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Master Thesis

« The Impact of a New Distribution Centre on the Delivery Performance: the Risparmio Casa case. »

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Abstract

This thesis is focused on analysing the impact of introducing an additional distribution centre in a company's network design.

Distribution network design is fundamental for a firm's profitability. Network design is based on a trade-off between the logistic costs and the customer service level. Indeed, guaranteeing to customers a higher service level is desirable, however, also the costs will rise proportionately.

In the context of a new distribution centre opening, there are many decision-making factors that interact. These may push more or less strongly towards the opening of a new distribution centre.

In this research, these decision-making factors are investigated. Going more in depth, the interviewees of the case study were asked to rank the importance of the factors and to underline why these were so important. The impact on the decision-making can be seen in a circular way. In fact, the factors influence the decision-making of opening a new distribution centre, and the latter then has an effect on the factors.

The most important decision-making factors were the service level, the logistic costs and the proximity and accessibility related factors. However, to the previously studied factors, two new ones were added. These were the perception of the distribution centre saturation and the impact of the European Regulation 2020/1054. The first factor did not receive a high ranking because of the contradictory effect of framing on the workers' perception. The latter, instead, can be seen as one of the most important factors influencing the decision-making because of its effect on the delivery time.

These two new decision-making factors were important to study because they give an overview on two previously overlooked topics. Indeed, the first gives a behavioural point of view in studying logistics. The second, instead, underlines the importance of regulations in companies' performance and it sets the stage for a comparative study of the factor at European level.

In this research the case of Risparmio Casa is studied in detail. The company is considering the opening of a new distribution centre and, through a qualitative approach, the impact of it is researched. This study is firstly based on the previous literature on this type of

decision-making. Then in the last two chapters, the empirical findings are analysed, and the impact and dynamics are studied in depth.

Preface

This research is submitted for the *MSc in Supply Chain Management at LUISS University*. At the same time, it constitutes the closing step of the academic path at *Tilburg University*, which I am currently attending with a Double Degree program.

I would like to deeply thank my supervisor, Dr. Pietro De Giovanni, for guiding me in this final step as a student and for the precious advices that helped me to do my best.

Moreover, I would like to thank *LUISS University* for giving me the opportunity of participating to the acknowledged Double Degree Program, and for giving me the chance to study in a challenging and educationally relevant environment.

In addition, I express my gratitude towards *Tilburg University*, for having given me the chance to participate to this prestigious Double Degree program.

Due to the Covid-19 pandemic, the experience was lived through digital means. Hence, I had to forgo the opportunity of living fully the University and the relationships between students and professors.

Lastly, I would like to thank my family for always supporting and giving me the strength to never surrender and try to build my own future. I thank my friends for being my teammates and standing close to me in the moment of need. I thank all of them for helping me improve and build the best version of myself.

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1. Introduction

Distribution is defined as "all the steps involved in the transportation and storage of goods from the supplier stage to the customer" (Chopra, 2003). The distribution network directly impacts the company's profitability because of its effect on the supply chain costs and the customer service level. (Shang, Yildirim, Tadikamalla, Mittal & Brown, 2009). Since the distribution network has a fundamental role in the flow of goods and services to the customers, consequently it affects the level of customer satisfaction. In fact, its main goal is to satisfy customer demands in the quickest and most efficient way (Murfield, Boone, Rutner & Thomas, 2017). In designing a distribution network there are many decisions to undertake, these will determine the number, size and location of facilities in a supply chain (Chopra, 2003; Korpela, Lehmusvaara, & Tuominen, 1998). Hence, the distribution network selection, for a firm is of uttermost importance in shaping its operational, tactical and strategic decisions (Archetti & Speranza, 2014; Farahani, Rezaour, Drezner & Fallah, 2014). The objective of a logistical strategy is to guarantee flexibility in providing high-level customer service while being cost-effective (Amiri, 2006; Bowsersox, Closs, & Cooper, 2020; Christopher, 2020).

1.1.Problem Identification

Companies continuously aim at maximising their flexibility in meeting customer expectations. In this regard, distribution network design is essential, since to be fully efficient it must reflect the firm's organization and expansion. In this context the company Risparmio Casa integrates perfectly. Risparmio Casa is an Italian company that operates in the retail sector and it currently has 114 stores.

Its distribution network to serve the mainland is organized with two distribution centres (DCs) located in Pomezia, near Rome. Through these DCs the freight is sent to the stores, which can be seen as the intermediate customers.

