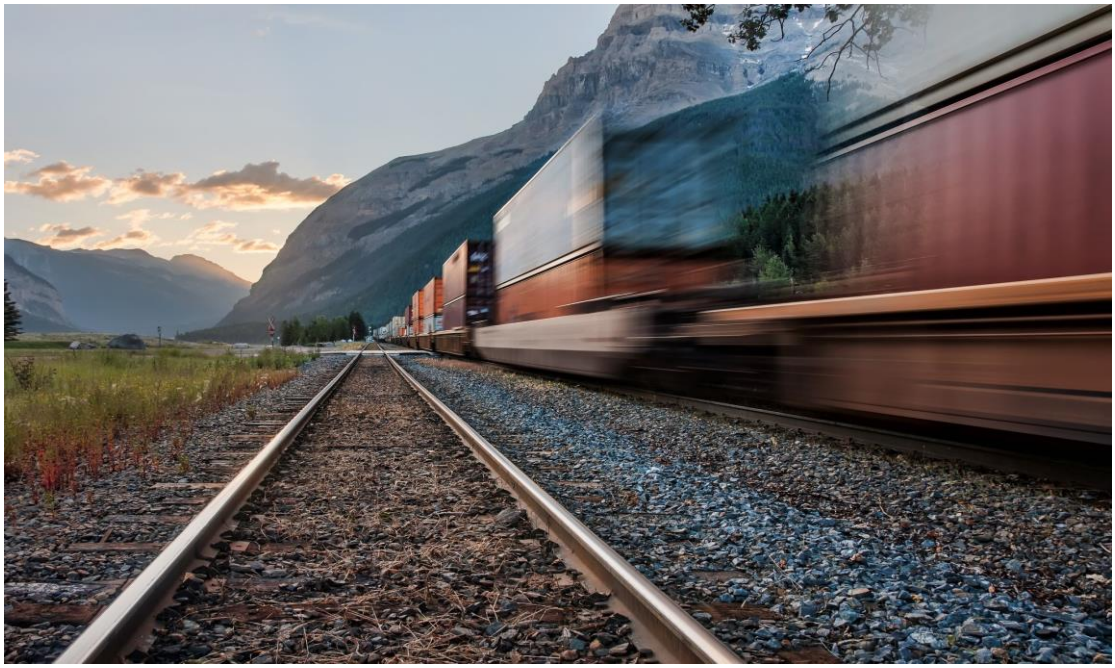
CHALMERS
UNIVERSITY OF TECHNOLOGY



Filling the gap between customers' expectations and inland transportation services - A QFD approach

Master's thesis in:
Management and
Supply chain management

Arwid Gunnarsson
Joakim Svanberg

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF SERVICE MANAGEMENT AND LOGISTICS

CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2021
www.chalmers.se
Report No. E2021:132

MASTER'S THESIS E2021:132

Filling the gap between customers' expectations and inland transportation services - A QFD approach

Arwid Gunnarsson
Joakim Svanberg

CHALMERS
UNIVERSITY OF TECHNOLOGY

Department of Technology Management and Economics
Division of Service Management and Logistics
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2021

Filling the gap between customers' expectations and inland transportation services - A QFD approach

Arwid Gunnarsson
Joakim Svanberg

Supervisor and examiner: Ceren Altuntaş Vural, Chalmers university of Technology

Report no. E2021:132
Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Göteborg
Sweden
Telephone + 46 (0)31-772 1000

Cover:
Inland transportation; https://www.pexels.com/photo/passing-train-on-the-tracks-1598075/
Gothenburg, Sweden 2021

Acknowledgements

This is a master's thesis conducted at Chalmers University of Technology during spring 2021 at the department of Technology Management in the Supply Chain Management programme. The thesis was originally thought of by a Shipping company and then refined in collaboration with the university and the researchers.

Firstly, we would like to show our appreciation for our supervisor and examiner Ceren Altuntaş Vural. With her commitment, continual support and insights, this master's theis wound never have been possible and attained our desired goal.

Secondly, we want to provide a large thank you to this thesis case company. Without their support, dedication and contribution, this thesis could have not been achieved. Also, a special thank you to our supervisors at the case company for providing time and energy in supporting us in bi-weekly meetings throughout this process and in this new COVID-19 landscape.

We would also like to say thank you to all participants in the data collection for this study for providing time and valuable insights in their operations.

Lastly, we like to thank our opposition team which provided valuable insights and constructive feedback to help make this master's thesis better.

Arwid Gunnarsson
Arwid Gunnarsson

Joakim Svanberg
Joakim Svanberg

Chalmers University of Technology
Gothenburg, Sweden
May 27th, 2021

Abstract

The shipping industry is a vital part of global trade where the complexity of supply chains has increased dramatically and shippers have met these challenges by vertically integrating. To maintain a competitive advantage in today's B2B service environment, companies must understand customer's expectations on services. So far, multiple studies have investigated customer expectations and their fit with product attributes, but few have been researching in a vertically integrated shipping context for inland transportation services.

Therefore, this study aims to investigate and explore the fit between customer requirements and inland transportation services in the northern region of Sweden by examining one single shipping company, referred to as this study's case company. This study has used a case study with a QFD approach for developing an adapted HoQ model. Both quantitative (questionnaires) and qualitative (semi-structured interviews) methods were used to collect and analyze data in five steps according to the HoQ matrix.

With the use of HoQ methodology, findings show 12 unique service attributes highlighted as important for the case company's inland transportation and 14 unique customer expectations highlighted by customers in interviews. After the customers ranked each customer expectation in a survey, a QFD team was appointed to analyze the relationship between each service attribute and customer expectation with a score dependent on the relationship strength. This data was then calculated and summarized to investigate what service attribute fulfills customers' expectations the best and which service attribute does not satisfy the customers' expectations on inland transportation services. It was concluded that some service attributes were better equipped to meet customers' requirements while others did not.

Keywords: Shipping, Inland transportation, B2B services, QFD, HoQ, Vertical integration, Customer satisfaction, Service quality.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

1. Introduction

Shipping plays an essential part in global trade and relocation of industrial production in the early years (Casson, 1986). Since then, the complexity of the ocean freight supply chains has increased dramatically (SanJaime, Cantos-Sánchez, Moner-Colonques & Sempere- Monerris, 2012). According to the World Trade Organization, global export has grown by approximately 290 percent from 2000 to 2019 and maritime transport is described as the backbone where ocean freight provides over 80 percent of global freight (Bai, Zhang, Li, Zhou & Yuan, 2020). Since economies of scale have become a major factor for achieving lower shipping cost, container ships have recently significantly increased their volumes in shipped goods where longer distances and larger volumes push cost down (Roso, Woxenius & Lumsden, 2008). This has put tremendous pressure on ports and hinterland access to manage these continuously larger vessels and volumes and incentives for shipping companies to increase further involvement with terminals (Zhu, Zheng, Ge, Fu, Sampiao & Jiang, 2019). In some cases, companies have started their own terminals to decrease waiting time at ports and thereby shorter transport times for customers (SanJaime et al., 2012). To manage the complexity of the shipping supply chain and achieve competitive advantages, companies have implemented integration strategies such as horizontal, vertical or conglomerate (Altuntaş & Göçer, 2014). Vertically integrated companies are thereafter able to become a logistical provider by offering more customer solutions such as complex inland intermodal transports (Frémont, 2007).

To maintain a competitive advantage in today's B2B environment it is increasingly important to understand customers' needs and drive customer satisfaction (Gustafsson, Ekdahl & Edvardsson, 1999). According to Hakanen, Helander & Valkokari (2017) companies are trying to develop and specialize their service offerings due to B2B customers' trend to demand requirements specific for their company and geographical location. Service management has thus become increasingly important in global trade and shippers are trying to find ways of offering more attractive solutions for their customers (van Klink & van den Berg, 1998). Nordin & Kowalkowski (2010) argues that companies increasingly market their product and service offerings with better customer solutions and customer service.

The issue in translating customer needs to specifications for services is to use a systematic approach to fully capture the needs. One approach for translating customer needs to specifications for services is by introducing the Quality Function Deployment (QFD) tool (Park, Letho, & Letho, 2021). QFD is a customer driven approach that can be applied both on products and services to support companies in a systematic way to turn customer requirements into defined and measurable criteria (Park et al., 2021). House of Quality (HoQ) is a house-shaped tool within the QFD methodology that enables customer expectations and service attributes to be compared and analyzed where each attribute is put in relation with each other to find connections and correlations (Park et al., 2021).

So far, multiple studies have investigated customer expectations with product attributes and their relations. However, few have been used in a vertically integrated shipping context for logistical services with a QFD approach. Also, much research has previously been conducted on developing new products and services with the use of QFD methodology, but few studies have been investigated already existing logistical services. Today large shipping companies are facing major challenges in growth in the ocean market and thus aims to better understand new markets such as inland transportation and how they best can satisfy those customers' expectations. This study aims to fill the gap by provide research on customer needs in a vertical integrated shipping context and how actors in such context can better meet customers' expectations on already existing inland transportation services. Additionally, this study aims to contribute to filling the research gap by systematically investigate a single case with a QFD approach that can be applied to other similar situations in future studies

1.1 Aim

The aim of this master thesis is to investigate and explore the fit between customer requirements and inland transportation services in a vertically integrated container shipping context. Based on the aim, this study seeks to address the following research questions. Additionally, the results of this study are expected to provide recommendations on how to mitigate any gaps between customer expectations on services and attributes on services to achieve a higher inland transportation ratio.

Based on the aim the following research question have been developed which will provide insights on the customer perspective on requirements for inland transportation services.

- What are the customers' requirements from inland transportation services for containers?

To understand what type of services that are currently provided to the customers in an inland transportation context the following research question was developed.

- What are the main service attributes for inland transportation provided by container shipping companies?

To investigate how the fit between customers' expectations and current inland transportation service attributes can better be configured to reduce potential gaps, the following research question was also developed.

- How can inland transportation service attributes be configured so that the customer requirements from this service are satisfied in a prioritized manner?

To answer the research questions this study will apply the HoQ methodology to systematically evaluate and analyze customer expectations and service attributes and their connections. Further insights and details will be provided in section 3.

1.2 Limitations

Due to the extent of the topic of this master thesis, the scope will be limited to a single case company's inland transportation market in the northern Swedish region in a vertically integrated context. The geographical limitations are based on two reasons: 1) due to the risk of the study being too broad and 2) this geographical area is of particular interest to the study's case company. Therefore, the company's customer base and data gatherings will be limited to the northern geographic region in a B2B environment. Employees at the case company will be related and chosen based on their knowledge and insights toward this study's topic. Also, containerized inland transports are the main focus where both import and export will be taken into account and not limited to only one specific Swedish port. However, this study will not engage in the area of ocean freight.

Data gatherings will be limited to in-depth interviews with key personnel at the case company, and selected customers will be exposed to in-depth interviews and surveys in the form of a questionnaire. Also, literature will be limited to the subjects "Service Management" and "Inland Transportation", where general inland transportation, vertical integration in a B2B shipping context, and QFD methodology will be the main focus.

2. Frame of reference

This section will present and describe the frame of reference that will frame this study's research, including theoretical literature within inland transportation, vertical integration, and B2B services. This section will review general inland transportation and then further investigate vertical integration by exploring benefits and criticism in general and in a shipping context.

2.1 Inland transportation

Eurostat (2019) announced that the market of inland transportation modes is divided as follows, 76.3% by road, 17.6% by rail and 6.1% by inland barges. Road is considered as the most prominent transportation mode regarding the aspects of speed and flexibility, it is also best adapted for short distances (Blumenhagen,1981; Islam, Ricci & Nelldal, 2016; Reis, Meier, Pace & Palacin, 2013). Compared to rail, the investment in trucks is relatively low due to a small fixed cost of transportation and no dependency to rails, the downside is the high energy expenditure caused by motorized vehicles (Blumenhagen,1981). The benefits of road-haulers are their availability to move containerized cargo to any destination within the hinterlands since they could offer door-to-door, port-to-door, terminal-to-door and less than container load services (Blumenhagen, 1981; Janic, 2007). Blumenhagen (1981) states that challenges such as regulations regarding the amount of hours or the maximum distance the truck drivers are allowed to drive per day will reduce the capacity for the road haulage which could lead to a reduction of competitiveness. Kurtuluş et al. (2020) declare that road transportation stands for 93% of the external shipping costs such as indicents, emission, global warming and traffic jams. Authorities have proposed that a transfer from truck to rail should be encouraged to minimize pollution, expand economic prosperity and diminish congestion. Vural et al. (2020) states that the large number of containers has increased the demand for inland transportation modes that are able to transport huge volumes of containers, preferably by rail. Since the transportation of road is often used for pre- and post-haulage, the main distance of the transport should be operated by rail and inland marine freight (Blumenhagen,1981; Kurtuluş & Çetin, 2020). Despite the recent statement, Frémont & Franc (2010) also states that inland transportation always includes transportation by truck for some parts of the journey.

Rail transportation is considered as a fast and high-capacity transport mode which is designed for far-distance, large volumes and heavy load shipments (Balinski, 1961; Blumenhagen, 1981). Rail transportation has a high fixed cost and requires large investments (Balinski, 1961; Blumenhagen,1981). Even though rail is attached to certain destinations due to railways and terminals, but also the high fixed costs, it has the ability to exploit the economies of scale, this could reduce the unit cost which in turn will decrease the overall costs (Blumenhagen,1981). The economies of scale could be attained by using so-called block trains which have the ability to move around 70 TEUs at the time if the rail system is designed for that capacity, the block trains should, to acquire this, be used effectively and regularly.

Barge transportation has a high capability of capacity (Fransoo & Van Woensel, 2015) and the medium has the lowest energy expenditure compared to road and rail, it is applicable for far-distance transportation (Blumenhagen, 1981). Barge transportation has an extensive fixed cost but has the advantage likewise as rail transportation to utilize the economies of scale which will reduce the cost per ton mile (Blumenhagen, 1981; Fransoo & Van Woensel, 2015). The low varying cost is attained due to the fact that barge transportation has a small energy consumption (Blumenhagen,1981). Since road and rail transportation are fast transportation modes, the haulagers have considered speed as a main transportation attribute. But due to growing fuel prices, the barge slow steaming within inland waterways has been a predominant component to increase transportation efficiency.

Fazi & Roodbergen (2018) describe that there are various actors involved in the distribution chain e.g., carrier's haulage, merchant haulage, port operators and shippers. Various actors operate within different steps of the chains of transportation. If the shipper uses carrier haulage, the carrier arranges the end-to-end transportation and if the shipper hires the merchant haulage, the carrier will only conduct a part of the transportation. Diansheng, Yuanyuan & Yanhong (2020) explains that hinterland ports are essential for the shippers to reduce their transportation cost. The competition by ports emerged from the shippers at the point when shippers pick which port to use. Diansheng (2020) states that shippers value transport information and the rate of condition of the cargo when deciding which port to use.
Van den Berg & De Langen (2015) explain that some shipping lines have changed their strategies from only operating with a port-to-port setup to offer their customers an end-to-end solution, due to a saturated maritime market. These decisions to penetrate the inland market are based on the shipping line industry since they spotted that cost reductions could be made at the inland side and by offering end-to-end solutions, they differentiate themselves from their competitors that only offer port-to-port solutions. This also provides the shipping lines with more control of their entire supply chain. The strategic decision by the shipping lines does cause disturbances in their transport chain due to coordination problems within the hinterlands. Berg (2015) elaborates that it is a challenge for carrier haulage companies to operate both at ocean and hinterland areas simultaneously since the services differ among them both on an operative and strategic level, this stalls the customer satisfaction. When customers purchase end-to-end solutions, they require full visibility in cost calculations to distinguish which haulers can provide the best cost and service solutions. This will in turn reduce dependency from the carriers over the customers but will increase complexity for the shippers to provide a fair price for their services. According to Frémont & Franc (2010), it is essential for carriers to, in particular, maximize the fill rate of containers and in general, prevent containers from being empty when transporting them, since they constantly have to decrease their per-kilometre freight rate within inland transportation.

Van den Berg & De Langen (2015) elaborate that the inland market shares among the carriers and merchant haulers are widely scattered depending on which part of the world they operate in. In Europe, merchant haulage controls the majority of the market shares, a large shipping line company reports that they only attain a market share of no more than 25%, this due to underdeveloped intermodal solutions. Van den Berg & De Langen (2015) states that merchant haulage has a competitive edge regarding inland transportation towards carrier haulage since the merchant haulage control and offer its own inland transportation solutions to their customers. Extensive connections within the supply chain operations among shippers, unified data systems and the option to choose any haulage company's services to provide solutions for every single customer at a particular deal has been beneficial to gain market control by the merchant haulages. Also, the fact that merchant haulage are independent actors in the market and since they have a relatively small amount of tied up capital in the form of trucks or rail contribute to a competitive market position.

To be able to decrease the price offered to the customers, Frémont & Franc (2010) introduce a concept called one way road transport and round trips. One way road transport increases the freight rate compared to round trips, round trip transportation means that a loaded container is transported to a consignee, when it is delivered, it is sent back empty to the origin again. This means that the customer has to pay for both ways of transportation. To achieve more efficient transportation flow, one way transportation should be used. One way transportation is a concept where containers carry load both ways. One way transportation provides the carriers to arrange a setup where the import customer and the export customer share the container and only have to pay for the actual trip that is relevant for the consignee. This concept could be useful for intermodal transportation.

Intermodal transportation is a concept described as when either humans or goods are being transported from one location to another with the combination of no less than two different transportation methods such as rail, truck or vessels where the transmission between them takes place at an intermodal depot (Crainic & Kim, 2007; Frémont & Franc, 2010; Bontekoning, Macharis & Trip 2004). Since the ocean freight has increased exceedingly during the last decades, which is the keystone to intermodal transportation, it has resulted in an escalation of container volume on the inland side. Crainic et al (2007) elaborate that the container shipping concept is a central part within cargo transportation and the containerized shipping business was initiated to increase security due to lost and destroyed goods. The standardized containers do also contribute to lowering the administering of containers which increase the efficiency and abate the cost. The benefit of intermodal transportation is that different transportation modes are united to achieve the most eminent door-to-door solutions (Slack, 2017). For multimodal inland transportation, Blumenhagen (1981) declares that road and rail transportation should be combined with their separate virtue of services of which is requested by the shipper, this will create synergies among road- and train haulagers. Kurtuluş et al. (2020) add that to reduce the external costs, a transmission to intermodal transportation is essential to achieve that premise. The intermodality of transportation is preferably most effective for extensive destinations (Vural et al., 2020). Kurtuluş & Çetin (2020) explains that rail compared to road is not cost effective if applied at destinations that are less than 400km, Arnold, Peeters & Thomas (2004) extend that figure to a distance of 500km. Although this is desirable, there are barriers that interfere with the transmission such as the distance of the transportation, the volume of the shipment, infrastructure, shipment category and valuable goods. To ensure that the company achieves high performance of these attributes, key performance indicators should be applied.

According to Kurganov, Gryaznov, Dorofeev (2017) & the U.S department of transportation (https://ops.fhwa.dot.gov/plan4ops/reliability.htm), reliable travel time within transportation consists of the aspect's quality and variability, which are essential aspect’s since it furnishes the actors in the logistical chain with a stable prognosis of transportation time which contribute to reliable transportation flows. If the reliable travel time is attained, it could lead to non-periodic delays and increase the improvement of on- scheduled transit execution. It is crucial to determine the main reason why delays occur and to solve the source of the cause to attain reliability of travel time.

There are two different kinds of service attributes such as tangible and intangible, which influences the customer gratification. Some of the tangible attributes are on-time loading and deliveries, accessibility of containers, transport and digitized services. The intangible attributes are the approach and knowledge towards the customers from the sales agents, customer service and communication replay rate. To achieve high service quality towards the customers, Hirata (2019) states that the service attribute's reliability, responsiveness, assurance and empathy could be applied. Reliability demonstrates the capability to provide in time and steady services, responsiveness is the commitment to support the consumers rapidly, assurance is the potential to construct confident towards the customer with expertise, courtesy and provide communication awareness, lastly, empathy illustrate the customer care and the ability to manage the customers.

There are certain key performance indicators that could be used to assess the performance of inland transportation services. Kurtuluş et al. (2020) presents five attributes that are appropriate in short-distance transportation, these are Transport Cost, Transit Time, Delays, Frequency and Free Time. Transport Cost covers the entire cost of freight from destination A to B, Transit Time involves the total transportation time which covers rail shipping time, idling and operating time at the depot and the period of time for the truck to deliver the shipment from A to B. Delays indicates the percent of overdue incoming containers concerning a defined time frame, regarding the intermodality of rail, it involves the truck haulage from destination A to B. Frequency measures the late rail deliveries. Free Time is only applied for ocean freight containers that are either stuck on vessels due to long unloading time or if the container is going

to get loaded onto the vessel. Free Time is applied so the customer does not have to pay for the depot costs they cannot affect.

This section presented the basics of inland transportation, intermodal transportation, usable key performance indicators for transportation and how different actors operate within the shipping industry. In the next section, vertical integration is introduced, which will present how these activities are connected to multiple actors within transportation.

2.2 Vertical integration

In this section, vertical integration is described first in general terms and thereafter in a shipping context. This section is vital for understanding the complexity of integrated companies and their logistical services. This insight will be used for understanding which service attributes shipping companies find essential in a vertically integrated context based on literature. Firstly, different integration phases are presented and described with terms as backward- and forward integration. Lastly, vertical integration in a shipping context will be explored and provide insights based on maritime literature and internal documents provided by the case company.

