operators coming into the market and the prices fell down... Then when the COVID actually started, there were so much need for that the mode of transportation that the railways could also raise their prices up."

Overall good earlier experiences have shaped the attitudes of the interviewees to be positive and in favour of the rail freight when the consignment characteristics meet with the requirements of rail freight. As interviewee 2 stated:

“I think if we didn't have this Ukraine crisis, we would already have (nominations for rail), ...I think it's a good opportunity and option to have.”

Issues

This second section will present the results in the consideration of the second research question: “What kind of issues there are yet to be resolved?”. The empirical study revealed seven different issues that usage of rail has. (See Table 2.)

Table 3. Detected issues from the data

Issues
Politics/War
Only FCL
Lack of suitable containers (overall/open top)
Limitation on weight per meter
Delays, if booking rates are low
Cannot be used with Letter of Credit
China regulations on import to dry ports

The most limiting and significant issue that was detected was the political situation between Russia and Finland due to war between Russia and Ukraine. According to the interviewee 1 the company has placed policy which forbids the goods to be shipped through Russia to Finland.

“At the moment Valmet has the policy that there are no shipments via Russia which is a lot of limiting the services which can be used with the rail connection.”

In 2022, Valmet updated its Sustainable Supply Chain Policy with new legal regulations for export control, trade sanction laws and regulations to address and answer the changed trade and political situation. (Valmet, 2023)

Both representatives saw FCL as limitation and issue. In rail freight, the container usage is limited for 40-foot containers and rarely LCL option is available. Business lines across Valmet have different kind of needs and in ocean freight the LCL option is heavily used. Open top containers are also not an option in rail freight which limits the possibilities of the usage. As an example, Valmet manufactures a lot of rolls which invariably need open-top containers because the rolls cannot be pushed to the container from the door. According to the representative rail freight also has weight per meter limitations which are faced with heavier pieces. The interviewee 2 had also experienced overall lack of suitable containers.

“And there were problems sometimes with the availability of the proper containers or space on the train...”

Due to volatility of the capacity, the predictability of the rail freight has faced time to time problems. Interviewee 2 had experienced times when the booking rates of the specific train were low and the estimated departure pushed for later. In these cases, the rail freight could lose the benefit of its faster transit time compared to ocean freight.

“...if we had to wait for the train to leave or wait for space on the next train, then it added with two or three weeks and that wasn't so good.”

Issues also arise if the agreed payment term has been set to LC between the trade partners. Rarely LC requirements can be met with rail freight. According to the Valmet representative this is due to possible multiple operators during the journey and non-negotiability of waybill which does not fit the usually agreed LC terms.

Empirical study also revealed that China has regulations in place to what are the possible destination ports for international shipments. Sometimes causes beyond the control of the carrier make the ports to change. As stated by the interviewee 1:

“... as I said it can change that you never know when you ship from here it can happen that when the train is on the way they change the port in China.”

Subject to agreed Incoterm this can be create an issue but as detected from the data the changes and unexpected obstacles are negotiable in the business world.

5 Discussion

In this chapter the author will discuss the objectives of this study in the light of answering the research questions “What kind of opportunities will the Finland-China railways bring for Finnish companies?” and “What kind of issues there are yet to be resolved?”. To reliably answer the objectives primary and secondary data was gathered and empirical study conducted. Primary data was collected through interviews with two professionals working in Valmet and secondary data was collected from the company’s online publications. The results of the empirical study were presented in the previous chapter (see Chapter 4).

5.1 Summary of main findings

The main goal of the current study was to determine the opportunities what usage of Finland-China railways brings to Finnish companies and detect the limiting factors around it. This study was undertaken to evaluate case company Valmet’s experiences and knowledge on the usage of the rail freight and apply the findings for the purpose of answering the research questions.