Considering the mainland, shipping the products in Rome or Lazio, the region which Rome is in, is for the company very affordable. However, shipping in Northern Italy is becoming an issue, given the continuous expansion the company is facing. Risparmio Casa cannot guarantee the same service level to all its customers in the mainland, because of the high differences in distances from the DC to the stores. Thence, it frequently happens that in Northern Italy the product arrival is delayed compared to the schedule and this causes a loss

of potential sales for the store and the company. Risparmio Casa has a fixed weekly schedule of delivery, but it does not manage to respect it fully. For this reason, the service level, towards these stores, is lower that the company desires. Moreover, the transportation costs are higher for the stores in Northern Italy compared to Lazio, but this is not balanced with an equally high service level.

The company's development strategy aims at strengthening the presence in Northern Italy. So, guaranteeing a high service level while minimizing costs will acquire even more importance. Thence, the objective of this research is to find a feasible solution to address the inefficiencies in the distribution network of Risparmio Casa, towards the stores of Northern Italy.

1.2.Problem Statement

The problem statement defines the central problem to be investigated by the research and it identifies the issues and contexts that gave rise to the study. Hence, the problem statement illustrates the direction and focus of the study (McGaghie, Bordage, & Shea, 2001; Miles, 2017)

Designing the distribution network that perfectly fits with a company's operational activities is crucial for profitability. Moreover, the firm's network design must also match the company's development and expansion strategy. A mismatch will limit the company's performance. For Risparmio Casa we see that the organization had a rapid growth in the last years, becoming a prominent presence also in Northern Italy. However, the delivery organization to the stores is starting to struggle, bringing to a lower service level than desired and higher costs. In order to tackle the issues associated with long distances and slowness of transportation, and to improve its performance to the stores in the Northern regions, the company is considering the option of opening a new DC in Northern Italy. Through this DC, Risparmio Casa intends to achieve the desired service level, through an improvement of the delivery performance.

The objective of the thesis is to investigate the impact for the company of the opening of a new DC. Therefore, how it will maximize the performance of the distribution network of Risparmio Casa. However, when taking the decision of opening a new DC, there are many factors to consider. This thesis will also study the factors that are considered for decision making and trying to identify new factors, for which Risparmio Casa is emblematic in the case study perspective.

This research objective can be summarized in the following problem statement:

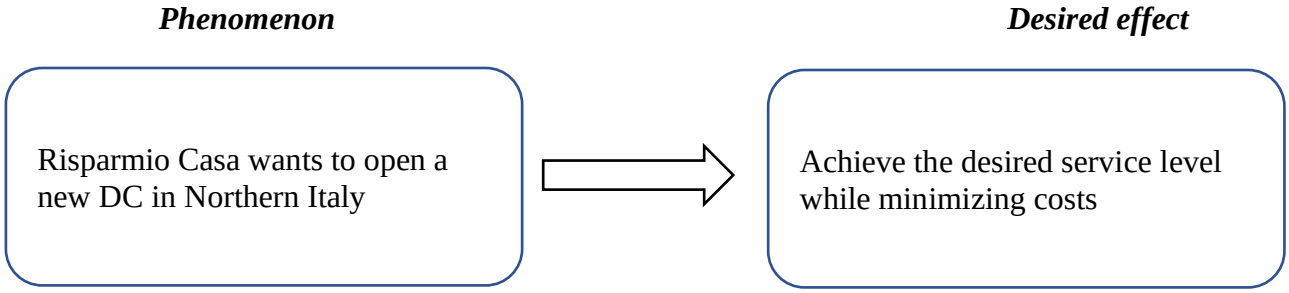
What are the dynamics underlying the decision making of opening a new DC for Risparmio Casa and how does it affect the delivery performance and service level?

1.3.Conceptual Model

In order to examine the problem statement, it is necessary to schematize the empirical problem and then link it to its theoretical background through a conceptual model.