2.2.1 Vertical integration in supply chains

Integration, in general, is described by O´leary-Kelly & Flores (2002) as an agreement and interaction between two actors in a market with supportive actions, information sharing, cooperation, and cohesiveness as main characteristics. In short, two integrated companies support each other's goals in an agreement where both invest effort in time and resources in the cooperation. Thereby, the level of integration depends on the amount of effort and interaction between these actors (O'leary-Kelly & Flores, 2002). Vertical integration is a strategy when companies decide to increase control of downstream or upstream (also named backwards or forwards) processes or activities in the supply chain (Riordian, 2005; Chen, 2001; Casson, 1986, Frémont, 2007; Altuntaş & Göçer, 2014). Vertical integration is also a practice for companies to seize control over the quality of their services or products (Li, Tan, Wang, Wei & Wu, 2020) or to reduce uncertainties in the supply chain (Arrow, 1975).

There are different levels and directions of vertical integration. Forward integration is defined as when a company expands its activities to provide distribution of goods of services and backward vertical integration is thus when a company has control over manufacturing or provides services needed to produce the final product or service (Riordian, 2005; Li, Tan, Wang, Wei & Wu, 2020; Chen). Vertical integration can be achieved by partial integration or full integration depending on how far backward or forward companies decide to seize control (Riordan, 2005). Partial vertical integration is also defined as when a company acquires part of an operation downstream or upstream without full control (Riordan, 2005). Altuntaş & Göçer (2014) argues that forward integration is preferable when a company wants to increase control over prices and backward integration is a facilitator of increased control over the quality of manufacturing. Li et al., (2020) also argue that vertically integrated companies have increased ability to control quality backward and increased control over service levels from forwarding integration. Integrated companies can also increase their bargain power and strengthen upstream companies' market power if they have the ability to arrange more agreeable situations for their own downstream companies (Zhu, Zheng, Ge, Fu, Sampiao & Jiang, 2019). This means that companies have the ability to set prices over costs or push competitors out of the market (Riordan, 2005). However, vertical integration effects depend on market structure and are complicated (Zhu et al., 2019; Riordan, 2005).

According to Riordan (2005), vertical integration has raised several issues regarding anti-competitive incentive and risk of facilitating collusion which has been a concern of antitrust policies and new industry regulations. Other scholars argue that vertical integration can cause

anticompetitive effects due to already integrated companies realizing that they can operate and benefit from higher costs and thus not as aggressive in pricing on the market as nonintegrated companies (Chen, 2001). Also, a company might receive decreased profits in its upstream integrated companies when companies downstream cut down on prices and thus no incentive to lower prices (Chen, 2001).

According to Casson (1986) if there is an efficiency discrepancy or capacity discrepancy between two actors' operations there can be integration issues and also not preferable when two companies provide joint products where the product disposal is costly. Additionally, it is a large cost factor to integrate with other actors on a market due to additional investments and there might not be clear what short-term benefits there are (O'leary-Kelly & Flores, 2002). However, there are markets that benefit from vertical integration such as within the shipping industry when integrating with ports to facilitate new investments (Zhu et al., 2019). According to Casson (1986) complications such as subcontracting, and issues of arrangements and responsibilities are some problems that must be solved in a vertically integrated context.

Companies can reduce company boundaries between downstream and upstream firms by applying real time information sharing to enable companies to optimize and sustain their supply chain and take part in fast information sharing (Goh & Fraser, 2012). Fast and efficient information sharing also enables companies to optimize use of assets by better positioning of empty containers and thus decrease transportation cost (Taghavi et al., 2017). Better collaboration between integrated companies in a supply chain will increase the chance of a smoother trading exchange (Goh & Fraser, 2012). However, since the transport industry is considered a traditional industry and reluctant to implement larger changes there must be cost advantages in the short term to change traditional structures of doing business (Vural, Roso, Halldórsson, Ståhle & Yaruta, 2020). Evangelista (2002) argues that traditionally shipping companies have not been in the vanguard of electronic links between integrated actors but have generally had strong EDI systems with agents and port terminals. Logistics software has increased pressure to increase integration and coordination for transport companies and forwarders to increase customer satisfaction within the supply chain where efficient ICT is a solution (Evangelista, 2002).

2.2.2 Vertical integration in a shipping context

According to Tan, Meng, Wang & Kuang (2018), supply chains in the maritime industry usually consist of a chain of globally transported containers. As illustrated in Figure 1 below, there are many different actors and processes involved in a shipping supply chain. Generally, it starts with some form of land transport which can be either truck- or rail transports. This process requires additional transport services for instance warehousing and as the inland transport reaches a port, other services such as terminal operations are also necessary. During land transport, in some cases, logistical services are also a requirement where cross dockings at different hubs or freight forwarders are used. Thereafter, ocean transports from ports or air transports by plane are a common method of transport from one continent to another where land transport once again is used to carry the cargo either to a dry port some distance away from the port or directly to the end destination. This also requires additional services such as terminal operations or the use of distribution centers. Logistical services at this stage are generally cross-docking once again and inspections of goods. Song & Panayides (2008) argues that ports have increasingly become a vital actor in the maritime supply chain and that at ports there are many actors adding value to the customer and to facilitate this there are needs to achieve efficient coordination and cooperation between all actors from and to the port. During the whole transport chain, tracking of deliveries is a common expectation from a customer perspective where inventory management systems can provide visibility in where the goods are being shipped (Song & Panayides, 2012). Integrating with terminal handling companies at ports and haulage companies, quality and control of their services can be increased by having them become more focused on their own cargo handling instead of other companies' cargo and thus

more efficient (Frémont, 2007). By achieving integration on multiple levels within a supply chain a shipping company can thereby become a logistics provider by offering more complex logistical solutions (Frémont, 2007).

Within a supply chain it exists a certain amount of information uncertainty and especially between vertically integrated actors (Arrow, 1975). According to Goh and Fraser (2012) global trade within the shipping industry puts more pressure on reliable information sharing and quality information among transport companies and their deliveries. Poulis et al. (2013) argues that applying Information Communication Systems (ICT), shippers can integrate more efficiently by providing stakeholders with real time information for them to act on to further facilitate flexibility in eventual issues or changes to further increase their services and thus increase collaboration efficiency (Poulus et al., 2013; Taghavi, Irannezhad, Schrobback, Moghaddam, Prato & Nave, 2017). According to Evangelista (2002) ICT is a critical element in shipping due to its ability to control and manage entire supply chains and have given shipping companies tools to manage their logistic services for increased efficiency in these processes.

Song & Panayides (2008) argues that integration within supply chains is vital for supply chain performance and to mitigate friction between actors there is a need for integrated IT systems. This permits shipping companies to efficiently provide each other with electronic documents and invoices, send and receive orders and provide information on shipping statuses with low lead times and is considered a vital building block for cooperation within the maritime supply chain (Song & Panayides, 2008). By integrating ports in the supply chain companies can further facilitate higher customer satisfaction by achieving higher support from ports to fulfil their objectives (Song & Panayides, 2008). Vertically integrated companies can therefore provide customers the experience of having access to the same information systems and thus a seamless experience throughout the supply chain and can lead to higher customer loyalty (Frémont, 2007). Also, Tan et al (2018) argue that increased market shares and economies of scope and scale improved routing flexibility with different transport modes and door-to-door transports are additional reasons for vertically integrating.

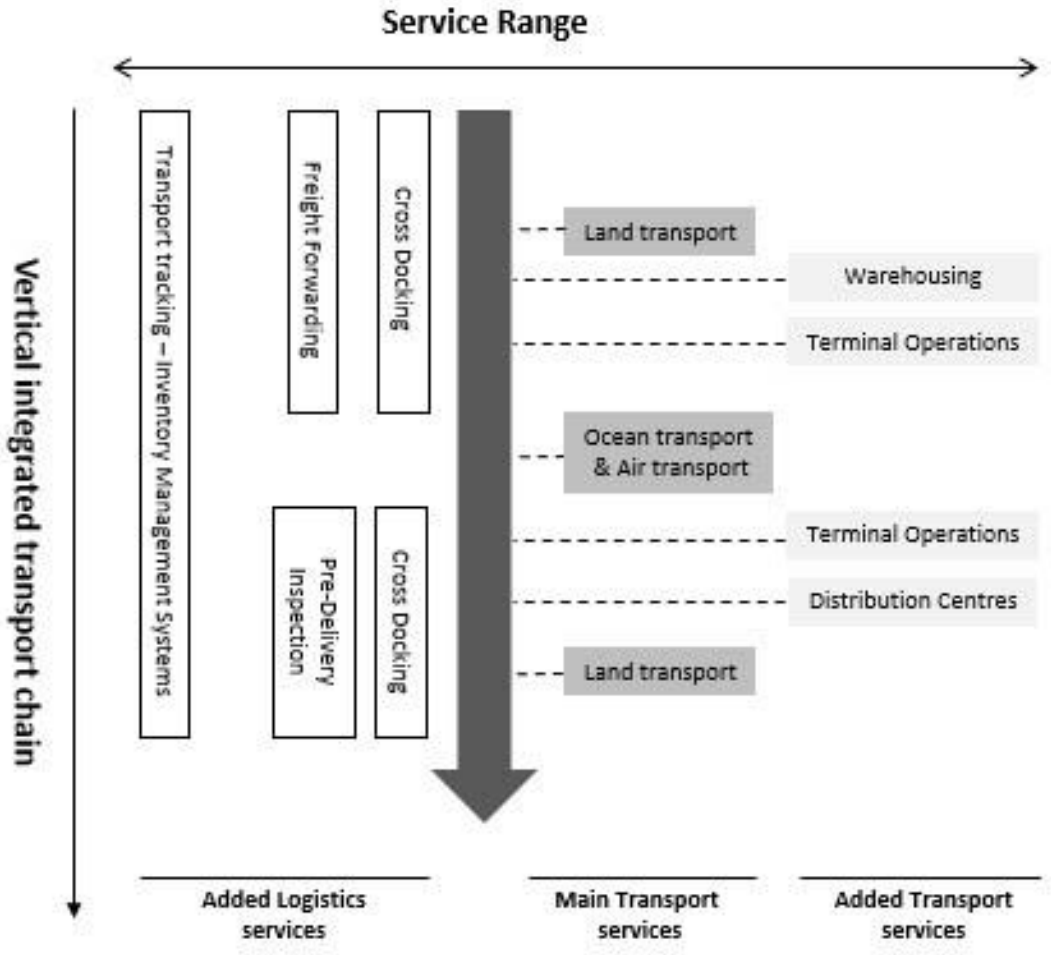


Figure 1. Adapted illustration of vertical integration in a shipping context from Song & Panayides (2012)

Drawbacks of vertical integration can be experienced if a smaller integrated company is connected to a much larger shipping company there can be issues in dependencies on the more dominant actor and thus creates a situation where other choices are limited and increases entry barriers for competitors (Frémont, 2007). Also, when a shipping company integrates forwards and expands its service offerings, forwarders transform into competition instead of traditional customers (Frémont, 2007). Cariou (2008) also argues that financially vertical integration can be considerably costly, especially when investing in port infrastructure and integrating with port terminals. Also, port authorities might not allow integrated companies to keep port operations exclusively for their own operations and give instructions to shipping companies to share their port investment with other shipping companies (Cariou, 2008). Vertical integration within the maritime industry, with its complexity of large transport networks both on sea and on land, have had its controversial issues with exclusion of rival companies from its integrated networks (Álvarez-SanJaime, Cantos-Sánchez, Moner-Colonques & Sempere-Monerris, 2013). According to Cariou (2008), implementing a vertical integration strategy might discourage new entries and thus gain exclusivity within the network and Altuntaş & Göçer (2014) argues that vertical integrated companies in the shipping industry must be careful when applying such strategy due to the risk of ending up in a monopolistic structure which is not allowed in numerous countries.

A vertical integration strategy is not always preferable, however, according to Casson (1986) vertical integration in a shipping context can be favorable in certain situations such as if government regulations on freight rates or price of shipping services are forcing shippers to own and operate their own vessels to keep costs down or if vertical integration enables strong

market presence which keeps competition out. Vertical integration is also preferred according to Casson (1986) when taxing between different regions or countries are more favorable in some geographical regions which enables companies to save cost by moving certain activities or cost to low tax areas to decrease total tax of profits, when shipping companies receives new technologies which benefits may be more efficient shared vertically and can be consolidated financially or if a shipping company have difficulties in managing the quality of provided shipping services due to fragility of goods. Álvarez-SanJaime et al. (2013) argues that shipping companies invest in vertical integration to increase control over port operations. Heaver, Meersman & Van de Voorde (2001) argues that increased control over ports can be achieved by a high level of collaboration among shipping companies by achieving a high level of bargaining power towards, for instance, terminal operators or inland transport companies. Vertical integration or shipping alliances have raised the question regarding whether to operate ports exclusively or to operate ports which is open for all in comparison to efficiency (Álvarez-SanJaime et al., 2013). Nevertheless, according to Casson (1986) vertical integration in shipping enables an uninterrupted flow of goods between activities upstream and downstream.

Containerization has provided shipping companies abilities to maintain an efficient flow of goods and enabled economies of scope or economies of scale and have given shipping companies the option to either focus on one transport activity such as ocean transport or to achieve end-to-end transport solutions as a logistics provider (Frémont, 2007). As a logistical provider, shipping companies have the ability to reduce costs in places besides from the ocean leg where it is difficult to continuously reduce costs in the long run (Frémont, 2007). However, as a logistical provider, a shipping company have multiple processes to manage and maintain competitive, it is important for shipping companies when providing complex logistical solutions such as end-to-end solutions to achieve high service capabilities (Liang, Chou, & Kan, 2006 as cited in Poulis, Poulis & Dooley, 2013). Vertically integrated shipping companies must therefore increase their relationships with both internal and external actors by improving communication routines to maintain efficiency between multiple actors and processes (Jenssen & Randoy, 2006 as cited in Poulis et al. 2013).

2.3 Service quality & customer experience

In this section, quality of services and customer satisfaction will firstly be described in general and thereafter describe the concept of customer satisfaction in a shipping industry context. As described in section 2.2, service quality and customer experience are essential in a vertically integrated shipping context due to the need to cooperate and coordinate multiple actors and processes. Service quality and customer experience will later in this study be translated into service attributes on inland transportation and customer expectations will be studied based on these services as a base to understand how customer expectations can be used to develop further and offer better services. Firstly, service quality and customer satisfaction will be introduced in general to understand why it is crucial. Lastly, customer satisfaction will be further investigated within the shipping industry to explore important logistical service attributes based on literature.

2.3.1 Customer satisfaction and service quality

According to Ghobadian, Speller & Jones (1994) the difference between product quality and service quality is the fact that service quality is inseparable in production and consumption, services are often intangible, services are perishable and that services are heterogeneous. Ghobadian et al. (1994) define service quality as to what extent the service fulfills customers' expectations of that service. Parasuraman, Zeithaml & Berry (1985) also argue that service quality is a measurement of the gap between perceived service and customer expectations and is thus a function of the two. Parasuraman et al. (1985) state that reliability, responsiveness, competence, ease of contact, communication, and behavior toward customers influence service quality. There are several difficulties for companies looking to increase service quality where the obstacles lie in the lack of visibility, difficulties in assigning accountability and that

deliveries of services are unpredictable (Ghobadian et al., 1994). Johnston (1995) argues that service quality can easily be increased by providing customers with helpful, friendly and committed employees. Seth, Deshmukh & Vrat (2005) also showed in their research that key factors in service quality are motivated staff, customer focused approach, sharp understanding of what service quality is and the influencing factors and efficient measurement systems.

Customer satisfaction is according to research conducted by Hirata (2019) a psychological reaction based on prior experience and the relation between perceived and expected performance of the service. Identifying which attributes that are important to the customers is often considered to be one of the most important factors for companies to become competitive and increase customer satisfaction (Flodén, Bärthel & Sorkina, 2017) and by including them in the developing phase of new services and products companies can gain a better understanding of their customers' requirements (Gustafsson, Ekdahl & Edvardsson, 1999). Paraschivescu & COTÎRLEȚ (2012) also argues that a customer-oriented company is better fit to identify customer preferred attributes on services and their behavior and thereby better understand what the customers perceive as value. Collecting and analyzing customer data on quality, needs and expectations companies can develop and maintain lucrative relationships with their customers (Paraschivescu & COTÎRLEȚ, 2012). However, when involving customers in developing new services there must be a systematic way of collecting data on service attributes (Gustafsson et al., 1999).

To mitigate these difficulties companies must increase their customer focus and marketing, educate, and empower personnel and implement a clear vision of the service outcome (Ghobadian et al., 1994). Johnston (1995) argues that some factors are major sources for dissatisfaction such as lack of responsiveness and thus quick and dedicated responses are a vital source of service quality. Ghobadian et al., (1994) continues to argue that quality of service is a major factor in the competitiveness and important component in differentiation of rivals and that quality is measured by the extent it fulfills customers' different expectations. Johnston (1995) states that companies can increase service quality by exceeding the customers' expectations, for instance by faster delivery time or increased customer service and thus increase customer satisfaction.

B2B markets in comparison B2C markets are more complex and consist of much larger transaction values where single actors can purchase significant volumes (Hutt & Speh, 2021). In B2B markets the customers are defined as organizations such as institutions, businesses or governments (Hutt & Speh, 2021). According to Zheng, Wen & Yen (2003) B2B environments usually interact with different businesses through electronic links and consist of critical mass elements, meaning that a business or a hub might consist of multiple customers. Thus, customers are approached in groups and that it is important to be the dominant actor at a certain hub (Zheng et al., 2003). Rauyren & Miller (2007) argues that it is more important to understand the customers context and needs in a B2B context than for consumers. B2B customers have a much greater need for customization of services and due to larger purchasing volumes than consumers there is a higher need for developing relationship with B2B customers (Rauyren & Miller, 2007).

Customer satisfaction in a B2B environment is also influenced by the customers' perception that the service or product they purchase is price worthy (Madaleno, Wilson & Palmer, 2007). The same authors also showed in their research that companies who provide multiple channels through which the customers can use in a B2B context are also experienced higher customer satisfaction than companies who don't. Khan, Naumann & Williams (2012) showed in their research that personal contacts with the customers were more important than the perception of the quality of the product. Rauyruen & Miller (2007) also state that personal contact is important to create customer loyalty in a B2B context and that focus should lay more on managing already developed relationships to secure long-term purchases, than on collecting and measuring the number of customers at the current moment. To nurture existing B2B

relationships it is important to understand the context in which the customer operate in to understand their specific needs.

According to Flodén et al. (2017) knowledge of customer wants is crucial for companies in the B2B transport industry when establishing and developing competitive and attractive solutions for its customers. To be successful in developing services that have a customer perspective, companies must be familiar and have a fundamental understanding of customer needs (preferences, requirements and expectations), customer service systems (IT-systems and knowledge of using IT-systems), customer values, customer behavior (how customers act and engage in the services) and customer's quality perceptions (how customers view quality and their main preferences) (Gustafsson et al., 1999). Oliva & Kallenberg (2003) argues that companies providing services to customers demand more focus on relationship building than companies producing products with no services. The following section will take the concept of customer satisfaction and place it in a shipping context.

2.3.2 Customer satisfaction in the shipping industry

According to Hirata (2019) shipping companies are providing a service instead of a product that can be either tangible or intangible. To fulfil customer satisfaction, shipping companies can provide intangible services such as industry knowledge, real time communication and customer services and tangible services such as on time deliveries, containers, transport solutions and digital solutions (Hirata, 2019). According to Yuen & Thai (2015) there are two different shipping segments with different characteristics of service quality namely the tramp sector and the liner shipping sector. The tramp sector is characterized with major bulk materials such as oil, coal, grain or other raw materials and their commodities are usually low value goods where customers are mainly looking for low cost and safety as their main customer satisfaction factor (Yuen & Thai, 2005). Liner Shipping has schedules on regular times with specific predetermined routes and in general higher value goods. Therefore, transit time, reliability and frequency of service are attributes that are considered more important to the customer than cost of the service (Yuen & Thai, 2015).

Other scholars within the shipping industry argue that attributes such as quality of sales personnel, quality of digital tools for customers and the quality of customer service are important service attributes to fulfil customer needs (Hirata, 2019). According to Lam & Zhang (2019) there are five main customer values that shipping companies must achieve to increase customer satisfaction namely: responsive service, customized service depending on customer, competitiveness of price and costs, reliability of service and corporate branding. Also, customers are expecting the shipping industry to keep up with the digitalization and provide a seamless experience for their users (Hirata, 2019). According to Chen, Chang & Lai (2009) forwarders are usually customers for shipping companies where a major percentage of total container volumes are contracted with forwarders. Chen et al. (2009) also argues that this has to do with the extra customer services provided by forwarders which makes them an attractive alternative and solution from a shipper's perspective.

Balci, Cetin & Tanyeri (2018) explored shipping service attributes depending on whether the shipping line wanted to differentiate themselves or not against other shipping company alliances. For high differentiation with high importance was availability to provide empty containers, provide problem solving and service response to issues, competitive prices for door-to-door solutions and error free documentation (Belci et al. 2018). Attributes with high differentiation but with low importance to the customer was fast documentation, ability to provide special equipment and how frequently the shipping line contacted the customer. Belci et al (2018) argues that attributes with higher importance but with low differentiation lever were how easily customers can reach employees from the shipping line, prevent damages and loss of goods, reliability in scheduled deliveries (on time deliveries) and low transit times. And in turn, low differentiation with low importance they found frequency of departure, space

availability, online tracking and the state of the container. Belci et al. (2018) then concluded that it is most important to invest time and resources in relationships with customers and is the most effective way to differentiate themselves in customer satisfaction for container shippers. Liu, Cao, Ajjan & Hong (2017), argues that customer satisfaction within the shipping industry and customers willingness to come back are influenced by post purchase activities such as tracking transports and customer service and that efficient shipping will be a competitive advantage for many different companies. Furthermore, satisfying customers in a shipping context gains additional complexity with the use of freight forwarders as the one who selects the services from liner shippers (Yuen & Thai, 2015). Freight forwarders can be involved to make decisions on which routes to take, the combination of modes and which carrier or transport operators to use and therefore important not only to satisfy the end customer but also the freight forwarder who acts as a direct customer (Yuen & Thai, 2015).