This study has shown that there are a variety of possibilities that Finnish companies could gain by utilizing the Finland-China railways. By using, the rail freight Finnish companies could gain competitive advantage compared to other European companies through shorter transit times, cost effectiveness and reach the targets of more sustainable supply chain operations. Rail freight is well trackable by GPS trackers and the existing infrastructure minimizes the development efforts that would be needed to utilize the route. The second major finding was that there are many complex issues that need to be resolved before the rail freight can be used in day-to-day operations. All of them can be seen in the previous Results chapter (see Table 2), but as one of the most limiting factors currently being Russia’s war actions in Ukraine. This is a question of international politics and ethics which is not solvable alone by the business world.

Other notable limitations are the container sizes and functionalities in rail freight and the possibility of LCL shipments. 20-foot containers are used widely when 40-foot container has too much capacity in the correlation of the needed space. LCL is widely used beside the FCL shipments with other freight modes and perceived as flexible and cost-effective option when the shipped quantities are not large. In the context of this research, the unavailability of open-top containers is significant limitation but other Finnish companies with goods that do not need that functionality does not have limitations from this factor.

The results of this study show that the interest towards rail freight started before the Covid-19 pandemic and the problems that it triggered: supply chain distractions and the component shortage. Without the limitations that the war created it is more than likely that the rail freight would be highly utilized mode of freight transportation among Finnish companies between Finland and China.

5.2 Practical implications

The findings of the present study encourage managers and forwarders to raise interest towards the rail freight as opportunity in day-to-day operations also in other continents. Moreover, it seems that there is a need for pressure from the businesses to the rail freight sector to electrification of the freight transportation side as well as the public transportation side has been developed. The findings of this study have several important implications for future practice. This information can be used to develop the operations towards shipments suitability for rail freight. As the presented theoretical implications in the Literature review chapter (see Chapter 2.4) the process of choosing the transport mode is complex. For a company to start utilizing new transport mode more widely it must make sure that the shipments characteristics are suitable for the mode and that employees who are ultimately deciding between the transport modes are supported by knowledge and company level guidelines and nominations if such are place for the other transport modes as well.

5.3 Assessment of the results in the light of literature

Credible literature regarding the chosen topic is rather vague which creates limitations to assess the results in the light of relevant literature. However, the findings of the present study suggest that rail freight can be seen as alternative option to air and ocean freight. This is consistent with Marttila (2017) findings that it is a viable option beside the earlier mentioned modes with advantages on transit time and costs. Pomfret (2023) highlighted in his publication that the rail freight transportation has established its need for the EU-China trade which has remained resilient despite the shocks of recent years. Present study is in line with this prior study when considering the business environment where Finnish companies are operating. According to Chapuis et al. (2022) improving cost efficiency, offering wide and reliable services and creating competition would drive the development of the rail freight industry. These factors are in line with the present study findings on what would create possibilities to Finnish companies to utilize the rail freight mode more in the future.

5.4 Limitations of the research

As in every study also in this one there were limitations faced while conducting the study. The author faced limitations related to access to data, validity and objectivity. The effect of these limitations was reduced to minimum by reviewing credible academic and business-related sources, applying research methods appropriately and following methodology literature in the process of data analysis. The author had the advantage of professionally being linked to the case company Valmet Technologies Oy, which allowed her to reach out professional individuals with special knowledge conveniently. The individuals were chosen carefully and by mapping the experiences regarding the rail freight usage in Valmet. Both representatives have a strong background in the transportation sector and had gained great insights during their employment in Valmet about the Finland-China railways. Both professionals can be confirmed as reliable sources and the secondary data of Valmet publications also due to its external auditing. The most restrictive limitations for conducting the study were the change in business environment during the study period. This made the testing of the route impossible in practice. The author and the interviewees had only vague knowledge about the China customs, regulations and laws regarding imports and rail freight. This limited the evaluation of the study objective.