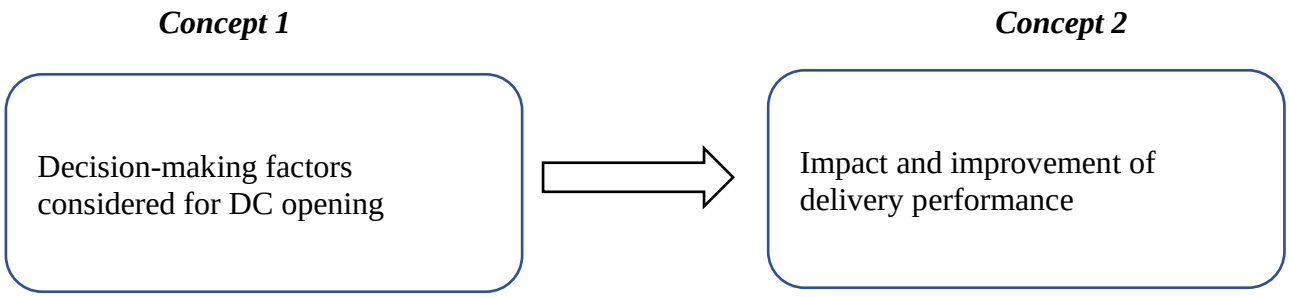
The problem statement can be translated in the following empirical problem model, which is based on a cause-and-effect relationship.

Figure 1: Practical Problem



To research this empirical problem, it has to be transposed in a conceptual model.

Figure 2: Conceptual model



The relationship clarifies that optimizing the distribution network will lead to an improvement in the delivery performance and service level. Given the rise in competition between firms, it is of uttermost importance that companies are able to guarantee a high service level, in order to respond to customer needs rapidly and effectively (Sisman, 2012).

1.4. Research Questions

To guide the research process, some research questions are needed. Being this a theory supported inductive study, the questions will regard both the empirical problem model and the conceptual model.

The research questions formulated are the following:

1. What are the factors considered to make the decision of opening a new DC?
2. What are the indicators of delivery performance?
3. What are the performance criteria that are affected by the distribution network design and the consequent addition of a new DC?
4. What new factors should Risparmio Casa consider in making the decision of opening a new DC?
5. How will these decision-making factors affect the choice of opening a new DC and what impact will it have on the distribution network of Risparmio Casa?

The first three will be answered using literature studies. On the other hand, the fourth and fifth questions will be answered using empirical data collection and analysis.

1.5.Potential Theoretical Contribution

This study will highlight the importance of a more decentralized distribution network for the responsiveness and delivery performance of a company. Aiming at understanding more in depth also the reasons that bring companies to transform their distribution network designs. Furthermore, the main focus of this study will be on the decision-making factors and the dynamics that are at the base of considerations about enlarging the distribution network design. The objective of this thesis is to identify also new factors that previous studies have not examined and how these interact with the decision making of the company. In this setting, Risparmio Casa constitutes a valuable case study because of the specificity of the company and the environment in which it operates. Indeed, the company is having a fast expansion hence making network design decisions also increase in relevancy. Moreover, the market in which it conducts its operations requires rapidity and responsiveness in the delivery, given the high degree of substitutability of the products. Lastly, the environmental setting in which the company operates, namely the Italian market, is particular too. In fact, its geography and transportation conditions, must be accounted for when designing a network, because of their major impact on the latter's efficient functioning.

Identifying new factors will be valuable for the literature because it may deepen the understanding of what affects the decision-making concerning distribution networks in companies. Understanding the decision-making underlying distribution network design, may also contribute to have a more in-depth awareness of the indicators that are used to measure the performance of the network. Prioritizing the factors will help also to rank the importance of the performance indicators related to them. Nonetheless, this contribution will be valuable also for other companies, given the practical nature of the topic and the fact that distribution network design decisions are fundamental for the performance of a company and the satisfaction of the customer requirements.

Hence, the potential theoretical contribution of this thesis will be about the identification of one or more new factors to account for when taking the decision of opening a new DC.

The thesis contains five chapters. After this introductory chapter, the second chapter focuses on the theoretical framework and literature studies. In the third chapter, the methodology of the research will be explained, followed by the analysis and findings of the research in the fourth chapter. Lastly, the fifth chapter is a conclusion with a focus on the recommendations and future opportunities of research.

2. Theoretical framework

In this chapter the concepts of the conceptual model are analysed. This section is comprised by four main sub-sections. Firstly, using academic literature, the advantages and disadvantages of having a more centralized or decentralized distribution network design are seen. In second place, this framework will focus on the different factors that are taken into consideration in the decision making of opening a new DC and deciding its location. In the third section, the various indicators of delivery performance for companies are analysed. This section is propaedeutic for the fourth section that focuses on the performance criteria that are affected by distribution network design, and their relationships with the addition of a new DC location. This theoretical framework will serve to answer the first three research questions.