According to Durvasula, Lysonski & Mehta (2000), it is difficult to maintain a faultless service quality in every exchange with the customer and it is the way a company handles customer service after a transaction that is important to retain customers. Responding to customers in time and in a sincere way will have a positive impact on customers' perception of the service and company in general (Durvasula et al. 2000). Durvasula et al. (2000) explored an area on how to handle unexpected issues in customer service to maintain healthy relationships with customers in the shipping industry called service recovery. Their research concluded that shipping firms that have strategies to handle service recovery have a major advantage on overall customer satisfaction and that prices are not the only way to satisfy customers, but high service levels are very important. Lewis (2006) argues that pricing in the shipping industry has different impacts on retaining and gaining new customers where already existing customers are price sensitive when it comes to base price and new customers are sensible for when prices are based on volume. Also, Miremadi, Ghalamkari & Sadeh (2011) found that multiple ports in the middle east have a gap between customer expectations on services and management's perception of these services meaning what attributes on services are important for the port. Miremadi et al., (2011) state that standardized integrated processes and continuously evaluating customer expectations is key to mitigate this gap.

Understanding customer expectations is important to increase customer satisfaction as described previously and to mitigate any conflicts between customers and services (Miremadi et al. 2011). According to Frémont (2009), it is important to understand customers' needs to provide them with direct services instead of relying on freight forwarders. For instance, if a shipping company vertically integrates with a port, they can directly organize their own representation at that port and dedicate it toward their customers (Frémont, 2009). However, to dedicate services to their customers, companies must first fully understand customer expectations on services provided (Flodén et al., 2017). This study aims to provide insight on what customers expect from inland shipping services and what attributes are provided from a shipping company and how to do that will be presented in the next section. Presented in the literate Table 1 below summarizes the findings regarding service attributes and customer requirements from shipping services. Respective academic sources are then highlighted for each service attribute and customer expectation in the row below.

Table 1. Summarized literature findings on service attributes and customer expectations

LITERATURE TABLE ON EXPECTED ATTRIBUTES ON INLAND TRANSPORTATION SERVICES		
Attribute	**Explanation of attribute**	**Related Authors**
Visibility	Tracking & tracing of deliveries	Song & Panayides (2012) Ghobadian et al. (1994)
Inventory Management/IT	The importance of IT solutions	Song & Panayides (2012) Gustafsson e tal. (1999)

		Hirata (2019) Frémont (2007)
Routing flexibility	Ability to use different transport modes which create flexibility in multiple routs	Tan et al. (2018) Yuen & Thai, (2015)
Cost	The importance of price and cost of services	Blumenhagen, (1981) Fransoo & Van Woensel, 2015) Frémont & Franc, (2010) Kurtulus et al. (2020) Zhang (2019) Belci et al. (2018) Lewis (2006)
Capacity	The ability of a transport mode to carry a certain amount of volume	Fransoo & Van Woensel, 2015) Belci et al. (2018)
Transit time	The total transportation time which covers rail shipping time, idling and operating time at the depot and the period of time for the truck to deliver the shipment from A to B	Kurtulus et al. (2020)
Frequency/reliability	Frequency of late deliveries/reliability of deliveries, services or departures.	Kurtulus et al. (2020) Zhang (2019) Belci et al. (2018) Parasuraman et al. (1985)
Free time	The time for which a customer does not have to pay extra for depot cost	Kurtulus et al. (2020)
Customer service & knowledge	The activity of providing the customers with help to add value to their core activities to maximize customer satisfaction	Ghobadian et al. (1994) Johnston (1995) Paraschivescu & COTIRLET (2012) Flodén et al (2017) Gustafsson et al (2019) Zhang (2019) Chen et al (2009) Liu et al. (2017) Durvasula et al. (2000) Parasuraman et al. (1985)
Response time	How quickly issues are being handled during customer service	Johnston (1995) Zhang (2019) Durvasula et al. (2000) Parasuraman et al. (1985)
Relationship building	The importance of relationship building with two or more actors	Belci et al. (2018) Oliva & Kallenberg (2003) Khan et al. (2012)

Table 1 above summarizes the literature findings on expected and important service attributes on inland transportation services. Some of these findings will be further used and viewed in a practical context explained in section 3.2. Visibility for instance, are used as the ability for the customers to track or trace their deliveries either by hub visibility or real time visibility. The

service attributes are important to define to better understand what type of inland transport services are being offered to the customers. The following section will describe a methodology for highlighting such service attributes and customers' expectations on inland transportation services in several structured data collection steps.

3. Methodology

In this section, the methodology will be presented and explained. Firstly, the study's research design will be presented. Thereafter, the study's core methodology will be presented in section 3.2 as a QFD approach which will be consistent throughout the whole report using the HoQ methodology. Due to the nature of the HoQ, interviews and sampling sizes will not have their own subsections but be included in each HoQ step. The HoQ matrix will be adapted and processed to fit this particular study's purpose and frame of reference. Additionally, the QFD section will describe how data was collected in each step where the result will be presented in section 4 and analyzed in section 5. Lastly, the study's research quality will be explained in a separate section at the end.

3.1 Research design

Sechdeva (2008) describes qualitative research as a method of understanding, translating and decode meanings of specific phenomenon. This study aims to understand a shipping company's product offerings and investigate if these service attributes align with customers' preferences and then analyze to understand the issue. Therefore, this study will use a QFD approach to answer the research question in a structured way. Gerring (2004) argues that a case study is a comprehensive study of an individual unit which can be a company. According to Noor (2008), a case study investigates a single unit or individual and not an entire organization and focuses more on a particular matter and creates a more extensive picture of the investigated issue. Kothari (2004) also describes a case study as a qualitative analysis of a single social unit that can be an institution, a cultural group or another form of individual. Based on these definitions and the aim of the project this master thesis decided a case study was the best fit for this type of study. Additionally, to answer this study's research questions a case study will be conducted on a global shipping company operating in the Swedish market.

In combination with the nature of a case study and that the purpose of this study fits the methodology, this study has chosen to apply a QFD approach with a HoQ structure to collect data in different steps. The QFD and the HoQ structure will provide insights into customer needs and how a company can meet these needs (Liang et al., 2006). This study will collect data in five steps which is described in more detail in the next section.

3.2 Quality function deployment

The QFD methodology was first applied by Mitsubishi in the 1960s and has been used by various companies ever since (Zairi, M., & Youssef, M. A. (1995). The QFD methodology consists of four steps which are the House Of Quality, Part Deployment, Process Planning and Production Planning. Due to the characteristics of this study, HoQ was chosen for this study based on its ability to provide insights on gaps between customer expectations and service attributes by providing a systematic approach in data gathering and analysis and will be further explained in this section. According to Chan & Wu (2002), the benefit of the method is that companies are able to work more proactive rather than reactive within the development phase of services or products which can reduce costs and cut design lead times. Zairi et al. (1995) mention that even if the QFD was created for designing new products, it can also be applied to evaluate current services, as in this study. However, the HoQ model will be modified and adapted to this specific study and thus some elements from the literature will not be relevant and therefore removed. The modifications and rearrangement of methodology order in the HoQ matrix is also based on the focus of investigating the gap between service attributes and customer expectations on a single case company and its customers and potential customers.

Additionally, the HoQ matrix will be applied to already established services which is one area of use according to Chan et al. (2002).

The HoQ contains 6 steps, Customers needs, Planning matrix, Technical measures, The Relationship matrix, Correlation Matrix and Technical matrix Chan & Wu (2002). However, this study's modified HoQ matrix is illustrated in figure 2 below. The HoQ will be adapted to be suitable for this study where Customer needs and Technical measures will switch places. Planning Matrix and Technical Matrix will not be used in this study since data collections regarding the shipping company's competitors will not be collected. In this section each step of this study's HoQ data collection methodology will be presented and explained in accordance with this study's purpose.

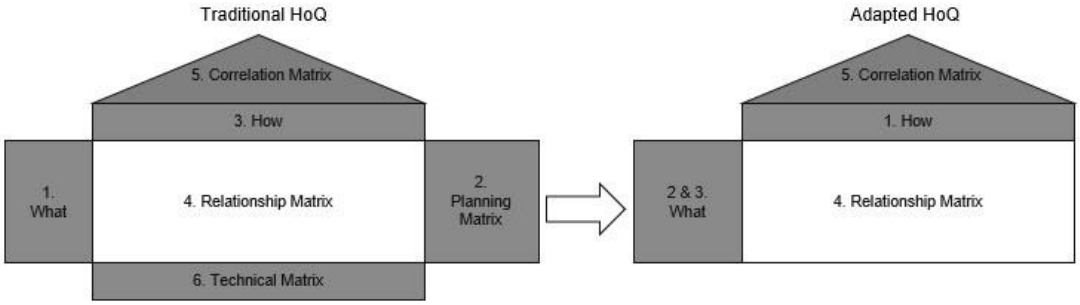


Figure 2. Illustration of a traditional HoQ matrix and this study's adapted HoQ matrix

3.2.1 Step 1 "How"

In contrast to a traditional HoQ structure where the customers are approached first, commonly referred to as the What step, this study's first step was the How step which represents the ceiling of the HoQ. In this step, semi-structured interviews with nine representatives from leading roles within the case company were conducted and are presented in Table 2 below. The decision on starting with the technical attributes of services was decided based on the importance of gathering information on what type of service attributes are currently offered to their customers to fully understand the context which enables higher quality data collection in the next step which is to investigate the customers' expectations on the services. Chan & Wu (2002) state that in the Technical Measures step, the attributes shall be collected at the place where the company recognizes the technical attributes of their products.

According to Liang et al. (2006), when collecting data for a QFD study, multiple sources can be applied such as already published publications, internal reports or consulting with employees with expertise in the field. In this step, this study has chosen to collect data through conducting semi-structured interviews. Since this study must acquire specific information from personnel holding specific knowledge required to answer the questions developed to collect data for the first step, semi-structured interviews were chosen. Interviews are also said to have the advantage of achieving insight of the interviewees' knowledge and experience and creates opportunities for individual opinions of specific topics from the interviewee (Kuada & Kuada, 2012). Interviews can differ from very structured to unstructured (Merriam (2002). Since structured interviews have precise and orderly questions, unstructured interviews have only a topic and no prearranged questions (Merriam, 2002). This case study has chosen a method in between called semi-structured interviews where there are no standardized question lists which the interviewer must follow but themes and questions that will vary in order depending on the interview and makes the interviews more open to new questions which may arise during the discussion (Kuada & Kuada, 2012). Merriam (202) continues to argue that semi-structured interviews have a blend of structured and unstructured interview questions. Therefore, throughout this study both in step 1 and in step 2 semi-structured interviews were conducted. The interview questions were then developed based on relevant literature and this approach

facilitated a deeper understanding of types of service solutions that already exist and provided a basis for more specific interview questions and thus higher quality on data collection from customers later on in the study and presented in Appendix A. However, the order of the interview questions was rearranged after the first two interviews with the case company to better follow a red line throughout the interview questions.

Sample sizes are defined according to Sachdeva (2008) as the group of people that is chosen and included in the project. It is difficult to determine sample size when performing data collection and there is always a risk of not achieving the optimal sampling size for a study. If the sampling size is too large, it will consume too much time and resources to collect the data and if it is too small there might be a risk of not receiving enough data to perform a high-quality analysis at the end of the study (Kothari, 2004). In this case, nine representatives from the case company covered all perspectives relevant to fully understand what technical service attributes exist on their inland transport services. Additionally, the roles at the case company were chosen based on their knowledge of their service offerings and their different company perspectives depending on their department at the company for higher quality data and include multiple perspectives on their services as seen in Table 2 below. This is in line according to Chan et al. (2002) which elaborates that the customer needs are converted to technical data which is the Hows in the HoQ. The Hows technical attributes could be methodological designs, enterprise estimations and quality measurements.

The data collected from the nine semi-structured interviews highlighted 12 service attributes that were considered important to the case company's inland transportation services at the Swedish market. Data was also collected on what type of customers should be contacted and a customer list was provided on which companies were already customers and which would be advantageous to interview in northern Sweden.

Table 2, List of participants in step 1 of the data collection

INTERVIEWEES IN STEP 1				
INTERVIEWE	**TYPE**	**INDUSTRY**	**DATE**	**Duration**
General Manager	Case company	Shipping	2021-02-25	1h
Product Manager	Case company	Shipping	2021-02-25	1h
Procurement Manager	Case company	Shipping	2021-02-26	1h

Product Manager	Case company	Shipping	2021-03-01	1h
Area Manager	Case company	Shipping	2021-03-02	1h
Sales Manager	Case company	Shipping	2021-03-04	1h
Director	Case company	Shipping	2021-03-04	1h
Sales Manager	Case company	Shipping	2021-03-08	1h
General Manager	Case company	Shipping	2021-03-12	1h

3.2.2 Step 2 "What"

In the second step representing the left wall in the HoQ matrix, commonly referred as *What*, this study investigated customer's needs and expectations on services within an inland transportation context to find what type of services are the most important to the customers. According to Chan et al. (2002), there are internal and external customers, in this study external customers are prioritized. The external customers in this study were chosen based on their geographical region in the north of Sweden and if they already were customers to the case company or had similar characteristics and thus potential customers and are presented in Table 3 below. Based on knowledge gained from interviews from the case company, deeper and more specific questions were developed for the customer part to further increase quality of data collection as shown in Appendix B. Bicknell & Bicknell (1995) state that there are several ways to gather information about customers' expectations and semi-structured interviews were again chosen in this step. Exclusively employees at customer sites that possessed knowledge on inland logistical solutions and transport were contacted to ensure high quality data collection therefore, logistical managers, supply chain managers or general managers were contacted and interviewed. The same logic as in the first step was applied in this step regarding sampling size and after six semi-structured interviews with six different logistical managers at six different companies the data started to saturate. Kothari (2004) argues that the sample size can be chosen based on type of sampling technique and that researchers must feel confident that the sampling size has the desired width for the study. A pattern started to show with similarities in answers to the point where the same customer expectations were highlighted and thereafter the interviews stopped. To further increase quality data collection, the interview questions were

sent out beforehand to the interviewees to ensure that all questions could be answered. Due to the established limitations of this study, the main focus of data collection from the customers was on their view of preferred customer expectations of the case company's attributes and not on other competitors on the market.

From these interviews, valuable insights were provided based on perspectives from northern Swedish companies in various industries as shown in more detail in Table 3 below. Based on the interviews and after careful review 14 customer expectations were highlighted and formulated and chosen as the most important customer expectations and are presented in section 4.2. The next step in this study's HoQ matrix is to rank each customer expectation and is described in the next section.

Table 3, List of participants in step 2 of the data collection

INTERVIEWEES IN STEP 2				
INTERVIEWEE	***TYPE***	***INDUSTRY***	***DATE***	***Duration***
Sales & Logistics Manager	Customer	Retail	2021-04-09	1h
Global Logistics specialist	Customer	Forestry	2021-04-09	1h
Head of Logistics	Customer	Agricultural machinery	2021-04-12	1h
Supply Chain Manager	Customer	Papery	2021-04-13	1h
General & Logistics Manager	Customer	Forestry	2021-04-14	1h
Sales & Logistics Manager	Customer	Forestry	2021-04-21	1h

3.2.3 Step 3 "Ranking of customer expectations"

This step in the adapted HoQ matrix is to provide each of the 14 customer expectations a ranking score. Since all information on the customer expectations were not available during the interviews, ranking of customer expectations was not possible during the interviews.

According to Bouchereau & Rowland (2000), when conducting data with a QFD approach, the majority of the data are gathered through qualitative methods, but some data are best suited to be collected through quantitative methods. This would further improve data analyzes at the later stage of the QFD approach (Bouchereau & Rowland, 2000). Therefore, a questionnaire was formulated and based on the 14 customer expectations, 19 questions were developed and presented in Appendix C. The questions within the questionnaire represented each customer expectation, some customer expectations had two questions to create clarity and explanation, and one question at the end was formed for the customer to write down its own thoughts regarding the customer expectations and provide additional comments. Also, since several of the expectations were applied in different operations at the companies that were interviewed, further questions were required to ensure that the case study received data from various aspects of the operations. The questionnaire was structured in such a way for the customers to rank each question by the scale from 1 - 10. According to Chan et al. (2002) there are multiple ways of ranking questionnaires when applying HoQ methodology, such as 1 - 10 or 1, 3 and 9. This study applied the 1 - 10 scale to attain simplicity for the customers to weigh the customer expectations and provide a ranking score for each question.

According to Chan et al. (2002), the customer has to rank their customer expectations since these are essential when the management team will sift important and less important attributes and also to focus the resources on relevant needs. Therefore, the questionnaire was sent out to a variety of companies in northern Sweden. The group that received questionnaires included the six customers who have previously been interviewed and additional company contacts that were received from interviews and discussions with the case company in the first step. Due to its efficiency in time and administering of the results, this method was chosen to complement interview findings (Sachdeva, 2008) and to rank all customer expectations at one single point instead of returning to each customer.

Overall, there were 46 questionnaires sent out towards companies with characteristics relevant to this study and in specific towards representatives who possessed knowledge within the field of inland transportation. When the time was due, 18 different leading representatives from each company answered and provided insights on their view on each customer expectation formulated in the questions. According to Kittleson (1997) a response rate of approximately 30 percent is considered a valid frequency of answers if the questionnaire is sent out via email. This study received a response rate of approximately 40 percent which is high when considering the time frame of around 1 week to provide answers.

When all data from the questionnaire was collected, the information was processed and the customer expectations were ranked based on a ranking score. Since each question had a ranking of 1 - 10, the ranking score was calculated on an average based on each participant's answer. The average mean is calculated by adding every nummerics and dividing the total amount with the number of different numeric (Speelman & McGann., 2013). The customer expectation who received the highest score was considered to have the most importance and the lowest score was considered to be the least important customer expectation in relation to this study's list. The customer expectations score point was provided with one decimal to distinguish them apart and simplify calculations later in the HoQ methodology. The results of the ranking score are provided in section 4.3.

3.2.4 Step 4 “Relationship Matrix”

As the fourth step in this study's adapted HoQ, the service attributes and customer expectations are compared and their relationships are analyzed. This was done by an appointed team of members from the case company and referred to as a QFD team. According to Michael, Johnson & Renaghan (1999) when comparing customer expectations and service attributes in an adapted HoQ methodology for services, it is important to involve the service providers due to their

knowledge on how each service attribute relates to each customer expectation. Michael et al. (1999) argues that a QFD team can evaluate how strong each relationship is from a better position than a mixed group or by researchers.

This study's QFD team consisted of 2 representatives from the case company from two different areas and with two different perspectives in a digital meeting to discuss and provide insights on the relationship between their service attributes and the customer expectations. A consensus was reached on each decision when discussing a relationship strength. This was important so that the relationship matrix is adapted to multiple perspectives and to give as accurate description as possible. This was done systematically in the center of the HoQ matrix and is presented later in section 5. According to Shrivastava (2016) and Chan et al. (2002) the relationships can be presented within the matrix as symbols representing weak relationship, moderate relationship and strong relationship. The weight score symbols are, circle which has the value of 1, triangle which has the value of 3 and square which had the value of 9 and if there was no relationship, the box was left empty. For consistency, this study used the 1, 3 and 9 relationship scale.

When the relationship matrix has been established, the relationship values are calculated by multiplying the relationship score with the customer ranking and then summarized at the bottom of the HoQ matrix (Shrivastava, 2016). This study's QFD team provided valuable insights on provided services and their relationship with customer expectations. Thereafter, each relationship score was multiplied with the customer expectation score provided by the questionnaire and later summarized at the bottom of the HoQ matrix. The summarized score will provide an objective measurement for benchmarking and on future improvements (Shrivastava, 2016) and is presented in section 4. 2.4 and will later be analyzed in section 5.

3.2.5 Step 5 "Correlation Matrix"

The Correlation matrix investigates if the company's various service attributes have any correlation between them and what these correlations look like and is presented as the ceiling of the HoQ matrix. There are multiple ways of determining the correlations between the service attributes where according to Shrivastava (2016), there are five different correlations among the service attributes: strong positive relationship, positive relationship, strong negative relationship, negative relationship and no relationship. Kurniawan (2020) for instance applied positive, negative or no correlation when applying the correlation matrix in their research on deaf students and technology at an elementary school. This case study will use the Kurniawan (2020) method and determine the correlations as strong, negative or no correlation. By determining the correlations between service attributes, companies can understand how different service attributes are connected, if one is changed or influenced, the correlated service attribute will also be influenced (Wasserman, 1993). Additionally, companies can investigate where potential tradeoff decisions might occur, and further investigation is of interest and this data is usually obtained by analysis tools or by experience (Chan & Wu, 2005).

According to Chan et al. (2002) this step of the HoQ is not commonly used by companies, although it has substantial advantages. This is valid information that indicates if different service attributes counteract with each other, if this occurs, it requires high transparency between the development departments to solve various issues regarding the product. This data was collected throughout the study and not at a specific time and was applied and filled in by this study's researchers and presented in section 4.4. The result was thereafter sent to the case company for validation and additional comments.

3.3 Research quality

Reliability and validity are important criterions to be considered in an academic study. Validity expresses to which degree a measurement is measuring the right thing and reliability ensures that there is accuracy in what is measured meaning that if right measurements are being used and if measured again the similar result will occur (Kothari, 2004; Bell, Bryman & Harley, 2018). To ensure high validity in this research data different leading employees at the case company were interviewed and their different perspectives were consolidated to ensure that the right attributes were selected and analyzed. As described in section 3.2 the same methodology was used when approaching the customers where a broad range of companies and different inland transportation setups and corresponding attributes were investigated. Since a QFD is considered to be a planning tool that presents and collects data in a structured way it is viewed as a qualitative study (Bouchereau & Rowland, 2000). However, when combined with quantitative methods to collect data the study can increase quality of data (Buchereau & Rowland, 2000) and thus increase reliability and validity.