The internal validity of the presented study was ensured by reviewing and applying the methods of current methodology literature. Applied research methods were appropriately chosen to reach the objectives of the presented study. The primary data collection method can have an effect on the validity of the results. There is possibility that interviewees lacked objectivity and had biased answers to the interview questions. The author did her best to retrieve the interview questions in an unbiased way and to the best of my ability in guidance of the theoretical data gathered in the Chapter 2. The generalizability of the findings is limited since the case study approach creates this limitation. The primary and secondary data used for the study were limited to one Finnish company which is large in size. However, the main findings regarding the positive factors (see Table 1) and issues (see Table 2) of the rail freight mode can be applied for all companies which are interested in rail as a transport mode option.

The objectivity of the author can be affected by the knowledge on the operations of the case company Valmet Technologies Oy. Author could have limitations regarding the objectivity on what

would be the opportunities and issues be for other Finnish companies with different kind of product portfolio and business strategies. Ethical issues were taken into consideration during the study by making a data management plan. In the interviewees which were conducted to gather the primary data the interviewees were informed about the nature of the research, management and usage of the data, possibility to anonymity and consent to take part into the study.

5.5 Recommendations for future research

It would be important with the future researcher to gather up to date data regarding the transit times and other implications of the usage of the Finland-China railways. This is recommended to do by testing the route in practice with actual shipment to gather data on how the operations function. Further research in this field would be of great help when entering Russian territory is possibly for Finnish companies. Knowledge and wider interest towards rail as a freight transport mode could push the forwarding companies to offer better services and support for Finnish companies. To sum up, many important questions and issues are yet to be resolved but the physical infrastructure is there and ready to be utilized in favour of Finnish companies.

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Appendices

Appendix 1. Interview questions

“What kind of opportunities will the Finland-China railways bring for Finnish companies?”

“What kind of issues there are yet to be resolved?”

Question 0: Has the Finland-China railways ever been used in Valmet?

1. Has Valmet actively tried to utilize Finland-China railways earlier and in what cases?
2. How has the offered service level been for this route when it has been researched?
3. Valmet is aiming to reduce the negative environmental impact of its operations, could the usage of rail freight benefit in that?
4. What other benefits Valmet has detected about the usage of Finland-China railways?
5. What are the detected problems/limitation for the usage?
6. Valmet has very wide catalogue. What kind of parts/materials would be most suitable for rail freight?
7. Thank you for your answer. Do you have any recommendations for further reading regarding this topic?

Appendix 2. Sample of the analysis

Code	Text from data sheet	Location of text	Analysis/comment
I1	At the moment Valmet has the policy that there is no shipments via Russia which is a lot of limiting the services which can be used with the rail connection.	Page 1	Not able to test, not on the decision of the employees
I1	Yes, it has been used actually before the Ukraine crisis quite a lot,	Page 12	Has been utilized and experienced useful
I2	The problem is that it's only possible to ship the full container loads	Page 2	Bigger cost

12	often the service is limited to full container loads.	Page 2	"Anyhow if we if we save the money of the air, air shipment, so the containers can be quite empty even"
13	there were problems sometimes with the availability of the proper containers	Page 13	Problems also with other transport modes
13	not open top.	Page 15	Many times open top needed
14	there are limitations about the weight per metre on those trains.	Page 15	Weight dense goods not able to ship
15	there were too few containers to go.	Page 13	Booking rates not consistent
15	he had to wait for the train to leave or wait for space on the next train	Page 14	the time benefit was lost
16	it's not going together with LC requirements	Page 14	Waybill is non-negotiable, many operators during the journey and then we would need to have one label in certain format only and that's not possible.
17	that China is giving this kind of permits to do this export rail shipments or transportations to some cities.	Page 5	Not much knowledge on this matter
17	not possible to ship from every cities and that was also changing	Page 5	Predictability
17	some months there was one place where to ship the train and then the other month it can be another city where to where to the trains were departed	Page 5	Predictability of the transit time and final location is not good
17	it can happen that when the when the train is on the way they change the port port in China	Page 5	Door to door not a problem, C terms could be