2.1. Centralized vs. Decentralized Distribution Network Designs

Bowersox (1969) states that "physical distribution consists of those business activities concerned with transporting finished inventory and/or raw material assortments so they arrive at the designated place, when needed, and in usable condition." Hence, the major role of physical distribution is to make the product available to the customer where and when the consumer wants. In a strategic context, physical distribution acquires importance, because if a firm does not meet the requirements of time and place of the products, it has nothing to sell to the customers. Moreover, if these requirements are not met efficiently, the company's profits will decline rapidly (Archetti & Speranza, 2014; Bowersox, 1969; Farahani, et al., 2014). For managers is fundamental to deploy the right quantities of inventory, taking into consideration its costs and the firm's delivery capabilities (De Giovanni and Cariola, 2020). However, the goals for inventory allocation must be compound with a system of facility locations, transportation capabilities and communication network. In this regard, the effectiveness of a distribution network is measured considering a dual standard, composed of total cost and customer service (Bowersox, 1969; Farahani, Rashidi Bajgan, Fahimnia & Kaviani, 2014). Indeed, physical distribution constitutes one of the main drivers of profitability, because of its concurrent effect on the total logistic costs and the customer service level (Chopra, 2003; Faber et al., 2013; Nozick and Turnquist, 2001).

In designing a distribution network for a firm, the considerations to make are many. Deciding the number, the locations and the capacities of the DCs is a long-term decision of strategic relevance, since it is fundamental to guarantee the accomplishment of an efficient product flow (Inderfurth, 2000; Stevenson, 2011). The main trade-off that firms have to face

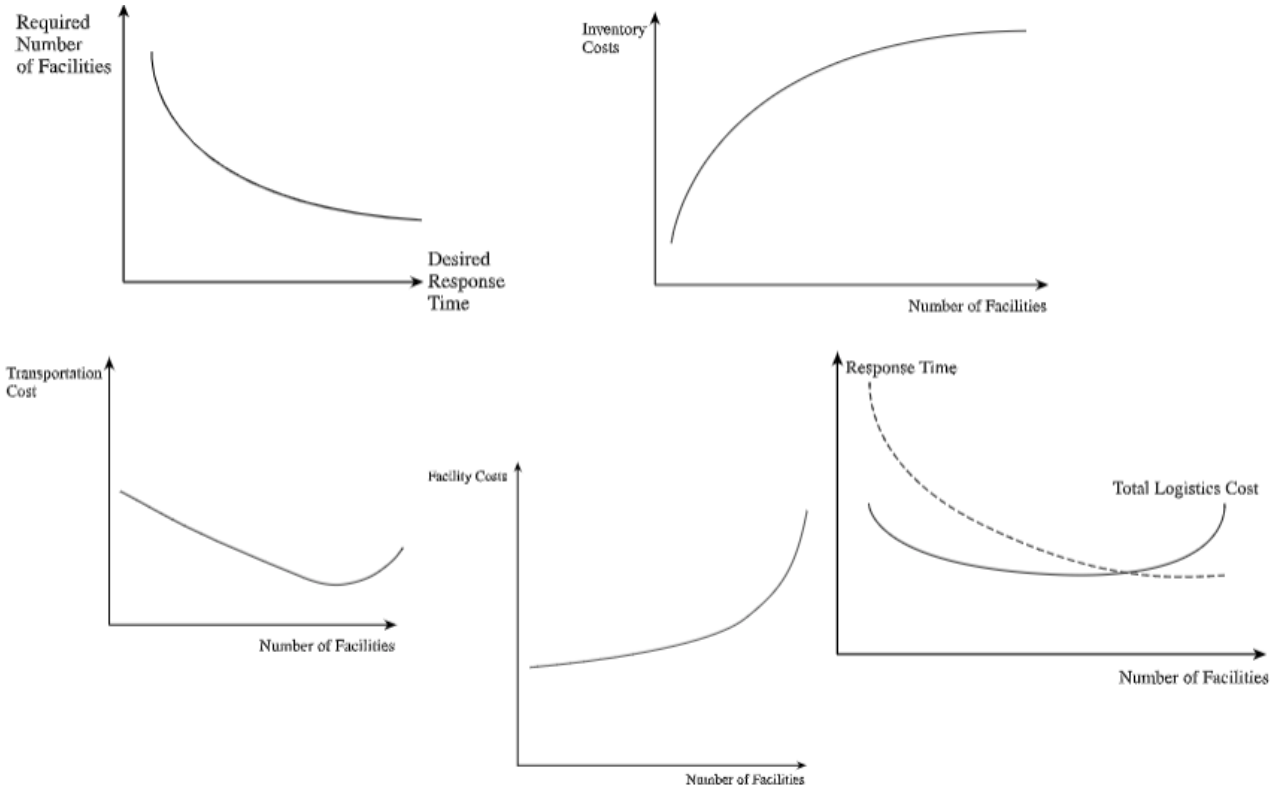
is the one between customer service and supply chain costs (Bowersox et al., 2020). Customers, in fact, want the products at the lowest costs and in the fastest way, however, firms must also consider their supply chain costs. So, it is important for firms to decide an optimal customer service level so to balance the two components. On one hand, guaranteeing to customers a very high service is extremely expensive for companies. On the other hand, customers take heavily into consideration the physical distribution service quality when taking purchasing decisions (Bienstock, Mentzer & Bird, 1997; Bowersox, 1969).