The interview questions were developed based on academic literature and on previous research on inland transportation. Since service attributes and customer expectations are highly subjective, the questions were designed to promote answers that could be translated into the HoQ. When conducting the interviews two work tasks were divided where one researcher was in charge of the interview and the other was tasked with writing down notes and questions that might arise during the interview. Due to the interviewers focus on the semi-structured interview questions and contributing to the discussion this was favorable due to certain follow up questions being more easily thought of from the sideline. These roles were in turn switched to ensure higher quality interviews after each time as it was a learning curve of developing interview techniques. The interviews were also recorded and reviewed after each interview to complement notes taken during the interview. According to Bouchereau & Rowlands (2000), there is a risk of ambiguity in the data collected by the interviews. However, to facilitate a firm understanding of the output from the data collection, a structured approach would increase validity. Also, to mitigate biases when determining relationship strengths in the HoQ, a cross functional team was developed with two representatives from two different departments.

To achieve high research quality in the questionnaire, it was developed based on academic literature, internal documents, and multiple interviews with leading representatives from both a shipping company and companies using inland transportation services daily, enabling high validity. According to Liang et al. (2006), a QFD questionnaire can be developed by academic literature, previous knowledge within the industry and other types of information sources for high validity. Chan & Wu (2002) also argue that using quantitative methods in combination with qualitative methods will increase the study's reliability and objectiveness. Also, other QFD studies were reviewed before distributing the questionnaire, which was sent out to various companies in order to gather data to determine how the customers interpret and rank the customer expectations after importance. This approach facilitated higher understanding of how the data was to be interpreted and understood. The questionnaire was sent out to 45 companies and the response rate reached 40%. A higher number of responses would nonetheless be more prominent to increase the perspective from additional companies. However, Kittleson (1997) states that a response rate of 30% is a good frequency of answers when the questionnaire is sent out once by email. The questionnaire was formed on the scale from 1 - 10 which is an effective tool to use according to Chan et al. (2002). The previous statement and the high frequency of answers improved the reliability as the questionnaire could be applied again and expect the same result (Kothari, 2004; Bell, Bryman & Harley, 2018). All the data from every question were calculated to determine the mean value (Speelman & McGann, 2013) for every customer expectation, the mean value was defined to rank each customer expectation which is an entitled method to apply to process data from questionnaires according to Fuller (2011).

4. Empirical findings

In this section all empirical findings will be presented. Firstly, a short general case company description will be introduced, also service attributes will be highlighted and explained based on interviews conducted from the case company. Customer expectation findings from customer interviews will be presented and described. Thereafter, the ranking of customer expectations as a result from the questionnaire will be presented and explained. The result of the ranking of the service attributes relations with the customer expectations from the QFD team will be presented. Lastly, the results of the correlations among the service attributes are presented. Thereafter, these findings will be compared and analyzed within the frame of HoQ model methodology in section 5.

4.1 Research context

This study's case company is a leading actor within the shipping industry and provides end-to-end solutions to their customers operating all over the world. Due to a shrinking market growth potential in ocean freight, their strategic goal is to focus their resources on inland shipping to gain market shares within inland transportation. Since they do not have any operations in the north of Sweden, their goal is to increase the inland haulage ratio in that region.

As previously described in section 3, the Hows are the service attributes provided from the service providers' logistical services and this thesis case company. According to internal documents and interviews, the case company has three inland transport service solutions illustrated in figure 3 below, from which the attributes will be highlighted. Inland hub transports is a solution the case company transports customer goods from one inland facility A to inland facility B. The case company is thus responsible for transporting goods from and to these inland facilities. The customer is then responsible for arranging first and the last-mile transports from and to these facilities controlled by the case company. In contrast to the inland hub service, where the customer must arrange transport, the Inland Delivery service is an end-to-end supply chain solution. The case company is therefore responsible for transports from a customer premise A to a customer premise B. The final inland transport service is called Overland Transport, a new service currently being developed at the case company. Both Inland Hub and Inland Delivery could include ocean transports where Overland Transport will only be conducted as point-to-point inland transports.

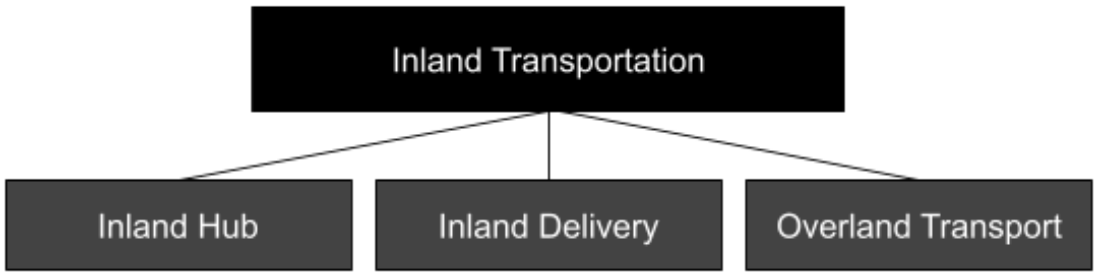


Figure 3. Case company's inland transport services

The *Figure 3* above describes the three main inland transport solutions provided by the case company. However, the case company also provides a supply chain management solution where they manage multiple transportation modes within these three services and management services such as bookings, control tower services, 3PL and 4PL solutions. As described in section 3.2.1, the interview questions were developed to understand their inland transportation services further and create a database of findings. According to the case company, the northern Swedish market was described as an untouched territory with no or little presence or

relationships with the local customers. This market consists of potential customers to the case company within the heavy industry. Large volumes of bulk materials such as forestry, chemicals and mining/steel have a potential for loading into container solutions either at the customer site or closer to port.

The case company's inland services *Inland Hub, Inland Delivery* and *Overland Transport* will be a base for answering this study's research questions and will be further investigated within the HoQ matrix and in the following sections.

4.2 Result of Quality function deployment

In this section, the data results of the QFD approach are presented, and each HoQ methodology step is highlighted in each subsection. First, the results from the first step are presented where all service attributes are described. Secondly, the customer expectations are defined and derived from six customer interviews. Thirdly, the ranking of each customer's expectations via a questionnaire sent out to a more extensive customer base is presented and described. Lastly, the results of the relationship matrix are presented from the QFD team, and lastly, the correlation matrix is presented and explained.

4.2.1 Result of step 1 "How"

In this section all findings from the interviews conducted at the case company will be presented. The following findings are based on the three inland transportation services presented in section 4.1 and will, together with internal documents, act as a database for highlighting the service attributes "How" which will be input in the HoQ.

According to interview findings in the first step of the HoQ, the case company argues that the case company has not achieved a higher presence at the northern market due to difficulties in export and import since there must be a balance between them when transporting longer distances up north. Finding the right volumes and triangulation is also considered by the case company to be an issue when reaching for new markets. Due to cost reasons, no containers can be transported empty. Additionally, the base of operations has been the Gothenburg region historically, and customers up north have already established stable supply chains with other actors. Since the case company is an established global shipping company worldwide, they have turned to solutions that have worked in different countries, including ocean transport with inland transport solutions as a package deal. However, this solution demands sales representatives in those regions which they currently do not have. When asked why other markets in other countries have a higher inland transportation presence, one recurring answer was a higher concentration of forwarders in northern Sweden than in their home market. This provided challenges in already established supply chains with the customers and the freight forwarders which caused entry barriers for the case company. Also, most of the representatives from the case company state that more aggressive sales personnel have achieved higher inland transportation in other markets lacking in Sweden. Other factors influence the Swedish market, such as geography and branding, meaning that the company brand weighs more in some regions than others.

During the interviews, multiple attributes were selected to be highly important for their services. Service attributes such as presence and network, synergies in distribution channels, combined transport of rail and truck, providing services through the entire supply chain, end-to-end solutions, ability to provide quality hardware such as containers or transport vehicles of multiple sorts, and their ability to use various suppliers for their inland transport solutions. Additionally, the cost was a service attribute that was considered essential but was not considered a competitive advantage due to their price of services being perceived not to be the lowest compared to other logistical providers at the inland transport market. According to the

case company, cost, quality, visibility of transport, flexibility in rebooking, and transit times are considered crucial.

To understand the booking process questions were asked on the methodology on how the customers' order the services. According to the interview findings, the customers' order inland transport services through a website owned by the case company. Depending on the type of customer and services, bookings can be achieved via email, phone, or EDI. At the moment, customers can book ocean freight and inland transportation in separate systems. However, integrating these two systems into one is an ongoing process since the inland transportation booking system is not fully developed. Since customer service is a part of retaining and gaining new customers, questions were asked on how the customer service is structured. The findings show that the case company has its own customer service department that sometimes has no direct contact with the customers. The customer service also differs depending on the size and importance of the customer, where some customers want to receive more comprehensive data and personal attention, and some do not want any contact with the case company. When asked if there were any known customer complaints, most respondents answered that delayed deliveries are the most common complaints. There are alerts when delivery is flagged as delayed in the digital systems, where the customer then receives a message, usually via email. However, this message is perceived as too late, and communication is also a common customer complaint. Other complaints highlighted by the case company are their flexibility which is perceived to be low in comparison to other actors on the market, and that prices are too high.

Since the case company operates multiple intermodal transports such as truck, rail, ocean, and a combination of all, the question of which transport mode they would consider to be most and least cost efficient and reliable was developed. Truck transport was considered to be more easily manageable, flexible, and faster. However, truck transport was also considered more expensive due to lower capacity for each transport and the least cost efficient. Rail transports were considered to have high efficiency, profitable, environmentally friendly and reliable. According to the case company, a combination of rail and truck was considered the best option regarding cost efficiency. It was considered essential to combine these two transport modes to enable lower prices. They have two types of combination structures where the customer could order rail and truck from two different suppliers called rail + truck or from the same supplier called "Railcombine". Other factors that influence cost are volumes, distance, and bargain power which would be achieved with increased volumes.

Questions were then asked to further understand what the case company observes as the preferred mode of transport in the northern Swedish region. The interview findings show that the case company understands that not every customer might use rail transports or container solutions for their transports. The ability to use different transport modes differs depending on customer geography and other environmental factors. It was considered a vast and extensive rail network but would require to be updated in the future to hold increased volume flows. Also, if customers in the northern region only prefer transporting bulk, the case company is opened to transporting different shipment loads in inland transportation. The case company has the ability to transport bulk materials on their inland transports. However, since most transports are transported to a port and thereafter onto a containership, it must at some point be loaded into a container.

To investigate the possibility for the case company to build new operations in the northern region and how maintenance and repair of containers would be managed, questions were asked on how common it was for containers to have to be repaired. Findings show that it is a significant cost factor and a common practice to return damaged containers where approximately 20 percent of all containers are returned damaged or dirty and needed repair or to be cleaned. Since some customers have high quality requirements on their containers, for instance, customers in the food industry, it is vital that there must exist abilities to repair and maintain containers locally up north if larger volumes are to be transported. The interview

findings indicate that this is a significant cost factor because the guidelines on adequately loading and unloading containers are not communicated to the customers effectively. According to the case company, customers are usually not allowed to transport any type of goods in a container. Still, some customers transport scrap metal or rigid wooden pallets which are the main reasons they become damaged.

When it comes to sustainability, the case company argues that all customers have sustainability demands, but very few are prepared to pay more. Previously only the largest customers have put demands on eco-friendly solutions, but recently smaller customers have followed in their footsteps. In some locations, authorities have recently focused their attention on sustainability issues. However, as it turns out when customers order fast deliveries from the case company, few are looking for sustainable solutions, and a large portion of the customers do not pay additional fees for greener transports.

Based on these interview findings and literature, the following 12 service attributes have been highlighted as most important and are later implemented in the HoQ matrix as presented in Table 4 below. Some service attributes are self-explanatory, and others must be explained. All service attributes are then analyzed and discussed in section 5.

Table 4, List of all 12 Service attributes highlighted during step 1 in the data collection

SERVICE ATTRIBUTES		
Origin	**Service attribute**	**Description**
Interview findings: - Inland hub transportation drives synergies and creates combinations of distribution networks among multiple customers for efficiency - Ability to create multiple alternatives and make profits on entire supply chain and not only on single transports	Synergies in transports	Ability to use same transportation routes for multiple customers
Interview findings: - Ability to provide customized inland transports in combination of transport modes to reach more customers Internal documents:	Customization	Customization of inland transportation services uniquely for each specific customer need

- Customization of intermodal solutions		
Interview findings: - Ability to provide rail-, truck-, and combination solutions Internal documents: - RailCombine (rail and truck transports are from the same supplier) & Rail + Truck solutions (different suppliers of transport modes)	Intermodal transport solutions	Ability to provide a combination of transportation modes such as rail and truck in combination
Interview findings: - Ability to provide multiple alternatives in rail solutions to different ports - Ability to use multiple suppliers of rail transports - Already purchased rail slots each week - Flexible rail solutions in northern Sweden	Rail flexibility	Flexibility in choosing multiple destination for rail solutions
Interview findings: - Right on time deliveries with rail solutions - Rail solution covers a large geographical area	Rail reliability	Ability to provide reliable rail solutions with few disruptions
Interview findings: - Ability to provide delivery precision in rail solutions, truck solutions and intermodal inland transport solutions	Delivery precision	Ability to be reliable in delivering inland transports within given time window
Inland transportation: - Ability to provide rail solutions to multiple Swedish ports - Intermodal solutions can fulfil more	Port accessibility	Their ability to access multiple port destinations with inland transportation services at the Swedish market

customers' requirements in unique delivery destination requests		
Interview findings: - Ability to fulfill multiple global customers' requirements - Ability to include package services which smaller or local shippers are not able to include or provide - Efficient feeder systems and a large organization that can back up all their services	Global network & services	Global shipping company with a global network and access to global services
Interview findings: - Global processes which is same for all customers - All customers receive attention but the dedication differs depending on customer - Customers receives alerts if transports are delayed	Dedicated CS department	Ability to provide an in-house dedicated customer service department
Interview findings: - Control the whole inland delivery process - Combination of transport modes enable door to door solutions Internal documents: - Inland hub services - Inland delivery services - Overland transport services	End-to-end solutions	Can provide inland transportation services from point A to point B
Interview findings: - Electrified rail solutions	Eco-friendly solutions	Ability to provide eco-friendly inland transportation options for customers

- Combination of rail and truck solutions to reduce CO2 emissions - ECO delivery solutions		
Interview findings: - Online booking channels - Customer portals - EDI - Email	Digital booking channels	Ability to provide digital booking channels for tracking and booking of inland transports

The attribute Synergies in transports represent the ability of the service provider to enable synergies in their different inland transportation modes. The case company can use their vast network of different transport modes and hubs to achieve higher efficiency when other transports from multiple customers can overlap and use numerous transport options. These synergistic effects would be hard for a smaller freight forwarder to mirror since economies of scale are prerequisites. Different types of cargo also fit in this attribute, for example, bulk materials, brown wagons, or standardized container solutions. The interviewed employees at the case company emphasized the importance of providing multiple alternatives to the customers. By having the capabilities of providing rail-, truck-, and ocean transports both in containers and in bulk, this attribute was added to the list of service attributes. However, since the case company only shipped containerized cargo on their ocean transports, the containerized cargo was also preferred in inland transportation.

The case company emphasized their ability to customize transport solutions for companies that had different needs than the standard transport routes. Therefore, the attribute Customization was added. This service attribute describes their ability to develop unique transport solutions specific for one customer. The service attribute Intermodal transportation represents the case company's ability to provide and combine different transport modes. The case company can provide services such as rail and truck in combination in two different ways. When they purchase transports from freight forwarders where rail and truck are ordered from other suppliers, they call it Rail+Truck. When rail and truck are ordered from the same supplier, it is thus called RailCombine. Both are characterized as intermodal solutions, and therefore the service attribute Intermodal transportation is included.

Rail reliability and Rail flexibility are service attributes that were commonly highlighted during interview data gathering. Flexibility in rail solutions is based on their considered vast rail network and their transport capability by rail to multiple locations. Delivery precision is an attribute that is described as their ability to transport goods within a promised time window. More precisely, the ability to enable transports between two locations with no or minor disturbances to promised location and time. Since this thesis case company is a dedicated shipping company that is trying to establish themselves at the inland transport market, they have a known presence at different ports. They also operate their own terminal at the Port of Gothenburg. Therefore, the service attribute Port accessibility is chosen due to their ability to transport multiple modes to different ports even since they prefer to transport through their own terminal at the Port of Gothenburg.

Global network and services are an attribute that describes the case company's ability to use their extensive global network to provide logistical solutions for their customers on both a national and international scale. Dedicated customer service department is an attribute that has

been highlighted due to the fact that the case company has its own department dedicated to customer service, both indirect and direct with customers. End-to-end solutions describe their capabilities to provide transports from point A to point B, including ocean, truck or rail transports globally and in Sweden. Since they have a vast rail network with trains running on electricity, they can provide environmentally friendly solutions to their customers. Thus, the attribute Eco-friendly solutions was added. Lastly, the case company has its own website where they prefer customers to find prices on their preferred transports and book or rebook transports. This enables customer bookings without contacting the case company directly and thus allows more automatic bookings. Therefore, the attribute Digital booking channels was highlighted.

4.2.2 Result of step 2 “What”

In this section, all findings from the interviews conducted with the customers and potential customers are presented. The interview questions were developed to understand what the customers expect from inland transportation as described in section 3.2.2. The following findings are used as a database for highlighting customers' expectations on inland transportation services and represent the “What” attributes in the HoQ matrix.

This step investigated the perspective of the customers in the northern part of Sweden and what they perceived to be the most important expectations on inland transportation services. Additionally, this section aims to understand the customers current inland transportation set-up to define their current expectations. The interview findings show that most customers and potential customers in the northern region consist of industries in need of transporting bulk materials or components. Many customers utilize freight forwarders as a buffer between them and larger shipping companies such as the case company. A large majority of the customers use truck transports for a large percentage of their inland transportations and some exclusively truck transports. Trucks are considered to be flexible in booking and rebooking and are easy to load and unload. Rail was considered to have too low flexibility in booking and rebooking where orders could not be canceled on short notice without paying for the service. Rail was also considered too expensive and tied up too many resources for the handling of goods, and that they must produce a certain volume for it to be cost competitive compared to truck transports. Truck transport was considered a cheaper option due to smaller volumes. However, the infrastructure around each customer's region influences the choice of transport. Some customers have rail tracks directly into their factories and some do not have any possibility to use rail solutions close to their operations. Also, a few customers find electric rail solutions to be cheaper than road transports. When asked what transport mode was considered to be the most efficient, five of six customers answered truck solutions, and one of six answered electric rail solutions.

The findings also show that they value competence in their transporter for instance, regarding stuffing to achieve a high filling rate in their transports since transport cost usually represent a large percentage of their total cost. Additionally, accessibility of truck transports, especially on short notice, is essential due to some variations in volumes produced. However, they experience a shortage of trucks in the northern part of Sweden, and it could take days or weeks for some customers to find trucks in their region. Therefore capacity, lead times, reliability, and flexibility of truck transport are also considered important attributes. The customers also emphasize the ability to provide the right choice of cargo mode, meaning if the transporter can provide different transport solutions. For some customers rail transports were not considered as an option due to fragility in their components which could take damage during rail transports because of ponderous swaying.

The customers commonly discussed the need for efficient communication between themselves and the transportation provider and that in some cases, these communications channels are too long and inefficient. Therefore, transporters placed locally and with a dedicated contact person are preferred compared to a global shipping company far away with no locally placed contact

person. It could be that the customer wanted to reach a specific truck driver and was then forced to contact a forwarder in the southern region who had to search in multiple lists to find the right contacts to that driver and then get back to the customer who in turn contacted the driver. This procedure was considered to be too long, and they now have a freight forwarder with more local knowledge who can provide them with much faster information and direct contact to transporters. Visibility was also a preference but to what degree differed among the interviewees. Some considered visibility through hubs, and some wanted real time visibility but considered it not a necessity but nicer to have when their customers in turn asked for information on their deliveries. Also, important service attributes were also considered to be the ability to transport to different ports, flexibility in booking and rebooking transports, ability to transport different volumes, storage yard to store goods to meet fluctuations and general environmental demands.

When the customers were approached with the question of if they were interested in additional transport services such as stuffing, stripping and customs there existed a general interest but many of these services were already outsourced to other actors such as freight forwarders. Some customers answered that they did not think this study's case company could do it better than they could themselves. Volume sizes, type of customer, and their customers influence the decision to either outsource the services or have it inhouse.

To understand the customers position at the market and their needs, questions on their current main challenges in inland transportation were asked. One major challenge was, except for the availability of trucks, the high cost of using truck transports from northern Sweden to the port of Gothenburg. The port of Gävle was considered to be a better option for some customers. It was considered a long distance to be using truck transport, but the northern part’s rail infrastructure was also believed to be a challenge. To be able to use different ports for their inland transports were preferred and they viewed the case company to be too tied to the Port of Gothenburg. Triangulation of deliveries was considered a problem due to few truck transports going north. The communication conducted with freight forwarders was inefficient, and they perceived to be forced to push their forwarders for data on deliveries instead of automatically providing transport data. The rail operators who operated on the rail network had monopoly power on the rail transports since they did not have any competitors. At the moment, the customers who utilized these rail systems had a good relationship with the rail operators, but it was always a risk and threat of increasing prices. The customers who transported in containers experienced a shortage of containers which fluctuates due to seasonal changes. Some customers also experienced challenges in keeping delivery times. Since their production sites cannot store large volumes if delivery from the production site is delayed, issues of storing produced goods appeared. Therefore, delivery precision and reliability in transports from their transporters are considered highly important.