As Chopra (2003) highlights the network types are various. Considering the number of locations of distribution centres and the closeness to the customers, the distribution network types can vary from very centralized to decentralised. Bowersox et al., (2020) states that a centralized distribution network has less facilities and hence fewer overhead costs, since you will hire a smaller number of people. The main focus for this type of network design is efficiency. Indeed, it enables better coordination and cost reductions through a better utilization of resources (Glock, 2012; Waller, Johnson, & Davis, 1999; Buratto et al., 2019). Moreover, this type of network design is characterized by lower inbound transportation costs, thanks to higher freight consolidation (Bowersox et al., 2020). However, Kohn (2005) adds that a purely centralized distribution network has also some major downsides. Indeed, having less facilities will mean that the freight needs to be transported on greater distances. Hence, the outbound transportation costs are higher for a centralized distribution network. All in all, it can be stated that a centralized distribution network has the major advantage of efficiency, but sacrificing the network's responsiveness to the client's needs, due to the longer distances from the distribution centres to the customer market (Bowersox et al., 2020; Chhetri, Kam, Hung Lau, Corbitt & Cheong, 2017; Chopra & Meindl, 2010).

On the other hand, a decentralized distribution network is able to supply the products faster to the clients and hence it results as very responsive to customer needs. Given the higher number of facilities, the distance to the market becomes shorter and the firm increases its capability of responding to changes in demand (Bowersox et al., 2020; Chopra, 2003). Moreover, another advantage is the reduced transportation and material flow costs. However, having more facilities will consequently generate higher facility and inventory costs (Jayaraman, 1998). Hence, a decentralized distribution network being more adaptive to market dynamics, reduces the likelihood of the occurrence of undesirable events and it allows

customers to be served in a more cost-effective and time-efficient manner (Tang & Tomlin, 2008).

Figure 3: Main trade offs in distribution network design



Source: Chopra (2003)

2.2. Decision-making factors

The biggest trade off when designing a distribution network is between supply chain costs and customer service level. Customer service on one hand, is composed of response time, product variety, product availability, customer experience, time to market, order visibility and returnability. Supply chain costs, on the other hand, are affected by inventories, transportation, facilities and handling and information (Bowersox et al., 2020). These criteria must all be taken into consideration, since they will influence the choice of the distribution channel layout. Indeed, in order to meet the required customer service levels, it is fundamental for firms to select the optimal distribution channel layout so to deliver customer needs while being cost-effective (Ashayeri & Rongen, 1997; Baker 2006; Verhetsel et al., 2015). The configuration of the distribution channel layout will contribute to create

very different results in terms of customer order lead-time and logistic costs (Onstein, Ektesaby, Rezaei, Tavasszy, & van Damme, 2019).

In this regard, the factors that affect the decision-making of distribution network design and location decisions are: demand factors, service level factors, product characteristics factors, logistic costs factors, proximity-related location factors, accessibility-related location factors and institutional factors (Onstein, et al., 2019). The factors contributing to warehouse location decisions have been studied also by Gergin and Peker (2019). The two authors assert that the factors mostly considered are the distance to the demand centre, the accessibility costs and the infrastructures available. Also, Mangiaracina, Song and Perego (2015) agree with the factors identified by Onstein et al. (2019), even though with some minor changes. According to these authors the criteria that mainly influence the distribution network design decisions are: demand features, service requirements, product characteristics, supply features and economic variables.

2.2.1. Demand factors

For what concerns demand features, the characteristics mainly analysed are demand level, demand dispersion and demand volatility (Christopher, 2020; Onstein et al., 2019). The demand level affects the number of distribution centres needed to serve customer orders in time. As Onstein et al. (2019) highlight a high demand level means that customers make orders daily. With demand dispersion the authors mean the geographical dispersion of customers on the market. Lastly, demand volatility is the amount the customer demand fluctuates over time. When the demand volatility is high, a more centralized layout is better so to reduce the inventory costs. On the contrary, when the geographical dispersion is high, decentralization is more favourable, so to be able to deliver quickly to the customer (Chopra, 2003; Mangiaracina et al., 2015).

2.2.2. Service level factors

Onstein et al. (2019) classify the service level factors in five major categories. These are the supplier lead-time, the delivery time, the delivery reliability, responsiveness and returnability. The supplier lead time is the amount of time that passes between the order reception by a supplier and the time the order is shipped. The lead-time affects the levels of inventory necessary and the order decisions. Consequently, a higher average lead time will cause customers to stock a major quantity of inventory (So & Zheng, 2003). Concerning delivery time, it is defined as the time that elapses from when the customers make the order

to the delivery (Bowersox et al., 2020; Wanke & Zinn, 2004). The delivery time customers are willing to accept is based on the type of product, indeed, for substitutable products customers desire a faster delivery. Consequently, firms that trade these products will opt for a more decentralized network distribution (Onstein et al., 2019). The third category is delivery reliability which can be characterized as the ability of the company to perform the delivery accurately and on time as promised. (Sarmiento, Byrne, Rene Contreras & Rich, 2007). Responsiveness instead is about the speed and the flexibility of the company in facing customer demand (Christopher, 2020). Finally, returnability refers to the easiness with which consumers can return their items. In this regard, a more decentralized network design will improve the firm's responsiveness and returnability capabilities. (Chopra, 2003).

2.2.3. Product characteristics factors

The strategy to choose depends also on the product type and characteristics. The criteria to be accounted are product value density, package density and perishability (Onstein et al., 2019). High value products are associated to high inventory costs, hence a centralized layout is more suitable, since inventory costs will be more than the transportation ones (Bowersox at al., 2020; Christopher 2020). On the other hand, products with low value density are usually fast-moving items that are easily substitutable. So, they need to be available locally, leading to more decentralized distribution networks (Ashayeri & Rongen 1997; Chopra, 2003). Moreover, package density, meaning the number of products per cube meter, influences handling, inventory costs and transportation efficiency (Bowersox at al. 2020; Onstein et al., 2019). The third criteria concerns perishability that is the months of shelf life (Wanke & Zinn, 2004). Xu and Sarker (2003) highlight that shelf life reflects the marketable life and it is not necessarily linked to the conditions of products.

2.2.4. Logistic costs factors

Logistics costs are composed by transportation, inventory and facility costs together (Chopra, 2003). These are divided in: inbound transportation costs, outbound transportation costs, inventory costs and warehousing costs (Onstein et al., 2019). Going more in detail, inbound transportation costs refer to the costs of the movement of material from the suppliers, or from a production facility to a DC. On the other hand, outbound transportation costs are the ones covering the movement of goods from to a warehouse or to the final customer (Ahmed, 2017). When the inbound transportation costs are high, a centralized layout is more predominant (Onstein et al., 2019). According to Sople (2010), inventory is

necessary because of the mismatch between demand and supply. In addition, inventory is fundamental because of its protecting role against demand uncertainty (Pedersen, Zachariassen, & Arlbjørn, 2012). However, there are many costs tied to inventory, such as insurance costs, cost of capital, obsolescence cost and deterioration costs (Christopher, 2020). The increasing trend towards more product variety and short response times has placed a greater emphasis on the smoothness of logistic operations (Preeker and De Giovanni, 2018). In this view, warehouses assume even more importance, since the efficiency and effectiveness of a distribution network is measured in the nodes, that are the warehouses (Rouwenhorst et al., 2000). Regarding its costs, warehousing costs include handling and storage costs (Bowersox et al., 2020).