Regarding customer service, it was considered essential to be able to solve critical issues quickly and with a dedicated service team. Confirmation that problems are being handled and it was important not to be put on a waiting queue. They did also perceive answers within hours to be a reasonable waiting time for answers. Other services such as deviation reports, ability to provide transport data, flexibility in their problem solving, and speaking to the same person or team were also considered important attributes for a transporter's customer service. Large majority of the customers emphasized the importance of local knowledge to fully provide them with transport data and problem solving in their local regions with short chains of communication. Overall, the customers were quite satisfied with their current customer service. However, some saw potential to improve and some were dissatisfied with the customer service provided by this study’s case company.

To investigate how the customers preferred methodology of booking transports and compare them to the case company’s perception of the customers preferences, similar questions were asked the customers as for the case company in step 1. When asked which their preferred

method of booking inland transport services it was scattered answers. Some preferred to book via phone or mail, while others preferred their own or general systems based services or EDI. However, the majority wanted a confirmation of the booking independent of the booking methodology. Factors that were considered important when booking or rebooking inland transport services were the ability to provide accurate ETA (estimated time of arrival) and ETD (estimated time of departure) times, flexibility in rebooking without cost, provide confirmation of booking being managed, ability to provide a contact register to contact if issues arise, an integrated booking system for communication with other additional systems and user friendly interfaces such as a booking template which is easy to fill in.

When deliveries are delayed, the customers receive a message noticing which transport is delayed. When asked about how they preferred to be contacted with this message, the majority answered via email or phone and in some cases via the booking system. It was considered important with proactive, reliable, and fast information which is provided in time and that the message had a contact person who they could contact to answer questions.

Since this study's case company is a global shipping company with ocean transports and inland transports, questions were asked on the customers' thoughts on booking both transport modes as a package. There was general interest, but currently, there were no competitive prices which discouraged them. However, some customers perceived the case company to have high competence in their operations, for instance, stuffing and port operations. Other expected potential benefits were that if one actor is responsible for all transports, it is easier to demand responsibility if something goes wrong. A package deal would provide a seamless customer experience. However, volume volatility is considered a barrier since the case company requires a long forecast that they cannot provide. The customers also perceive themselves to be too small actors and with too low volumes for this solution, and that the flexibility in using freight forwarders as a middleman is then lost.

When they were asked how they would compare this study's case company compared to other inland transporters, they overall perceived the case company to be risk-free and would not be a cost competitive solution. They also realize that the case company has interesting destinations, which they would otherwise not be able to reach in combination with package solutions. Some customers have experienced not-so-friendly customer service when asked for prices they could not find on the case company's website. It has also originated frustration when the case company's different departments in other regions could not communicate, and the customer had to mediate between them. Also, the case company was perceived to be too tied to the port of Gothenburg and inflexible in offering the right solutions due to the size of the customer. Since the case company demands forecasts of at least six months when booking package deals, including ocean transports, it is discouraging for smaller customers to meet these requirements since fluctuations in volumes occur and cannot provide more extended forecasts.

When asked about the customers' view on visibility for inland transports, the majority answered that visibility in departure and arrivals were enough. However, some customers perceived real time visibility as beneficial if their customers in turn contacted them for transport data on the transport's current location. They would then be able to provide this data firsthand instead of having to contact a transporter. Therefore, it is essential to trust that the transporters are keeping their delivery times.

When asked about sustainability demands, most of the customers were unwilling to pay extra due to the market's competitiveness. However, some were determined to use clean diesel for their bulk ships and HVO-fuels for their truck transports. Overall, a large percentage of the customers evaluated larger transporters as a whole for environmental policies and not the single haulage company collecting their goods. At the moment, no environmental demands on their transporters have been stated, and they trust that each company has its own policies and contributes to the sustainability effort. There was also no initiative for increased cost for more

eco-friendly inland transports. They could implement such strategies if there were no real changes in prices or if all the other competitors were also forced to increase cost. Some customers in certain situations have paid more for eco-friendly solutions and they found it important that the transporters are transparent with the reason this particular transport is eco-friendly. The option to choose rail solutions was discussed but at the moment it is considered too expensive.

Based on these findings above, the following 14 customer expectations were highlighted and viewed as the most important customer expectations and are presented in Table 5 below. Some customer expectations are provided with a detailed explanation below, but some are self-explanatory with the previously provided information.

Table 5, List of all 14 Customer expectations highlighted during step 2 in the data collection

Customer expectations		
Origin	**Customer expectation**	**Description**
Interview findings: - The service provider needs to have high competence within their operations	Competence	High skill in their specific operation to reduce unnecessary cost
Interview findings: - The capacity of truck availability in the northern market region	Capacity	The ability to provide sufficient capacity for their inland transportations
Interview findings: - The requirement of having high reliability of the inland transportation and services	Reliability	The expectation of inland transports arriving within given time window
Interview findings: - Short and reliable lead times	Lead times	Lead times between points in the transport chain
Interview findings: - Be able to choose between road or rail transportation depending on	Different transport modes	The ability to have the choice between different inland transportation modes

capacity and flexibility attributes		
Interview findings: - Instant communication through various medium	Communication	Efficient communication with their transportation provider to reduce the chain of communication
Interview findings: - Committed customer service with one person dedicated for the same customer	Customer service	Ability to receive fast and dedicated problem solving from their inland transport provider
Interview findings: - Need for larger storage yards to store goods to manage fluctuating supply and demand	Storage yard	Ability to provide storage locations
Interview findings: - Choose the cheapest transportation mode to increase the margin profit	Cost	The cost of inland transportation services
Interview findings: - Depending on the value of the products have either hub-visibility or real time visibility	Visibility	Ability to provide real time visibility or visibility through hubs within the transport chain
Interview findings: - The expectation to have flexibility of rebooking shipments and transportation modes	Flexibility	Ability to provide flexibility of logistical services
Interview findings: - The expectation of freight haulage to have local knowledge	Local knowledge	Local understanding of the region and their way of conducting business

regarding logistical service providers, suitable transport mode and local price knowledge		
Interview findings: - The availability to book shipments via booking systems	Booking systems	Ability to provide a user-friendly booking system
Interview findings: - To have the option to choose between eco-friendly solutions which do not affect the price of logistical services	Eco-friendly solutions	Ability to provide inland transportation solutions that is sustainable and eco-friendly

The customer attribute Competence refers to the expectation that the service provider must be skilled at their specific operation. For example, high filling rate of containers is a prerequisite to achieve low cost and efficient transport and was highlighted as important since profit margins are usually low within these industries. The interviews showed that during customer operations it occurred different capacity needs and that there were on occasions a demand for truck capacity on short notice. To maintain a continuous flow was vital for operations and there was a notion of shortages of trucks in northern Sweden. Thus, the customer expectation Capacity was added. When asked what the current main challenge was, a majority answered that availability of trucks was their main challenge at the moment.

Reliability is a customer expectation that refers to the importance of sending and receiving transports within a promised timetable. Lead time is a related customer expectation that refers to the time it takes between different points in the transport chain. Different transport modes refer to the customer's expectation of choosing between different transport modes such as rail or truck. Different types of cargo modes such as bulk transports or containerized transports are also included in this customer expectation. Communication is a customer expectation that includes short communication chains with transporters or fast and reliable communication between different transporters. It was shown during the interviews that efficient communication between the transporter and the customer was important to mitigate misunderstandings and reduced time between booked transport and confirmation. Communication of delayed transports are also included in this customer expectation. Customer service represents customers' expectations on how they would like to be treated when engaging a customer service department. The result showed that customers viewed customer service as very important. Fast response time, dedicated customer service personnel, able to provide updates on transports, no telephone ques and kept promises are some important factors for customers in customer service. For one customer in particular, customer service has not been efficient when previous collaboration with the case company. Attitudes towards smaller customers and inefficiency in solving problems in shipments that are connected to two companies within the same concern as the case company.

Storage yard is a customer expectation that refers to the ability to provide storage locations if transport delays occur. This was highlighted due to the fact that if there is delayed transport that misses an ocean transport that might ship once a week, there is a risk that the goods must be stored outside and could be damaged by weather if stored for a longer time. Since transporting goods represents a large portion of total costs, reducing the cost of transports was important to these companies' competitiveness in a competitive market. Therefore, Cost was added as a customer expectation.

Visibility refers to customer expectations on how customers can track and see their transports. Visibility, in this case, includes both visibility through hubs, meaning that they can see if their goods have passed a particular hub, or real time visibility which refers to the ability to track transports in real time between hubs. Flexibility represents customers' expectations on flexibility in their transports. Flexibility in ability to handle different volumes, flexibility in booking/rebooking transports and flexibility in loading and unloading were factors that were highlighted during interviews with the customers. Local knowledge is a highlighted customer expectation since there was a common expectation that the transporter must have local knowledge of the geographical area in which the customers operate. Local knowledge of transporters and the understanding of which actor to call if issues arise are problems which were highlighted during the interviews.

Booking systems refers to the methodology in how a customer can order, book or rebook a transport. It was shown during interviews that some customers preferred a user-friendly system or that booking of transport was outsourced to other actors such as freight forwarders. For example, if a customer uses DHL as a transporter, they usually let DHL manage the bookings. Other customers preferred to order via a booking system and then a phone call for confirmation. It was also found that a booking system called Unifaun was used for larger deliveries where the majority of freight forwarders were connected which simplified the usage. Eco-friendly solutions is an attribute where customers are expecting logistical solutions that are somewhat environmentally friendly and sustainable. There were already some thoughts on environmental policies regarding the type of fuel that larger transporters use in their trucks in general but there were no stated demands towards when smaller transporters transport their goods. When customers were asked if they were prepared to increase cost for more environmentally friendly logistical solutions, very few were prepared to do so due to the market's competitiveness.

4.2.3 Result of step 3 "Ranking of customer expectations"

In this section, the results of the customer expectations from the survey are presented. As mentioned above, 14 customer expectations have been ranked after importance by the customers based on the scale of 1 - 10 distributed among all 14 customer expectations where the highest score was ranked as the most important. 18 companies provided answers in the survey and all of them were located in the north of Sweden. The companies that engaged in the questionnaire operated in various industries related to this study.

In Table 6 below is all the data collected through the questionnaire presented and to which customer expectations each question was connected to. Thereafter, an average score was calculated based on the answers from every 18 participants. Some customer expectations had two questions, these were summarized and received a new merged average score.

Table 6, data from the questionnaire in step 3 in the data collection

Participant	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12	Q 13	Q 14	Q 15	Q16	Q 17	Q 18
Respondent 1	10	5	5	9	4	6	10	3	9	8	8	7	9	10	10	6	7	5
Respondent 2	9	10	1	9	7	3	10	1	7	8	7	4	10	10	8	3	8	8
Respondent 3	10	3	10	10	7	5	8	10	6	6	4	1	9	8	6	9	9	10
Respondent 4	10	10	5	10	7	5	10	1	10	6	6	10	10	10	10	6	8	3
Respondent 5	7	10	2	8	8	8	10	6	9	7	10	5	5	10	2	5	6	1
Respondent 6	10	10	10	9	9	9	9	9	8	9	9	7	10	10	10	9	10	4
Respondent 7	10	10	5	10	5	7	9	1	7	5	3	2	9	9	5	5	10	8
Respondent 8	10	10	8	10	5	1	10	1	9	3	3	2	7	10	10	2	10	10
Respondent 9	10	10	6	10	4	5	9	9	8	6	6	4	10	8	9	6	6	7
Respondent 10	7	9	3	10	8	2	9	3	9	5	3	2	9	9	9	9	9	7
Respondent 11	10	8	1	10	5	8	9	9	10	8	8	5	10	10	10	7	8	2
Respondent 12	9	10	2	10	7	6	10	4	7	8	8	6	8	9	8	9	8	8
Respondent 13	9	10	5	10	10	7	10	8	9	9	9	7	8	10	10	6	8	3
Respondent 14	3	3	8	8	2	2	8	9	9	9	5	3	9	8	9	2	9	8
Respondent 15	10	10	7	10	10	8	10	7	8	8	8	6	10	10	10	10	8	8
Respondent 16	8	9	3	9	6	9	9	5	9	7	5	3	4	9	8	9	9	8
Respondent 17	10	10	6	10	9	8	10	4	8	10	9	6	9	10	9	8	10	8
Respondent 18	7	9	6	7	5	5	7	10	7	3	4	8	8	7	8	6	7	7

Average score	8,8	6,8	9,3	6,6	5,8	9,2	5,6	9,3	6,6	4,9	8,6	8,4	6,5	7,4
	Competence	Capacity	Reliability	Lead time	Different TM	Communication	Storage yard	Cost	Visibility	Flexibility	Local knowledge	Customer service	Booking system	Eco-friendly solutions

The customer expectations were ranked in the following way, Reliability received the highest score with 9.3 points and was the most important customer expectation. Communication was the second most important expectation regarding the customers, with a score of 9.2. Next up were the competence expectation, which was ranked 8.8, Local knowledge was the fourth most important expectation with a score of 8.6 and customer service got 8.4 score points. Cost was ranked with the point of 8.3, Eco-friendly solutions were an expectation that the customers considered as an important factor but due to the exposed competitive market, was perceived challenging to prioritize and got the score point of 7.4. Capacity received the score point of 6.8, Lead times got the score point of 6.7, Visibility received the point of 6.6. Booking systems were ranked with a score of 6.5, Different transport solutions were ranked with a point of 5.8. Storage yard was a less important customer expectation with a score of 5.6 and the least important expectation was Flexibility with a score point of 4.9.

Additional data was collected in a comment question in the questionnaire. One participant expressed disappointment that rail transport was not as cost effective compared to truck transport in the northern region of Sweden and that rail providers should solve this issue. When transporting with rail, capacity is an issue when companies are not able to transport the volumes they require simultaneously. Other comments expressed that there are too high volumes transported by trucks that could have been placed on a train instead and that there is a business opportunity for rail providers to work in different ways than today. According to another comment, one company had different sites where some sites rely more on rail transports. Some rely exclusively on truck transport based on the geographical location and to what extent the rail network is built. Some respondents answered that they expect the transporters to manage larger responsibilities on a higher level of detail.

Based on this data, the HoQ matrix was updated with the customer expectations and service attributes highlighted in previous steps, as shown in Figure 5 in the next section.

4.2.4 Result of step 4 “Relationship matrix”

As stated in section 3.2.2, the QFD team consisted of two leading employees in a multifunctional team at the case company. The team aimed to reach a consensus on how each service attribute and customer expectations were related. After reaching a consensus on how each service attribute was related with each customer expectation the following result was developed and illustrated in Figure 4 below. The absolute value point shows the degree of relationship between customer expectations and a particular service attribute. Each point of the customer expectations was added together in every column. Every customer expectation received a relationship point which was based on the grade of the relationship between the customer expectation and the service attributes, the relations was ranked with a scale of 1, 3 or 9, illustrated with symbols as mentioned in section 3. The relative value point expresses the total score of customer expectations and the service attributes. Every customer expectation was multiplied with each service attribute. The product for every relationship was added together, summarized, and presented at the bottom of the HoQ matrix. This section will present the findings in three structured paragraphs. Firstly, all relationships which received a strong relationship are presented. Thereafter, medium and weak relationships are presented.

Some relationships require a more detailed explanation of the reasoning and some relationships are obvious such as the customer expectation of Eco-friendly solutions and the service attribute of Eco-friendly solutions and thus not explained. Therefore, some are described in more detail below and some are only briefly explained.

Strong relationship, □ = 9
Medium relationship, ○ = 3
Low relationship, ▽ = 1

Customer expectations		Synergies in transport	Customization	Intermodal transportation	Rail flexibility	Rail reliability	Delivery precision	Port Accessibility	Global network & services	Dedicated CS department	End-to-end solutions	Eco-friendly solutions	Digital booking systems
Competence	8.8	□	○	□	○	▽	▽	▽	□	□	□	○	□
Capacity	6.8	□	□	□	□	□	□	□	□	□	□	▽	□
Reliability	9.3	□	□	□	□	□	□	□	□	▽	□	○	
Lead times	6.7	□	□	□	□	□	□	□	□	▽	□	○	
Different transport modes	5.8	□	□	□	▽	□	□	□	□	▽	□	▽	▽
Communication	9.2	□	□	▽	○	□	□		□	□	□	▽	▽
Customer service	8.4	□	□	○	□	▽	▽		○	□	□		○
Storage yard	5.6	▽	▽	▽	▽	▽	○	□	□		○	▽	▽
Cost	8.3	□	□	□	□	□	□	□	□	▽	□	□	▽
Visibility	6.6	○	▽	□	▽	□	□	▽	□	▽	▽	▽	▽
Flexibility	4.9	□	□	○	□	□	□	▽	▽		○		○
Local knowledge	8.6	○	□	□	▽	▽	○		○		□		□
Booking systems	6.5	□	▽	□					○	□	□		□
Eco-friendly solutions	7.4	○	□	○	□						□	□	
Absolute value		100	96	92	73	76	80	57	91	50	106	32	47
Relative Value		**746**	**724**	**684**	**547**	**550**	**578**	**403**	**679**	**394**	**810**	**250**	**352**

#	Technical Requirements	Relative score
1	End-to-end solutions	810
2	Synergies in transport	746
3	Customization	724
4	Intermodal transportation	684
5	Global network & services	679
6	Delivery precision	578
7	Rail reliability	550
8	Rail flexibility	547
9	Port accessibility	403
10	Dedicated CS department	394
11	Digital booking systems	352
12	Eco-friendly solutions	250

Figure 4. HoQ matrix with the relationship matrix evaluated by the QFD team

Strong relationships

The customer expectation *Competence* was considered to have a strong relationship with *Synergies in transport* and thus received the highest score. According to the QFD team, achieving synergies in transport demands a high level of competence of the provider. To achieve a global network and global services the QFD team argues that it requires a high level of competence to maintain such a network of services. Therefore, that relationship received a strong relationship score. The same reasoning also applies to the service attributes of *Dedicated CS department* and *End-to-end solutions* and thus received the highest score. Also, the ability to have a high competence and providing digital booking solutions receive the highest relationship score since it is perceived to require high competence to implement such systems where not every transporter has this capability.

The customer expectations *Capacity* received a strong relationship score with all service attributes by the QFD team except for Eco-friendly solutions which received a low relationship score. *Capacity* and *Synergies in transports* received a high relationship score because it requires a certain amount of capacity level to maintain synergies in transport, meaning that one transport might have different customer destinations and thus require a capacity to fill those needs. The same logic was applied for customization of transport solutions and intermodal transportation. Also, to be able to achieve a high delivery precision, provide flexibility and reliability in rail solutions, and port accessibility, capacity is considered an important factor and thus receive a strong relationship score. For the case company to maintain a global network and global services, there is a need for high capacity for inland transports and thus a strong

relationship score was provided. The service attributes of *Dedicated CS department End-to-end solutions* were also considered to require high capacity and received the highest score. To maintain and sustain a large and complex digital booking system, there is a need to have high volumes from multiple customers and thus, *Capacity* and *Digital booking systems* received a strong relationship score.

The customer expectation *Reliability* in relation to *Synergies in transport* received a strong relationship due to reliability is important for sustaining multiple distribution channels and transport modes. The same logic was applied to the service attributes *Customization, intermodal transportation, Rail reliability, Rail flexibility, Global services & network, End-to-end solutions and Delivery precision.* When transports are destined to a port, there is a timetable to consider and therefore this relationship is also considered to be strong. Similar logic was applied to the relationships between the customer expectation *Lead times* and *Synergies in transports, Customization, Intermodal transportation, Rail flexibility, Rail reliability, Port accessibility, End-to-end solutions* and *Global network & services* due to transit times are always a factor when providing inland transportation services.

The customer expectation *Different transport modes* are considered to be strongly related with the service attributes *Synergies in transports, Customization and intermodal transportation* due to the case company's ability to provide different customized transport modes at different complexity and thus a strong relationship score. Also, the service attributes *Delivery precision, Port accessibility, End-to-end solutions,* and *Global network and services* compared to the customer expectation of *Different transport modes* was all considered by the QFD team to have a strong relationship score since all require different transport modes. *Communication* is a customer expectation that received a strong relationship score with both *Synergies in transport* and *Customization* due to both service attributes requiring a high level of communication to function efficiently. Similarly, the customer expectations *Visibility* was overall considered not to have strong relationships with the case company's service attributes, except for *Intermodal transportation, Rail reliability, Delivery precision* and *Global network and services,* which received a strong relationship score. Visibility was considered to be connected strongly to intermodal solutions due to some visibility between different transport modes. *Delivery precision* provided visibility when transports arrived in time and the same logic was applied to *Rail reliability.*

Reliability in rail solutions was considered to have a strong relationship with the expectations of efficient *Communication.* Also, *Global network & services, Dedicated CS department* and *End-to-end solutions* were considered to have a strong relationship with *Communication.* Customers' expectation of a high level of customer service received a strong relationship score with the service attributes *Synergies in transport, Dedicated CS department, Customization, Rail flexibility* and *End-to-end solutions.* However, *Flexibility* was only considered to be strongly connected to *Synergies in transport, Rail flexibility, Rail reliability,* and *Customization* due to the nature of these service attributes as flexible.

The customer expectation of providing a *Storage yard* for their goods was considered by the QFD team to only have a strong relationship with *Port accessibility* due to ports terminal's ability to provide container yards and with *Global network and services* since their vast network can provide multiple different services including storage areas.

Local knowledge has a strong relationship with *Customization, Intermodal transportation, End-to-end solutions and Digital booking systems. The customization* has a strong relationship with *Local knowledge* since the customers require that the shipping company has local knowledge about the area the customer is operating within such as road- and rail haulage actors, prices and geography. *Intermodal transportation* has the same motivation as *Customization.* When the customer purchases an end-to-end solution, they strive to get the best optimal solution for all the steps within the logistical chain. Therefore, it is, similar to intermodal transportation,

important that the company chooses the most flexible, affordable and seamless solution, this could require local knowledge to attain. If the company has a *Digital booking system,* they could obtain *Local knowledge* through their booking system.