2.2.5. Proximity-related location factors

Proximity-related location factors refer to the distance from the DC to the production facilities, the suppliers and the consumers (Onstein et al., 2019). The number of DCs and their consequent closeness to customers, heavily influences the service level. Indeed, being closer to customers is more important for companies that place greater priority on the service level delivered (Pedersen et al., 2012).

2.2.6. Accessibility-related location factors

An accessible location is the one that can be reached easily from other sites, hence through transport infrastructures (Rodrigue, 2020). The criteria under which accessibility must be analysed are: distance from DC to motorways, airports, seaports, inland ports, rail terminals, but also, transportation infrastructure and lastly, the congestion between the DC and the market (Onstein et al., 2019). For what concerns Italy most of the freight transportation is done by motorways. In fact, 85% of internal freight transportation is done by road, compared to 17% done by train (De Ceglia, 2019).

2.2.7. Institutional factors

Here we refer to the political, regulatory and tax framework that a distribution network must satisfy. When opening a new DC, a company must take into consideration the taxes applied and tax incentives, the free trade zones, the laws, regulations and customs, the quotas and the investment incentives (Bowersox et al., 2020; Onstein et al., 2019).

All the decision-making factors explained have been schematized in the table below.

Figure 4: Decision-making factors

Decision-making factors	Sub-categories	Studies
Demand Factors	Demand level	Chopra (2003); Christopher (2020); Mangiaracina et al. (2015); Onstein et al. (2019)
	Demand dispersion	
	Demand volatility	
Service level factors	Supplier lead-time	Chopra (2003); Christopher (2020); Bowersox et al. (2020); Onstein et al. (2019); So & Zheng (2003); Wanke & Zinn (2004)
	Delivery time	
	Delivery reliability	
	Responsiveness	
	Returnability	
Product characteristics	Product value density	Ashayeri & Rongen (1997); Chopra (2003); Christopher (2020); Bowersox et al. (2020); Onstein et al. (2019); Wanke & Zinn (2004); Xu & Sarker (2003)
	Package density	
	Perishability	
Logistic costs	Inbound transportation costs	Chopra (2003); Christopher (2020); Onstein et al. (2019); Pedersen, et al. (2012); Preeker and De Giovanni (2018); Rouwenhorst et al. (2000); Sople (2010)
	Outbound transportation costs	
	Inventory costs	
	Warehousing costs	
Proximity-related location	Distance from DC to production facilities	Onstein et al. (2019); Pedersen, et al. (2012)
	Distance from DC to suppliers	
	Distance from DC to customers	
Accessibility-related	Distance from DC to motorways	Onstein et al. (2019); Rodrigue,

	Distance from DC to airports	(2020)
	Distance from DC to seaports	
	Distance from DC to inland ports and terminals	
	Distance from DC to rail terminals	
	Transportation infrastructure	
	Congestion between DC and market	
Institutional	Political framework	Bowersox et al. (2020); Onstein et al. (2019)
	Regulatory framework	
	Tax framework	

Given the previously studied factors, this thesis is aiming to identify new factors that affect the decision making of companies in the context of a new DC opening. More specifically, these new decision-making factors will be the impact of the law on freight transportation and the perception of the saturation of the DC. The first can be considered as a sub-category of the institutional factors, since it focuses on the European Regulation 2020/1054.

2.3.Indicators of delivery performance

In a more globalized world, with higher possibility of substitution of products, the ability of companies to produce or commerce a higher variety of products in the fastest way constitutes a relevant competitive advantage (Ishaq Bhatti, Awan & Razaq, 2013). Hence, being able to measure the performance of organizations is even more important, so to check if the objectives are achieved efficiently (Ghalayini & Noble, 1997; Maestrini, Luzzini, Maccarrone & Caniato, 2017). In order to measure performance, organizations require indicators to compare and evaluate the ongoing of an activity (Fitz-Gibbon, 1990). The performance indicators usually considered by companies are: quality, cost, financial indicators, delivery reliability, employees' satisfaction, customer satisfaction, environment/community and learning and growth (Ishaq Bhatti, Awan & Razaq, 2013). Not all organizations will use the same performance indicators. They will choose the ones that fit

with their strategy, organizational structure and environmental uncertainty. Moreover, depending on what the firm wants to verify, different performance indicators will be chosen (Estampe, Lamouri, Paris & Brahim-Djelloul, 2013; Gosselin, 2005)

An effective management of the supply chain constitutes a major component of the competitive strategy of a firm, so to increase productivity and profitability. To verify the performance of the supply chain and the achievement of the objectives, the supply chain processes must be measured and compared with a set of standards or performance indicators (Gunasekaran, Patel & McGaughey, 2004). Traditionally, the performance metrics related to supply chain are divided according to the processes to which they refer, namely, planning, sourcing, production, delivery and customer (Gunasekaran, Patel & Tirtiroglu, 2001; Stewart, 1995; De Giovanni and Esposito Vinzi, 2014).