Booking systems and *Synergies in transportation* received a strong relationship by the QFD team because the booking system connects all the transportation modes which will increase integration and transparency. The same logic was applied for *Intermodal transportation.* The *Dedicated CS department* attained a strong relationship with *Booking systems* since if the booking system is well functioned, the customer service department would not receive unnecessary customer tickets concerning questions about the booking system. The *booking system* had a strong relationship with *End-to-end* solutions due to the fact that when a customer wants to buy an end-to-end solution, the customer has the ability to accomplish this through the booking system. *Booking systems* and *Digital booking systems* received a strong relationship, because the company has an established digital booking system that the customers expect of inland transportation services.

Eco-friendly solutions and customization received a strong relationship by the QFD team since a customized service solution is adapted for the customer, requiring high demand for eco-friendly solutions. *Rail flexibility* acquired a strong relationship with *Eco-friendly solutions* according to the QFD team since a flexible rail solution would decrease the emission due to fewer delays and flexible routes. *End-to-end* solutions obtained a strong relation with *Eco-friendly solutions* by the same reason as the previous one since the transportation modes within the logistical chain have to be flexible to attain eco-friendly transportations. *Eco-friendly solutions* and *Eco-friendly solutions* received a strong relationship by the QFD team since the company can offer eco-friendly solutions and the customers demand that service solution. Similarly, *Cost* was considered to be a customer expectation with many strong relationships with the case company's service attributes. The QFD team considered all service attributes to have a strong relationship except for *Dedicated CS department* and *Digital booking systems* due to no direct connection to the prices of the services.

Medium relationships

Competence and Customization was considered not to have a high relationship but still required some competence in inland transportation activities and thus received a medium relationship score. Competence and rail flexibility are considered to have a medium relationship due to competence not considered a vital factor if flexibility exists. Although it still has some importance and thus receives a medium relationship score. Also, the relationship between the service attribute Eco-friendly solutions and Competence is considered to have a medium relationship strength since some competence is required to maintain environmental solutions.

Intermodal transportation, Global network & services and Digital booking systems received a medium relationship score by the QFD team in comparison to the customer expectation Customer service due to those service attributes having a relationship with Customer service but not the strongest relationship. Similarly, Reliability and flexibility in rail solutions received a medium relationship score. Synergies in transport received a medium relationship score by the QFD team due to some degree of visibility within their inland transportation channels. Intermodal transportation was also considered to have some degree of flexibility and thus received a medium relationship score with Flexibility. The same logic applied to End-to-end solutions and Digital booking systems.

Synergies in transportation, Delivery precision, Global networks & services gained a medium relationship with Local knowledge. If the company has Local knowledge, they could exploit the Synergies in transportation to exploit and arrange smarter synergies among their transportation services such as rail and road. The Delivery precision could increase if the case company attained high local knowledge since the awareness of road and rail haulers with high

reliability could be hired for their services. Synergies in transport and Intermodal transportation obtained a medium relationship with Eco-friendly solutions since there is a relationship but not that strong. There is a need to have synergies in transportation to achieve eco-friendly solutions since the company could use their services to offer environmental solutions. Intermodal transportation has the ability to use more eco-friendly alternatives such as rail to reduce emissions. Additionally, booking systems and Global network & services got a medium relationship, the QFD team motivated this with the fact that if the customer required a booking system, the company could afford this to their customers with their global network and services.

Weak relationships

Rail flexibility received a low relationship score due to competence having less impact on reliability than flexibility in rail solutions. Since it is the transporter's competence and not directly the case company's competence who influences delivery precision, the relationship between Competence and Delivery precision was provided with a low relationship score.

Competence is perceived to have a low relationship score with the ability to access ports and thus receives a low relationship score. Eco-friendly solutions were not considered to have a strong relationship with the customers' capacity expectations and thus received a low relationship score. Also, Reliability received a low relationship score with Dedicated CS department. Similarly, the relationship between Lead times and Dedicated CS department was considered to be low due to the fact that the customer service cannot directly affect the transports. The ability to provide flexibility in rail solutions has also a low relationship with the customers' expectations of access to multiple transport modes and Different transport modes, Eco-friendly solutions and Booking systems had a low relationship with Dedicated CS department. Also, the QFD team reasoned that Communication had a low connection to Intermodal transportation and that their ability to provide Eco-friendly solutions and Digital booking systems also had a low relationship since they believed them to have a low connection with communication. The QFD team considered Rail reliability and Delivery precision not to have a strong relationship and thus received a low relationship score. Synergies in transport, Customization, Intermodal transportation, Eco-friendly solutions, Rail flexibility, Rail reliability and Digital booking systems were considered to have a low relationship with the customer expectation Storage yard and thus received a low score. Also, the relationship between the expectation of Flexibility and Global network & services was perceived to be low.

The customer expectation Cost received a low relationship score with the service attributes Dedicated CS department and Digital booking systems. Additionally, since ports have little flexibility when transporting via inland transportation, Port accessibility received a low relationship score with the customer expectation Flexibility. Rail flexibility and rail reliability have a weak relationship with Local knowledge. If the company obtained local knowledge, they could exploit the option to choose between haulers, this could improve their flexibility to coordinate any unpredictable disturbances within the transportation chain. The Rail reliability could also increase if they had knowledge about how the rail operators operate and plan their transportation according to time windows and routes. Similarly, the relationship between the customer expectation Booking systems and the service attribute Customization received a low relationship since if the customer purchases a customized service, a booking system could provide some benefits and should be included in that solution.

Based on these relationships described above the relationship scores were then multiplied with the customer expectation ranking and summarized at the bottom of the HoQ matrix as a Relative value as shown in Figure 4 above. This score will later be analyzed in section 5. The following section will present the findings from this study's last step in the adapted HoQ where the correlations between each service attributes are highlighted.

4.2.5 Result of step 5 “Correlation matrix”

As described in section 3.2.1, the Correlation matrix represents the roof of the HoQ matrix and acts as an illustration of the correlations between each service attribute. The matrix was conducted based on knowledge developed during the early stage of interviews with the case company and internal documents. The following correlation symbols were used to indicate if the service attributes have either a positive correlation, illustrated with a “+”, a negative correlation illustrated with a “-” or no correlation which is illustrated by leaving the field blank.

The Synergies in transports service attribute had a positive correlation with Customization due to the synergies in transportation increase the customization solutions for the customers. Rail flexibility received a positive correlation with Intermodal transportation since the case company has a broad network of synergies within their transportations, increasing the ability to offer intermodal transportation. The correlation with Rail flexibility and Synergies in transports received a positive since they could increase the flexibility in transportation. Rail reliability had a positive correlation with Synergies in transports because they attain benefits of each other. Port accessibility gained a positive correlation with Synergies in transports since they would expand the ability to access different ports. The correlation between Synergies in transports and Global network & service attained a “+” since the case company obtains global solutions and has different capabilities. This was the same result with End-to-end solutions that received a positive correlation. Customization had a positive correlation with Intermodal transportation since if the service solutions are customized, the case company could offer Intermodal solutions. The Delivery precision and the Customization had a positive correlation because if the customized service solution is offered to the customer, the delivery precision should be high. The Global network & service and the Customization gained a positive correlation since through the case company’s global network and services, they could offer customization solutions, for the same reason, the End-to-end solution service attribute received a positive correlation. The Eco-friendly solutions had a positive correlation with Customization since if the customer requested a customized eco-friendly solution, this could correlate.

Intermodal transportation gained a positive correlation with Delivery precision because the case company could offer a combination of both truck and rail, which could increase the delivery precision. Port accessibility had a positive correlation with Intermodal transportation since the ports could have the infrastructure for both rail and truck. Global network & service got a positive correlation due to the fact that the case company could provide an intermodal solution due to this global presence, of the same argument, the End-to-end solutions service attribute received a positive correlation with Intermodal transportation. Rail flexibility acquired a positive correlation with Rail reliability since an increase in flexibility provides a higher degree of problem solving of the transportation which would improve the reliability. From the same viewpoint, the Delivery precision got a positive correlation with the Rail flexibility. The Rail reliability received a positive correlation towards the Delivery precision since if the reliability was maintained, the delivery precision would consist of. Port accessibility due to the case company’s Global network & services would provide a high accessibility of ports, which positively correlates the service attributes. For the same reason, End-to-end solutions received a positive correlation with Port accessibility. The Global network & service, service attribute positively correlated with end-to-end solutions since End-to-end solutions are dependent on global network & services and vice versa. Dedicated customer service departments received a positive correlation with Digital booking systems because a digital booking system relies on a functional customer service. The other service attributes not mentioned had no correlation and were marked with a blank space. There were no negative correlations among the service attributes. The correlation matrix from the HoQ is illustrated in Figure 5 below.

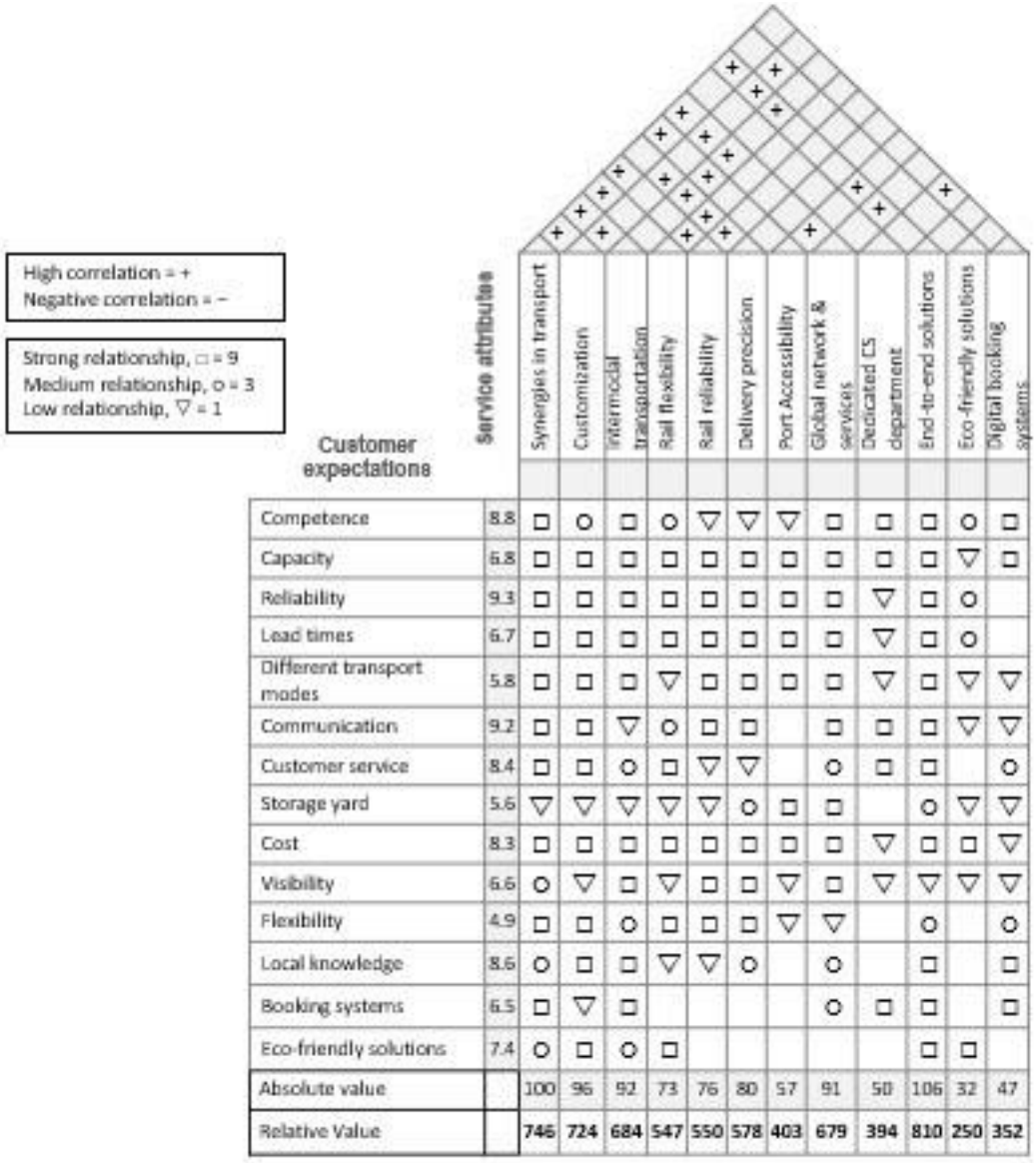


Figure 5. Finished HoQ with Correlation matrix, Relationship matrix, customer expectations with ranking and service attributes

The findings from each five steps in this section have completed the data collection steps in the HoQ and will be further analyzed and discussed in the following section. The findings will be compared together with *literature* as presented in section 2.

5. Discussion

In this section, the empirical data collected within the scope of this study will be analyzed and discussed in relation to the frame of reference. The HoQ matrix represents this study's main findings. It will be analyzed based on the absolute and relative values calculated within the matrix, indicating how well each service attribute satisfies the customers' expectations with and without their respective ranking score provided in the questionnaire.

This section will start with a discussion regarding the service attributes and the customer expectations. Thereafter, the discussion will go deeper into the HoQ matrix and analyze the relationship matrix. Lastly, the correlation matrix is discussed.

5.1 Service attributes in relation to Customers' expectations

As described in section 4.2.1, 12 unique service attributes were highlighted and presented by the case company's most essential attributes on their services. In this section, customer expectations and service attributes are highlighted and discussed together with the literature. Thereafter, how the customer expectations were ranked are discussed and analyzed.

According to the literature on customer satisfaction within the shipping industry, reliability, frequency of service and transit times are considered more important for the customers than cost (Yuen & Thai, 2015). This is somewhat aligned with what this study found in the answers from the customer interviews. Although lead times and reliability were highlighted as important, the cost was also a significant factor when determining transporters due to the competitiveness of the northern Swedish inland transport market and was thus provided with a high-ranking score of 8,3. Cost is also considered in the literature as one of the few most essential attributes within inland transportation (Kurtuluş et al., 2020).

When asked how the customers preferred to book transport services, there were various answers where some preferred phone or e-mail and some preferred using digital booking systems. However, the majority answered that a confirmation of a booking is always needed, which could be done by a single follow-up email or confirmation within the digital booking system. There was a fear that if booked via a digital booking system, it would take time before the system realized the booking and that uncertainty would arise if the systems had confirmed the booking or not. Since multiple actors are usually involved in one transport together with the need to triangulate empty containers, it is vital with fast and efficient information sharing and communication between the customer and transporter to increase utilization of assets and decrease transport cost (Taghavi et al., 2017). This could explain the customers view on communication which received the second highest ranking score of 9,2. Visibility in transport was considered necessary by all customers, although different levels of visibility were preferred. Tracking of deliveries is a typical customer expectation from customers (Song & Panayides, 2012). However, some were satisfied with only tracking via hubs and ranked it as a 6,4-average score, meaning that they could see when a mode of transport had reached or left a specific destination within a transport. Other customers stated that real time visibility is a way for them to increase control over the transport and enable them, in turn, to provide information to their customers on estimated times on arrivals or information on the transport in general instead of waiting for the transport to reach a hub. Visibility was ranked 6,9 indicating that it was considered more important than through hubs. Increased visibility would significantly reduce communication needed towards their transporter for information and could directly provide information to their own customers and thus increase service quality and customer satisfaction (Ghobadian et al., 1994).

Digital booking systems might be a solution for increased communication, supporting visibility and reducing friction between customers and transporters. By applying an efficient communication method, companies can provide customers or other stakeholders with real time information to mitigate unexpected issues with increased flexibility in problem solving (Poulis et al., 2013). The overall average score for *Booking systems* was 6,5. However, only one customer considered this customer expectation to be the highest ranking score contradicting the literature when information and similar systems are described as important to provide efficiency for multiple processes Evangelista (2002) which would shorten communication chains and increase customer satisfaction (Johnston, 1995). One explanation that many customers prefer email and phone for confirmation is that the shipping and transport industry is a traditional industry and thus reluctant to change (Evangelista, 2002).

According to Durvasula et al. (2000), it is challenging to maintain a logistical service with no issues or delays and there will always be a need for companies to solve problems in an efficient way to retain customers. Lam & Zhang (2019) argue that responsive service is important for customers within the shipping industry. In this study, customer interviews found that fast and reliable customer service was considered key to increase customer satisfaction. During interviews with some customers, they were perceived to have been treated poorly even though one service attribute from the case company was a dedicated customer service department. When i.e. customer contacted the case company in some cases, they experienced that they were not heard. Olivia & Kallenberg (2003) argue that service providers are in the relationship business and thus need to focus more on relationship building than producers of products. Especially within the shipping industry where relationships are critical when choosing a transporter.

Local knowledge was ranked by the survey as the fourth most important customer expectation on inland transport services with a score of 8,6 which could still be considered a relatively high score. These ranking scores are calculated with a mean value based on all participants and therefore the score can be lowered by a single participant's perspective. As is this case, when analyzing the data, a large majority of the participants provided *Local knowledge* with a score of nine or higher and two participants provided a very low score. That local knowledge is ranked as high is aligned with Seth et al. (2005) research showing that a customer focused approach is essential in service quality and Paraschivescu & COTÎRLET (2012) argument that a customer oriented company is better suited to identify and meet customer requirements. This statement is supported when the customers highlighted local knowledge as one of the most important customer expectations on their transporter. To have local knowledge is to have an understanding of which local transporter can be trusted, who to call during critical issues or who can transport a shipment on short notice without having to call multiple contacts before reaching the right person. One solution might be implementing sales representatives at that specific region who will collect data and understand how the market works and thus gain local knowledge. This was something the case company highlighted during interviews that could be one explanation to why they did not have a strong network up north. Since the case company is more focused on the southern Swedish market and has established themselves as a global shipping company with global services and networks, it can be difficult for them to gain specific local knowledge in certain markets without investing effort in building relationships. The case company has stated during interviews that they see a future with automatic booking systems where there is little or no contact with the customers. This approach can be problematic when the customers prefer a human contact to either confirm bookings or turn to when issues arise especially when some customers perceive that some information is hard to find on the case company's website.

Another customer experience that is considered important for northern Swedish customers is to trust that the transporter has high competence in their specific activities. More specifically, since transports represent a high percentage of customers' total cost, it is important that stuffing for instance is conducted correctly and efficiently to achieve a high filling rate. Hirata (2019)

also states that quality of service personnel is vital to achieve high customer satisfaction within the shipping industry. Although the customer perceives the case company to have a high degree of competence in all their activities, they still find them too costly, inflexible and too far away geographically which is connected to local knowledge. However, the case company has low flexibility compared to freight forwarders, which is known both to the customers and to the case company that both factions stated during the interviews. Even though high competence is considered very important (average ranking score of 8,8) and the case company is perceived to have high competence with a feeling of low risk, smaller customers would still turn to a freight forwarder for their ability to be flexible concerning volumes and forecasts. According to the case company, one common customer complaint is late deliveries, although customers' perception of the case company is a skilled and high competence logistical provider. The service attribute *Delivery precision* highlighted during early interviews refers to their ability to provide accurate ETAs within a given time window. Their perceived competence might be related to their service attribute *End-to-end solutions* which is their ability to provide inland transports from point A to point B. These findings align with research conducted by Kurtuluş et al. (2020) when they argue that transit times are vital for understanding how well a shipping company manages to provide inland transport solutions from one point to another.

When the case company was asked what they thought would explain why they did not have a strong presence in the northern Swedish market, their main argument was that they traditionally had viewed Gothenburg as their core base of operations. The customers might have realized this and could be a base for their fear that the case company does not have ambitions to increase their local knowledge in the northern Swedish market. Additionally, it is considered to be difficult to triangulate containers for the northern customers due to long distances when considering Gothenburg as the base of operations.

During the interviews with the case company, they took much pride in transporting via rail which was considered environmentally friendly and cost efficient. Two service attributes called *Rail flexibility* and *Rail reliability* were developed based on their ability to transport goods via a vast rail network within the Swedish market as a whole. However, when the customers were asked what transport they found to be the most cost efficient and reliable almost all answered that truck solutions were the best choice of transport. The one exception was one customer who had one rail system directly from one of their warehouses to a port. According to the rest of the customers, it was neither cost efficient or reliable to use a rail solution for their transports. This was based on their geographical location where rail systems were infrequent and costly. That rail was perceived to be too costly in comparison with truck transport based on the fact that multiple handling activities were needed when using rail and that when transporting via trucks they reduced the number of handling activities and thus were cheaper. It was also viewed that rail solutions were inflexible and that if a train malfunctioned or was stuck due to other train delays, it was difficult to solve the problem and there was a risk of the transport being stuck for a longer period of time. This contradicts inland transport literature that overall has a consensus that rail solutions usually are cheaper than truck solutions, however, this is only if the transport is a certain distance long (Kurtuluş & Çetin, 2020; Arnold et al.,2004). The customers in this study did not transport very long distances and could explain their preference of truck solutions and why truck transports stand for approximately 75 percent of worldwide total inland transportation. Additionally, the customers preferred truck transport due to their ability to book and order new transports on short notice quickly. However, there were issues with the capacity of trucks due to few trucks up north and that it was experienced to be easier to find transports going south than transports going north. This might be explained by the fact that customers are fewer and more scattered in the north than in the south of Sweden.

The ranking of each customer expectation resulted in reliability in transport receiving the highest customer ranking with a score of 9,3. This result indicates that among all customer expectations provided by the interview findings, reliability in transport was perceived to be the most important where almost all participants in the quantitative survey provided the highest

ranking. This might be connected to the extensive use of truck transport in the northern region and the shortcoming of available trucks highlighted in the interviews. This was considered to be a problem since not all customers could transport via rail solutions due to high prices or that the infrastructure is underdeveloped in their specific regions. Since rail transportation demands significant investments to develop and maintain and longer distances to be profitable (Balinski, 1961; Blumenhagen 1981), it can be costly for smaller companies in the northern region to transport via rail transports due to shorter distances, for instance. According to the survey, rail operators are reluctant to develop or invest in new ways to operate to promote the use of rail transports.

An interesting thing regarding customers' expectations on eco-friendly inland transportation solutions is that most customers explained that eco-friendly transport solutions are preferable and ranked the importance of such solutions as an 8,3. Still, few were ready to increase cost and reluctant to pay more for increased eco-friendly transport and their willingness to pay extra was ranked as 6,4. They argued that due to the competitiveness of their current inland transport market there was no room for increased cost unless all other competitors also had to implement new changes towards eco-friendly inland transports.

Franc (2010) argues that inland transportation always includes some type of truck solutions at some part of the transport. In this study it was found, when analyzing the need for different transport systems, both customers and the case company considered it important to be able to provide and book different transport modes. These different modes could be either rail and truck in combination, container solutions or bulk transports for instance. This customer expectation is aligned with the service attribute *Intermodal transportation* and therefore on this point the case company fulfills customers' expectations on inland transports. However, since most of the transports are transported to any port for export, it would be appropriate to investigate further whether transports could be transported in bulk and reloaded into containers either at the port or at any other locations. Since most customers in northern Sweden operate in bulk, it could be a possibility for shipping companies to explore opportunities in taking over the reloading at customer sites to increase presence and to gain local knowledge and build trust. Also, in contrast to interview findings where the ability to book different transport modes was considered an important factor, the ranking of this customer expectation presented an average ranking score of 5,6. This indicates that different transport modes were considered to not be as important in relation to the other customer expectations. None of the respondents considered and provided the highest ranking within the questionnaire.

According to customer satisfaction literature within the shipping industry, there are certain customer values that are considered to be more important than others, for instance, customized service for each customer (Lam & Zhang, 2019). Customization is one service attribute that is considered to be important for the case company and was highlighted as one of the service attributes used in the HoQ. Customization refers to the ability to provide customer specific solutions for inland transportation depending for instance on different customer needs or geographical locations. Since building relationships in the shipping industry is important (Oliva & Kallenberg, 2003) and to customize transport solutions is a factor for high customer satisfaction and customer perceived quality (Gustafsson et al., 1999), this service attribute can be considered to be important for facilitating increased presence in the northern market. Additionally, the customers stated that larger shipping companies such as this study's case company must be more flexible and provide solutions adapted to their particular needs, meaning customization. Some customers discussed solutions for storing goods at specific locations such as storage yards during transports if they experienced longer delays. This was brought up due to the characteristics of certain goods which were sensitive to bad weather conditions or other climate impacts. The ability to provide a storage yard for their customers was a customer expectation that was very scattered among the answers in the questionnaire. The result showed that some customers perceived it to be of the highest importance and some perceived it to be the lowest, with an average ranking score of 5,6. This indicates that this

customer expectation depends much on the type of customer and their operations. Some customers might have the need for storage areas close to production while some customers only require storage at ports. Nevertheless, this customer expectation should be investigated for each new customer separately and not be considered as only a low expectation. The same analysis can be applied to the customer expectation ranking of *Flexibility* which received an average ranking score of 4,9. Some customers provided the highest ranking while some provided the lowest ranking and should also be evaluated on customer level and not all as a group as knowledge of each customer is crucial for providing high quality services for designing competitive transport solutions (Flodén, 2017).

Port accessibility is a service attribute that refers to the ability of the case company to transport to multiple port locations which is connected to customization of inland transportation. However, when approaching the customers with the question of comparing the case company with other transport providers, one recurrent issue is that they are too focused on and tied to the port of Gothenburg. However, since the case company operates their own terminal at that port, they can provide additional services and cost solutions that other actors may not. In a vertically integrated context, ports are a vital part of a maritime supply chain where they have the position to provide added value for customers (Panayides, 2008).

The case companies' service attribute *Global network & services*, enables them to differentiate themselves from other actors on the market such as freight forwarders who might not have the same capabilities as a more prominent global shipping company. This capability can provide services on a global scale, for instance if a local company wants to export certain materials overseas, they can turn to their global services for consulting. One could argue that their global network and services facilitate their other highlighted service attribute *Synergies in transports.* Since they have a vast network of different distribution channels, they can use the same channel for different customers and therefore are not forced to create new transport channels for each new delivery, differentiating themselves from other transporters. According to Balci et al. (2018), shipping services can be differentiated from the competition if a company can provide for instance, by solving problems or providing services that competitors could not.

How these customer expectations were ranked in contrast to each other by the customers via the questionnaire are discussed in the next section.

5.2 Relationship matrix

This section will discuss the service attributes in relation to literature and from a relationship perspective with customer expectations based on the QFD team result. Thereafter the correlation matrix will be briefly discussed and analyzed.

End-to-end solutions was the service attribute that scored the highest *relative value* point of 810, which implied that it has the strongest relationship in a total of all service attributes with the customer expectations and therefore has the smallest gap between customer expectations and the service attribute. Since the case company is a global actor providing end-to-end service solutions, this result could be expected as evident. This implies that the case company should prioritize their resources on this service attribute to meet the customer expectations. *End-to-end solutions* received the highest *Relative value score* because of multiple strong relations with high ranked customer expectations, for instance, *Reliability* which had the highest customer rating score. Yuen & Thai (2015) state that reliability is an attribute that is considered more important for the customer than the cost of the service. However, the customer expectation *Cost* did thus have a strong relationship with *End-to-end solutions.* Li et al., (2020) clarify that vertically integrated companies such as the case company have the ability to control the quality for upstream- and downstream services, since they attain control over the whole logistical chain, they increase the reliability of their *End-to-end solutions. Communication* did also have a strong relationship with *End-to-end solutions* and was the second highest customer expectation. Since

the case company offers end-to-end solutions, a well-established communication process throughout the logical chain is important to prevent uncertainties (Arrow, 1975) and enables to reach out to customers and haulers (Goh and Fraser., 2012). Taghavi et al (2017) elaborates that information sharing would improve container positionings for the shipping companies and could thereby decrease the cost.

Eco-friendly solutions received a strong relation with *End-to-end solutions.* Since an end-to-end solution involves intermodal transportation, wherefrom an inland transportation perspective includes road for the pre and post transportation for the most part (Blumenhagen,1981; Kurtuluş & Çetin, 2020) and rail for the long-distance transportation (Kurtuluş & Çetin, 2020), this intermodal set up will reduce the emissions and then be considered as an eco-friendly solution. Even though the majority of the interviewed customers express that they consider an eco-friendly solution as an important factor and strive to choose that solution, they are not willing to pay extra for this service due to exposed price competition on the market. Therefore, the service attribute *Eco-friendly solution* have in general not been utilized fully by the northern customers in this study.

Synergies in transportation received a *relative value* score of 746, which is the second highest point of the service attributes. *Reliability* did, as mentioned before, receive the highest rating from the customers and the QFD team considered it to have a strong relationship with *Synergies in transportation*. By the same logic as with *End-to-end solutions, Reliability and Synergies in transportation* would provide control over the logistical chain by using different transportation solutions and thereby increase the reliability of their services. Since the gap for this service attribute is relatively small, the case company should use the benefits due to the small gap for this service attribute to increasing customers' satisfaction, making the case company more successful (Flodén et al., 2017). *Competence* got a *Relative value score* of 8.8 by the customers and had a strong relationship with *Synergies in transportation.* To benefit from the synergies in transportation, Yuen & Thai (2015) mention that it is essential to have knowledge within the industry.

Customization was the third highest service attribute with a *Relative value* score of 724. According to the QFD team, it received strong relationships with the customer expectations, *Capacity* and *Different transportation modes.* When customers choose a customized service solution, one factor such as capacity could be one alternative that the customer requires. The capacity in this context could imply the capacity of volume concerning the transportation modes and the capacity of truck and rail availability. Rail and barge have a high-capacity capability for inland transportation (Balinski, 1961; Blumenhagen,1981) and should be prioritized for a customized solution that requires high capacity. Since there are three available transportation modes in general, such as rail, road and barge, but two available in Sweden, road and rail, the case company could benefit from the *Different transportation modes* (Eurostat., 2019). This depends on what kind of service solution the customer requires e.g., long distance transportation, flexibility or capacity. The customers required the flexibility of road transportation and since the capacity of trucks was low at times, the case company should try to provide this solution.

The service attribute *Intermodal transportation* gained a *relative value* score of 684. It had a strong relationship with *Different transportation modes* which is evident since the concept of intermodal transportation includes at least two different transportation modes (Crainic & Kim, 2007; Frémont & Franc, 2010; Bontekoning, Macharis & Trip 2004). For inland transportation in Sweden is road and rail the primary options and the case company could combine these two factors to offer eminent door-to-door solutions with high profitability and low emission (Slack, 2017). The customer expectation, *Lead times* did as well get a strong relationship with *Intermodal transportation,* road and rail are fast inland transportation modes and since the combination of road and rail provides flexibility, the case company could offer short lead times to the customers (Balinski, 1961; Blumenhagen,1981; Islam, Ricci & Nelldal, 2016; Reis,

Meier, Pace & Palacin, 2013). Since most interviewed customers only use road transports as their primary transportation and few customers used rail transports from some of their production facilities to the port of Gothenburg, intermodal transportation is not applied to a large extent. Since the gap between the service attribute and the customer expectations is relatively small, the case company should exploit this option to become more profitable by providing this service. Nevertheless, since the empirical findings indicate otherwise, this should be further investigated.

Global networks & services got a *relative value point* of 679 and the QFD considered *Different transport modes* and *visibility* to have strong relations with that service attribute. Due to the fact that the case company has operations and services all over the world they could provide the customer with different transport modes and visibility since they are a company operating within a vertically integrated context. Song & Panayides (2012) state that customers require visibility for their transportation services to provide an overview of where the cargo is located. Depending on the goods, some customers stated that they only required hub visibility and others required real time visibility. The QFD team did not consider visibility as that important for the customers, but still, they provide hub visibility for inland transportation to their customers. There is a clear gap concerning *visibility* since the interviewed customers did request some sort of visibility, but the customer expectation did only receive the score point of 6.6 which is a medium result compared to the other customer expectations. This could imply that the other customers participating in the survey did not consider *visibility* as an important expectation compared to the other 11 customer expectations presented in the questionnaire.

The service attribute *Delivery precision* got a *Relative value score* of 578 and received a strong relationship with *Different transport modes* and *Flexibility* by the QFD team. By using different transportation mediums and possessing high flexibility would contribute to the high precision of the transportation. Also, by combining different transportation modes such as road and rail, and choosing between the most prominent mode for a specific destination and solution, e.g. door-to-door or terminal-to-door (Balinski, 1961; Blumenhagen, 1981; Janic, 2007). The case company is dependent on their haulers to maintain delivery precision towards the customers. Since some of the customers interviewed had low accessibility to store their finished products, delivery precision was essential to them to be able to ship the products away from the storage yard to mitigate production downtime.

The customer expectation, *Rail reliability* gained 550 in *relative values score*. Since the reliability depends on the road and rail hauler, the case company has to ensure that the haulers maintain the transportations' reliability. Road transportation could be exposed to traffic jams (Kurtuluş et al., 2020) and rail is limited to specific destinations (Blumenhagen.,1981). The QFD team considered the customer expectations, *Reliability, Visibility* and *Communication* to have strong relations with *Rail reliability.* Since the case company does not operate within road and rail transportation themselves but purchases this service from haulers, they rely on the haulers to provide the shipment to the customers. If the reliability is inadequate, visibility is an important factor to apply to inform the customers where the shipment is located at the moment and when the cargo approximately will arrive at the end destination (Song & Panayides, 2012). If disturbances in transportation occur, both hub visibility and real time visibility are options to be used. A functional communication chain to inform the customers of updates is a critical component to use in these situations to enforce customer satisfaction (Johnston., 1995) which the case company possesses.

Rail flexibility received a *relative value* of 547, similar to *Rail reliability* and a relatively low point compared to *End-to-end solutions. Flexibility* and *Cost* were considered to have strong relationships with *Rail flexibility* by the QFD team. Rail flexibility could be hard to attain since it is limited to rail tracks and specific destinations (Blumenhagen,1981). If a specific destination is caused by disturbances or other problems making it impossible to transport to, the flexibility to choose a different route could remedy the situation. This would although affect the cost due

to demurrage. This statement is similar to what the potential customers in the north of Sweden perceived concerning rail flexibility since most customers required flexibility that rail does not attain compared to road. Rail transportation also requires a certain amount of volume due to the fixed cost compared to road transportation, several of the customers did not reach this production volume.

The service attribute *Port accessibility* obtained a *relative value point* of 403 and had a strong relationship with *Reliability* and *Cost.* Since the case company operates their own port which is the gateway for incoming goods from all over the world towards the hinterland (Zhu et al., 2019), they can strategically plan incoming deliveries in an optimal way. This could decrease waiting time and shorten the lead time to the customers (Álvarez-SanJaime et al., 2012). Thereby could the case company increase the *reliability* of inland transportation. The recent statements also motivated to reduce the cost for the case company since the demurrage will be eliminated. The interviewed customers expressed that the port of Gävle was a more obvious choice of destination for them due to the short distance compared to the Port of Gothenburg. Also, many of the products were shipped to customers located in the continent of Europe and would be more convenient to use the port in Gävle.

The service attribute *Dedicated CS department* received a *relative value score* of 394 which is the third lowest service attribute. *Communication, customer service* and *Booking systems* were considered to have a strong relationship with the *Dedicated CS department.* The case company considers themselves to have a solid customer service but prefers to guide the customers towards the booking systems instead of directly communicating with the customer. Liu, Cao, Ajjan & Hong (2017) elaborates that it is essential to have good customer service to attain customer satisfaction. The customers emphasized that a dedicated contact person was something that they valued highly from the logistical service provider and that the communication channels should be short and efficient.

Digital booking systems is the service attribute that received the next lowest *Relative value score* of 352. Findings showed that the customer demanded multiple methods for booking inland transportation services such as phone, email and system-based booking systems. However, they demanded confirmation for knowing the booking had been placed properly. Especially in a vertical shipping context where fast and reliable information sharing is important (Goh & Fraser, 2012). However, according to the HoQ matrix the service attribute Digital booking systems fulfilled the customers' expectation of inland transport services to a low degree in comparison to the other service attributes. The QFD team perceived Digital booking systems to have a strong relationship with expectations such as Competence, Capacity, Local knowledge and Booking systems. However, even though this service attribute does not fulfill customers' expectations on services the best, it is still important for shippers to have an effective information system to control and manage complex supply chains and thus increase efficiency in other areas (Evangelista, 2002).

The service attribute that received the lowest Relative value score was the case company's service attribute *Eco-friendly solutions* which received a *Relative value score* of 250, because it only received two strong relationship scores by the QFD team with *Cost* and *Eco-friendly solutions* and the rest low and medium relationship scores. It was considered to have a relationship with cost due to it will increase prices if customers choose more environmental inland transports. The customers' expectations on eco-friendly solutions received a high relationship score due to self-explanatory reasons and will not be discussed further. According to Flodén (2017), it is essential to understand what the customers expect and what service attribute fulfills their expectation the best. By receiving the lowest Relative value score this service attribute is considered to fulfill the customers' expectations on inland transport services the least and if improved, would not further facilitate customer satisfaction unless it would be developed and improved to increase relationship connection to other customer expectations such as *Booking systems* or *Local knowledge*. This score also reflects the customers ranking on

their willingness to pay more for environmental solutions which was low. Additionally, the findings show that truck transports are the main mode for inland transportation in the northern region and are at the moment preferable for most customers due to cost and infrastructure issues. Eco-friendly solutions might not be the most important focus for the customers while truck transports stand for approximately 93% of total shipping external costs (Kurtus et al., 2020) but it would be a solution for the future since it has the potential to bring costs down if the infrastructure is developed and appropriately invested in the northern region.

5.3 Correlation matrix

As described in section 3.2.5, the Correlation matrix investigates whether the company's service attributes have any correlations between themselves, whether negative, positive or no correlations. If two service attributes have a positive correlation, these will support each other, and if one service attribute is removed, it will also affect the other (Wasserman, 1993). For example, suppose the service attribute Synergies in transport is considered to fulfill customers' requirements and thereby improve or invest resources in which in that case, it will also affect the service attribute Intermodal transportation. Since there are multiple ways of determining the correlations between service attributes (Shrivastava, 2016), it is essential to be consistent when evaluating all service attributes. This study has assessed each correlation based on knowledge collected throughout by studying internal documents, interview findings, and consulting with the case company representatives. This process is considered to be based on subjective decisions and could hold a certain margin of error. However, Chan & Wu (2005) argue that it can be done either by complex analysis tools or simply by experience when deciding correlations among service attributes. Nonetheless, companies need to understand how their service attributes are connected Chan et al. (2002). To involve experience in the decision of deciding correlations within the matrix, it was sent to the QFD team representatives for further analysis and comments to confirm that it is considered valid for their service attributes. The Correlation matrix also showed that the top three service attributes ranked by Relative value score also had a positive correlation. This means that if one is influenced or changed, the others may also be affected and changed.

Some final remarks for the whole discussion section are that the customer expectation, Flexibility did receive the lowest score from the customer ratings but is in fact regarded as a common and essential expectation to apply in various industries, which is stated in the literature both from inland transportation (Blumenhagen,1981; Islam, Ricci & Nelldal, 2016; Reis, Meier, Pace & Palacin, 2013) and vertical integration perspective (Tan et al., 2018). Since this study has used one definition for flexibility, other meanings of flexibility might be one reason the customer perception of flexibility is scattered.

Additionally, since the QFD team consisted of a group of two people from the Case company and the relationship ranking was applied by these people's perception, the rankings' output was subjective. If there had been additional people from the case company participating in the QFD team, further discussions would have taken place and a consensus about the relationship between the service attributes and customers' expectations could have reached another outcome. Also, since customers' expectations are considered dynamic and may change over time, they must be measured and evaluated periodically. Based on this study's finding and previous discussion, the following section will present the main conclusions that will answer the study's research questions presented in section 1.

6. Conclusions

This section will provide the main conclusions based on collected data findings and discussion in section 5. Literature has developed multiple HoQ methodologies for different purposes, products or services. This study has developed a HoQ matrix as a model to understand what expectations the customers have regarding inland transportation services in the northern Swedish region. These customer expectations have then been compared and discussed in relation to this study's case company's attributes on inland transportation services referred to as Service attributes. Section 6.1 aims to answer the study's first and second research question, while section 6.2 aims to answer the third and final research question which is presented in section 1 and stated below.

- What are the customers' requirements from inland transportation services for containers?
- What are the main service attributes for inland transportation provided by container shipping companies?
- How can inland transportation service attributes be configured so that the customer requirements from this service are satisfied in a prioritized manner?

6.1 Customer expectations and service attributes for inland transportation

The purpose of this case study was to mitigate the gap between customer expectations and the service attributes offered by the case company with a QFD approach. The customer expectations and service attributes were collected and founded through semi-constructed interviews with representatives from both the case company and customers in the northern region of Sweden, the customer expectations were ranked through surveys from 45 various customers from the same area. A frame of reference was formulated based on adequate theory from inland transportation, vertical integration in a shipping context and service quality & customer expectations.

With the use of a QFD approach, this study has found 14 customer expectations from customers in the northern Swedish market that represent their expectations on inland transportation services i.e. Competence, Capacity, Reliability, Lead times, Different transport modes, Communication, Customer service, Storage yard, Cost, Visibility, Flexibility, Local knowledge, Booking systems and Eco-friendly solutions. This study has also highlighted 12 attributes on services by investigating a case company whose ambition is to establish themselves at the northern Swedish market for inland transports i.e. Synergies in transports, Customization, Intermodal transport solutions, Rail flexibility, Rail reliability, Delivery precision, Port accessibility, Global network & services, Dedicated CS department, End-to-end solutions, Eco-friendly solutions and Digital booking channels.

These customer expectations and service attributes have been analyzed based on the HoQ matrix and with a multifunctional QFD team to investigate relationships among the expectations and attributes. By analyzing the Relative value score this study highlight which service attribute fulfills the customers' expectations the most and which service attribute does not currently fulfill customer's expectations highlighted in this study. With the HoQ and Relative value score, the case company were able to evaluate their service offerings in comparison to customers' expectations and thereby configure them to decrease the gap between service attributes and customers' expectations.

End-to-end solutions were the service attribute that received the highest relative value score and had the smallest gap among the service attributes. Reliability, Cost and Eco-friendly

solutions were discussed from an end-to-end solution point of view since they had a strong relationship with the service attribute. Synergies in transportation received the second highest relative value point and the customer expectations, Reliability and Competence were debated for the conditions. Customization was the third highest service attribute according to the QFD team, Capacity and Different transportation mode was illuminated in respect to Customization. Since these service attributes were the three highest, it implies that the case company fulfills the customer expectations the foremost and based on the empirical findings, should focus their time and resources to maintain this small gap. Since the case company operates in a global shipping context, however, these three service attributes are connected to the inland transportation market, they are still somewhat connected to a global context and could potentially receive the same Relative value score globally. The Correlation matrix showed that the top three service attributes ranked by Relative value score also had a positive correlation. This means that they are connected and if one is changed for the better the others also receive a positive change.

The service attribute that received the lowest Relative value score was Eco-friendly solutions and therefore attained the most significant gap between the service attributes and customers' expectations. The case study mentions that the customers prioritize eco-friendly solutions and consider this as an important expectation but are not prepared to pay extra for this service. This was due to a competitive market with a price pressured industry. The other service attributes received a medium relative value score and was considered to have a moderate gap.

According to the customers in the northern region, there is a need for relationship building and having the ability to contact a dedicated employee when booking or rebooking services for inland transportation. The case company aims to automate the booking system for customers which can be problematic for the northern customers. Results also showed a discrepancy between customers' perception of the case company's customer service and their own view on their customer service. Some customers perceived to be treated poorly when asked on prices for uncommon destinations that did not appear on their website. For the transporter to have local knowledge was considered important to the customers in the northern Swedish region. The case company was perceived to lack local knowledge that other inland transport providers had which were located more closely. There is also a discrepancy between requiring customers to forecast up to six months and customers' ability to forecast. Since the case company is a global shipping company and investigates solutions to connect ocean transports with inland transportation, mitigating this discrepancy would bring more smaller customers onto their package solutions. Also, it was shown to be a discrepancy between the perception by the customers that the case company is too focused on the port of Gothenburg and that customers require other options of other ports as well. This study also concluded that there is a gap between the customers' expectation of environmentally friendly solutions and their willingness to pay for it. However, if other companies in their regions have to pay more, there is a willingness to turn to more eco-friendly solutions. The lack of rail solutions also contributes to truck transports which are considered to be less environmentally friendly than rail transports. Also, there seems to be a discrepancy between the case company's ability to provide inland rail transport and the extent of rail tracks around the customers participating in this study.

Based on the conclusions presented in this section, various recommendations have been developed and presented in the following section.

6.2 Recommendations

Several recommendations to the case company have been identified based on this study's findings and conclusions. Since the service attribute End-to-end solutions received the highest Relative value score in the HoQ matrix, it is considered to fulfill customer expectations the most in relation to the other service attributes. Therefore, this study recommends the case company to continuously improve this service attribute. Additionally, the service attribute Eco-

friendly solutions received the lowest Relative value score is considered to not fulfill the customers' expectations in an efficient way and is recommended to be further explored since it may provide other beneficial aspects such as cost reductions or branding.

Due to most of the customers required that their logistical service providers attain local knowledge to understand the customers' needs, the case company should establish a local presence in the northern region of Sweden. One solution could be by implementing sales representatives in the northern region to further understand their specific ways of operating and do business or find other solutions such as investing in local haulers.

Some customers experience that they cannot reach a specific and consistent shipping volume since it fluctuates because of a varying market. However, this is a requirement by the case company to achieve consistent volumes and lead to higher prices that the customer cannot afford, making them turn to other logistical service providers. Therefore, the case company should find solutions to offer plausible alternatives for those customers affected by this outcome.

The case company should also communicate to the customers that there are other ports available to use for their shipments since the customers believe the port of Gävle is more prominent than the port of Gothenburg due to distance.

Since most northern customers prefer truck transportation and few options for the customers to use rail are limited, the case company should invest in intermodal transport for the northern customers participating in this study. Since there is a perception that rail transports have too many material handling operations such as loading and unloading activities, the case company might look into solutions to take over those activities as well.

6.3 Future research

Since this study's focus has been to explore potential gaps between customer expectations in the northern region of Sweden and service attributes on provided inland transport services from a case company, there has not been a focus on the competitiveness of inland transport providers. Few studies have been conducted on the competitive aspect between shipping companies and freight forwarders in the Swedish market. This study has used the HoQ matrix to understand the gap between customer expectations and service attributes, but more research is available on how shipping companies can compete with the freight forwarders already established on that market. Therefore, future research may be conducted based on inland transport competition between shipping companies and freight forwarders.

Areas of future research may also be to conduct a QFD survey to obtain and analyze a more extensive customer base. Since statistical data was not the primary focus in this case study and only included 18 participants, it is unsure if it mirrors the entire customer base. Since this study is primarily based on subjective data collection, other areas of future research could be to apply a similar research method but apply a Fuzzy logic to the QFD approach. This approach would reduce uncertainty in collected data from interviews or focus groups and provide more accurate quantifiable data from vague subjective answers. This case study was limited to the northern region of Sweden, the field of study could be extended to other and larger areas in Sweden or at a global level. Additionally, future research could focus on other actors within the inland transportation to explore and understand further aspects of the inland shipping industry. The service attributes could also be investigated from a financial aspect to find out how much each attribute costs and earn in profit since the gap does not explore these details. Lastly, further research could investigate specific service attributes that attained a high or low relative value score from this case study to explore if the gap differs in other circumstances

7. References

Altuntaş, C., & Göçer, A. (2014). Integration Strategies in Shipping Industry: Drivers and Barriers.

Álvarez-SanJaime, Ó., Cantos-Sánchez, P., Moner-Colonques, R., & Sempere-Monerris, J. J. (2013). Vertical integration and exclusivities in maritime freight transport. Transportation Research Part E: Logistics and Transportation Review, 51, 50-61.

Arnold, P., Peeters, D., & Thomas, I. (2004). Modelling a rail/road intermodal transportation system. Transportation Research Part E: Logistics and Transportation Review, 40(3), 255-270.

Arrow, K. J. (1975). Vertical integration and communication. The Bell Journal of Economics, 173-183.

Bai, X., Zhang, X., Li, K. X., Zhou, Y., & Yuen, K. F. (2020). Research Topics and Trends in the Maritime Transport: a Structural Topic Model. Transport Policy.

Balci, G., Cetin, I. B., & Tanyeri, M. (2018). Differentiation of container shipping services in Turkey. Transport Policy, 61, 26-35.

Balinski, M. L. (1961). Fixed-cost transportation problems. Naval Research Logistics Quarterly, 8(1), 41-54.

Beatty, P. (2005). Robert M. Groves, Floyd J. Fowler, Mick P. Couper, James M. Lepkowski, Eleanor Singer, and Roger Tourangeau. Survey Methodology. Hoboken, NJ: Wiley–Interscience. 2004. 448 pp. $49.95.

Bell, E., Bryman, A., & Harley, B. (2018). Business research methods. Oxford university press.

Bicknell, B.A. and Bicknell, K.D. 1995. The Road Map to Repeatable Success—Using QFD to Implement Change Boca Raton, FL: CRC Press.

Blumenhagen, D. (1981). Containerization and hinterland traffic. Maritime Policy and Management, 8(3), 197-206.

Bontekoning, Y. M., Macharis, C., & Trip, J. J. (2004). Is a new applied transportation research field emerging?—A review of intermodal rail–truck freight transport literature. Transportation research part A: Policy and practice, 38(1), 1-34.

Bouchereau, V., & Rowlands, H. (2000). Methods and techniques to help quality function deployment (QFD). Benchmarking: An International Journal.

Cao, Y., Ajjan, H., & Hong, P. (2018). Post-purchase shipping and customer service experiences in online shopping and their impact on customer satisfaction. Asia Pacific Journal of Marketing and Logistics.

Cariou, P. (2008). Liner shipping strategies: an overview. International Journal of Ocean Systems Management, 1(1), 2-13.

Casson, M. (1986). The role of vertical integration in the shipping industry. Journal of Transport Economics and Policy, 7-29.

Chan, L. K., & Wu, M. L. (2002). Quality function deployment: a comprehensive review of its concepts and methods. Quality engineering, 15(1), 23-35.

Chan, L. K., & Wu, M. L. (2005). A systematic approach to quality function deployment with a full illustrative example. Omega, 33(2), 119-139.

Chang, C. H., & Thai, V. V. (2017). Shippers' choice behaviour in choosing transport mode: the case of South East Asia (SEA) region. The Asian Journal of Shipping and Logistics, 33(4), 199-210.

Chen, K. K., Chang, C. T., & Lai, C. S. (2009). Service quality gaps of business customers in the shipping industry. Transportation Research Part E: Logistics and Transportation Review, 45(1), 222-237.

Chen, Y. (2001). On vertical mergers and their competitive effects. RAND Journal of Economics, 667-685.

Crainic, T. G., & Kim, K. H. (2007). Intermodal transportation. Handbooks in operations research and management science, 14, 467-537.

Durvasula, S., Lysonski, S., & Mehta, S. C. (2000). Business-to-business marketing service recovery and customer satisfaction issues with ocean shipping lines. European Journal of Marketing.

Eurostat, 2021 Eurostat Freight transport statistics - Modal split available on https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Freight_transport_statistics_-_modal_split#Modal_split_in_the_EU (accessed on 20 may 2021)

Evangelista, P. (2002). The role of ICT in the logistics integration process of shipping lines. Pomorski zbornik, 40(1), 61-78.

Fazi, S., & Roodbergen, K. J. (2018). Effects of demurrage and detention regimes on dry-port-based inland container transport. Transportation Research Part C: Emerging Technologies, 89, 1-18.

Flodén, J., Bärthel, F., & Sorkina, E. (2017). Transport buyers choice of transport service–A literature review of empirical results. Research in Transportation Business & Management, 100(23), 35-45.

Frémont, A. (2009). Shipping lines and logistics. Transport Reviews, 29(4), 537-554

Fremont, A., & Franc, P. (2008, April). Port inland transportation in Europe: Combined versus road transport. In Association of American Geographers, 2008 Annual Meeting (p. 20p).

Frémont, A., & Franc, P. (2010). Hinterland transportation in Europe: Combined transport versus road transport. Journal of transport geography, 18(4), 548-556.

Fuller, W. A. (2011). Sampling statistics (Vol. 560). John Wiley & Sons.
Gerring, J. (2004). What is a case study and what is it good for?. American political science review, 341-354.

Ghobadian, A., Speller, S., & Jones, M. (1994). Service quality: concepts and models. International journal of quality & reliability management.

Goh, M., & Fraser, K. (2012). Innovative ICT applications in transport and logistics: some evidence from Asia. In Supply Chain Innovation for Competing in Highly Dynamic Markets: Challenges and Solutions (pp. 123-136). IGI Global.

Gustafsson, A., Ekdahl, F., & Edvardsson, B. (1999). Customer focused service development in practice–a case study at Scandinavian Airlines System (SAS). International Journal of service Industry management.

Hakanen, T., Helander, N., & Valkokari, K. (2017). Servitization in global business-to-business distribution: The central activities of manufacturers. Industrial Marketing Management, 63, 167-178.

Hanssen, T. E. S., Mathisen, T. A., & Jørgensen, F. (2012). Generalized transport costs in intermodal freight transport. Procedia-Social and Behavioral Sciences, 54, 189-200.

Heaver, T., Meersman, H., & Van de Voorde, E. (2001). Co-operation and competition in international container transport: strategies for ports. Maritime Policy & Management, 28(3), 293-305.

Hirata, E. (2019). Service characteristics and customer satisfaction in the container liner shipping industry. The Asian Journal of Shipping and Logistics, 35(1), 24-29.

Hutt, M. D., & Speh, T. W. (2021). Business marketing management: B2B. South-Western, Cengage Learning.

Islam, D. M. Z., Ricci, S., & Nelldal, B. L. (2016). How to make modal shift from road to rail possible in the European transport market, as aspired to in the EU Transport White Paper 2011. European transport research review, 8(3), 1-14.

Janic, M. (2007). Modelling the full costs of an intermodal and road freight transport network. Transportation Research Part D: Transport and Environment, 12(1), 33-44.

Johnston, R. (1995). The determinants of service quality: satisfiers and dissatisfiers. International journal of service industry management.

Khan, M. S., Naumann, E., & Williams, P. (2012). Identifying the key drivers of customer satisfaction and repurchase intentions: An empirical investigation of Japanese B2B services. Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, 25(3), 159-178.

Kittleson, M. J. (1997). Determining effective follow-up of e-mail surveys. American Journal of Health Behavior, 21(3), 193-196.

Kothari, C. (2004). Research methodology : Methods and techniques. ProQuest Ebook Central https://ebookcentral.proquest.com

Kuada, J., & Kuada, J. (2012). Research methodology : A project guide for university students. ProQuest Ebook Central https://ebookcentral.proquest.com

Kurganov, V., Gryaznov, M., & Dorofeev, A. (2017, August). Information support reliability of transportation systems in the industry. In Proceedings of the 7th International Conference on Information Communication and Management (pp. 162-167).

Kurniawan, V. R. B., & Wijayanti, D. (2020). A House of Quality (HOQ) matrix of assistive technology for deaf students at elementary school to enhance basic-level language

competencies. In Journal of Physics: Conference Series (Vol. 1456, No. 1, p. 012040). IOP Publishing.

Kurtuluş, E., & Çetin, İ. B. (2020). Analysis of modal shift potential towards intermodal transportation in short-distance inland container transport. Transport Policy, 89, 24-37.

Lam, J. S. L., & Zhang, X. (2019). Innovative solutions for enhancing customer value in liner shipping. Transport Policy, 82, 88-95.

Lewis, M. (2006). The effect of shipping fees on customer acquisition, customer retention, and purchase quantities. Journal of Retailing, 82(1), 13-23.

Li, D., Qu, Y., & Ma, Y. (2020). Study on the impact of subsidies for overlapping hinterland shippers on port competition. Transportation Research Part A: Policy and Practice, 135, 24-37.

Li, P., Tan, D., Wang, G., Wei, H., & Wu, J. (2020). Retailer's vertical integration strategies under different business modes. European Journal of Operational Research.

Liang, G. S., Chou, T. Y., & Kan, S. F. (2006). Applying fuzzy quality function deployment to identify service management requirements for an ocean freight forwarder. Total Quality Management & Business Excellence, 17(5), 539-554.

Madaleno, R., Wilson, H., & Palmer, R. (2007). Determinants of customer satisfaction in a multi-channel B2B environment. Total Quality Management & Business Excellence, 18(8), 915-925.

Matsubayashi, N. (2007). Price and quality competition: The effect of differentiation and vertical integration. European Journal of Operational Research, 180(2), 907-921.

Merriam, S. B. (2002). Introduction to qualitative research. Qualitative research in practice: Examples for discussion and analysis, 1(1), 1-17.

Michael, L. D., Johnson, D., & Renaghan, L. M. (1999). Adapting the QFD approach to extended service transactions. Production and Operations Management, 8(3), 301-317.

Miremadi, A., Ghalamkari, S., & Sadeh, F. (2011). Customer satisfaction in port industry (A case study of Iranian shipping). In 2011 International Conference on Sociality and Economics Development (Vol. 10, pp. 58-62).

Noor, K. B. M. (2008). Case study: A strategic research methodology. American journal of applied sciences, 5(11), 1602-1604.

Nordin, F., & Kowalkowski, C. (2010). Solutions offerings: a critical review and reconceptualisation. Journal of Service Management.

Notteboom, T. (2004). A carrier's perspective on container network configuration at sea and on land. Journal of International Logistics and Trade, 1(2), 65-87.

O'Leary-Kelly, S. W., & Flores, B. E. (2002). The integration of manufacturing and marketing/sales decisions: impact on organizational performance. Journal of operations management, 20(3), 221-240.

Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. International journal of service industry management.

Paraschivescu, A. O., & COTÎRLEȚ, A. (2012). Kano Model. Economy Transdisciplinarity Cognition, 15(2).

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. Journal of marketing, 49(4), 41-50.

Park, S., Lehto, X., & Lehto, M. (2021). Self-service technology kiosk design for restaurants: An QFD application. International Journal of Hospitality Management, 92, 102757.

Poulis, E., Poulis, K., & Dooley, L. (2013). 'Information communication technology innovation in a non-high technology sector: achieving competitive advantage in the shipping industry. The Service Industries Journal, 33(6), 594-608.

Rauyruen, P., & Miller, K. E. (2007). Relationship quality as a predictor of B2B customer loyalty. Journal of business research, 60(1), 21-31.

Reis, V., Meier, J. F., Pace, G., & Palacin, R. (2013). Rail and multi-modal transport. Research in Transportation Economics, 41(1), 17-30.

Riordan, M. H. (2005). Competitive effects of vertical integration.

Roso, V., Woxenius, J., & Lumsden, K. (2009). The dry port concept: connecting container seaports with the hinterland. Journal of Transport Geography, 17(5), 338-345.

Sachdeva, J. (2008). Business research methodology. ProQuest Ebook Central https://ebookcentral.proquest.com

Seth, N., Deshmukh, S. G., & Vrat, P. (2005). Service quality models: a review. International journal of quality & reliability management.

Shrivastava, P. (2016). House of quality: An effective approach to achieve customer satisfaction & business growth in industries. International Journal of Science and Research (IJSR), 5(9), 1365-1371.

Slack, B. (2017). Intermodal transportation. In Handbook of Logistics and Supply-Chain Management. Emerald Group Publishing Limited.

Song, D. W., & Panayides, P. (2012). Maritime logistics: a complete guide to effective shipping and port management. Kogan Page Publishers.

Song, D. W., & Panayides, P. M. (2008). Global supply chain and port/terminal: integration and competitiveness. Maritime Policy & Management, 35(1), 73-87.

Speelman, C., & McGann, M. (2013). How mean is the mean?. Frontiers in Psychology, 4, 451.
Taghavi, M., Irannezhad, E., Schrobback, P., Moghaddam, M., Prato, C. G., & Nave, R. (2017, January). Strategies to increase port competitiveness. In ATRF 2017-Australasian Transport Research Forum 2017, Proceedings. ATRF, Commonwealth of Australia.

Tan, Z., Meng, Q., Wang, F., & Kuang, H. B. (2018). Strategic integration of the inland port and shipping service for the ocean carrier. Transportation Research Part E: Logistics and Transportation Review, 110, 90-109.

Van den Berg, R., & De Langen, P. W. (2015). Towards an 'inland terminal centred'value proposition. Maritime Policy & Management, 42(5), 499-515.

Van Klink, H. A., & Van Den Berg, G. C. (1998). Gateways and intermodalism. Journal of transport geography, 6(1), 1-9.

Vural, C. A., Roso, V., Halldórsson, Á., Ståhle, G., & Yaruta, M. (2020). Can digitalization mitigate barriers to intermodal transport? An exploratory study. Research in Transportation Business & Management, 37, 100525.

Wasserman, G. S. (1993). On how to prioritize design requirements during the QFD planning process. IIE transactions, 25(3), 59-65.

World Trade Organization (WTO). (2021, January 29). International trade statistics. Retrieved from https://data.wto.org/.

Yuen, K. F., & Van Thai, V. (2015). Service quality and customer satisfaction in liner shipping. International Journal of Quality and Service Sciences.

Zairi, M., & Youssef, M. A. (1995). Quality function deployment. International Journal of Quality & Reliability Management.

Zeng, Y. E., Wen, H. J., & Yen, D. C. (2003). Customer relationship management (CRM) in business-to-business (B2B) e-commerce. Information Management & Computer Security.

Zhu, S., Zheng, S., Ge, Y. E., Fu, X., Sampaio, B., & Jiang, C. (2019). Vertical integration and its implications to port expansion. Maritime Policy & Management, 46(8), 920-938

8. Appendix

Appendix A

Interview questions case company

1. Can you shortly describe your role within the company?
2. As we understand it, * offers three products (* Inland Hub, * Inland Delivery and *Overland Transportation). Based on your perspective and role, what are the most important factors/attributes in these services?
3. What type of services do you consider to be least & most cost efficient and reliable?
4. Can you explain the methodology on how customers order * services?
5. What does customer service look like and does it differ depending on customers?
6. Are there any known larger customer complaints on these services?
7. How common is it that containers return damaged and is it a large cost factor?
8. Have you ever considered using other shipment loads apart from containers?
9. What type of customers do you have in northern Sweden?
10. According to you, what is the reason * does not have a large presence and a large customer base in the north part of Sweden?
11. Why does the Danish market have a higher inland haulage radio than Sweden?
12. Which transport modes are available in the north of Sweden and are there any barriers for intermodal transports?
13. Have the customers any specific demand on sustainability?

*The name of the company have been removed and replaced with a * symbol due to anonymity

Appendix B

Interview questions customers

1. Can you shortly describe your role and position within your company?
2. What is your current inland transport setup and what do you find to be the most important service attribute for these services?
3. What type of transportation mode do you mainly use from your current provider (truck, rail, combine)?
4. What transport mode do you find to be the best option regarding cost and efficiency?
5. Are additional inland transport services of interest to you such as stuffing, stripping and customs?
6. What are your current main challenges in inland transportation?
7. What is important to you regarding customer service and service response?
8. How does your current inland transport provider meet your requirements on customer service?
9. What is your preferred method of booking inland transport services?
10. What factors are important when booking and rebooking inland transports from your suppliers?
11. How do you prefer to receive information on delayed transports from your logistical provider?
12. What are your thoughts on purchasing both ocean and inland transports as a package from a logistical provider?
13. What are your views on visibility for inland transports and do you have any specific demands for it?
14. How do you compare * services against other logistics providers?

15. Do you have any specific sustainability demands?
16. How important are eco-friendly solutions and are you willing to pay more for it?

*The name of the company has been removed and replaced with a * symbol due to anonymity

Appendix C

Interview questions questionnaire

1. How important is it that your current inland transport provider has high competence in their specific transport solution?
2. How important is it for you to have accessibility of transport capacity regarding truck?
3. How important is it for you to have accessibility of transport capacity regarding rail?
4. How important is the ability of the transportation service to meet promised delivery time along an extended period?
5. How important is the time it takes to transport your cargo from the inland destination to the port?
6. How important is it that your transporter provides you with different transport solutions (train, truck, containers, bulk etc.)?
7. How important is fast and reliable communication between you and the transporter?
8. How important is it that the transporter can offer a place to store your goods such as warehousing or open storage yard?
9. How important is cost regarding your transporter services?
10. How important is visibility in tracking your transports in real time?
11. How important is visibility in tracking your transports when it goes through hubs?
12. How important is it that your transporter lets you change your preferred port, stuffing choice or booking when you order an inland transportation service?
13. How important is it that your transporter has local knowledge of transport solutions?
14. How important is it with fast and reliable customer service?
15. How important is it to have a specially appointed contact person/team for customer service?
16. How important is it to have web-based/system based transport booking systems?
17. How important is it with environmental and sustainable transport solutions?
18. On a scale from 1-10 how would you rank your willingness to pay more for environmental and sustainable transport solutions?
19. Are there any other expectations regarding the inland transportation services?

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF SERVICE MANAGEMENT AND LOGISTICS
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se

CHALMERS
UNIVERSITY OF TECHNOLOGY