The first activity in a supply chain is orders. How the firm processes and plans the orders will affect considerably the downstream activities and inventory levels (Gunasekaran et al., 2001). The first order metric to be analyzed is the order entry method, which evaluates how the customer specifications are converted in information to be exchanged more downstream in the supply chain (Gunasekaran et al., 2004). This information influences the whole supply chain and scheduling of activities (Mason-Jones & Towill, 1997). Also, the order lead-time must be taken into consideration, namely the time passed between the order of the customer and the delivery of the finished product (Gunasekaran et al., 2004). Being able to reduce this time is an important source of competitive advantage, since shortening the supply chain response time directly affects the customer service (Christopher, 2020; Towill, 1997). Lastly, the customer order path that traces the path of an order. Through it non-value adding activities can be highlighted and eliminated (Gunasekaran et al., 2001).

Having a good relationship with the suppliers is fundamental for an effective supply chain. Involving the suppliers in the processes, can lead to higher supplier performance, enhancement of process and products, these will then bring to higher organizational performance and customer satisfaction (Shin, Collier & Wilson, 2000). Traditionally the supplier performance was judged based on price competition and on time delivery. Currently, more attention is dedicated to measures of good quality and delivery reliability (Cormican & Cunningham, 2007).

How the production of goods and services is done, heavily impacts the product cost, product quality, speed of delivery and delivery reliability (Mapes, New & Szwejczewski,

1997). Production is a fundamental step of the supply chain and for this reason it must be continuously monitored (Gunasekaran et al., 2001; Stricker, Echsler Minguillon & Lanza, 2017). The most important indicators are: range of products and services, capacity utilization and effectiveness of scheduling techniques. Capacity utilization is tightly linked to the product range and it affects the speed of response to consumers demand (Slack, 1998). Finally, scheduling means when the activities and processes of production will be undertaken. The latter influences the flow of resources and consequently the performance of the supply chain (Gunasekaran et al., 2001).

The part that is closest to the customer in the supply chain is the delivery. The delivery performance of a firm is the driver of customer satisfaction and expectations, so it is a major source of competitive advantage (Gunasekaran et al., 2004). The delivery performance is strongly affected by the lead-time, hence reducing the latter will make the performance increase (Maestrini et al., 2017; Stewart, 1995). However, customers value firmly also on-time delivery, indeed, it is a measure of customer service level (Gunasekaran et al., 2001). Bowersox et al. (2020) focuses also on the fact that orders must not only be on time but they must be complete, in perfect condition and with the accurate documentation. Moreover, a good delivery system has a high percentage of finished goods in transit, meaning less inventory and less tied up capital (Gunasekaran et al., 2004). In ensuring a high delivery performance, also the distribution channel layout, vehicle scheduling and DC locations have an important role (Bowersox et al., 2020; Gunasekaran et al., 2001).

Customer satisfaction is based on customer expectation. If a customer's expectation of a firm's performance is met or exceeded, the customer will be satisfied (Bowersox et al., 2020). Customer expectation of a firm's delivery performance is strictly linked to receiving the perfect order. A measure of whether the perfect delivery has taken place or not can be found in the number of faultless notes invoiced. Looking at this number, firms can understand where improvements must be done (Gunasekaran et al., 2001). Moreover, other than delivery reliability, namely being able to deliver what firms have promised (Sarmiento et al., 2007), also delivery flexibility is fundamental. Through delivery flexibility, firms can meet particular customer needs and satisfy their expectations, making the customer feel unique, so delivering a superior value. Hence, flexibility is able to influence the customers' purchasing decisions and is an important ingredient of customer satisfaction and loyalty (El-Adly, 2019; Novich, 1990).

Having given an overview of the delivery performance indicators, we can assert that firms usually focus on the achievement of three measures, that are the quality of delivered goods, on time delivery and flexibility of delivery to meet customer needs (De Giovanni, 2020a). The focus of firms on these three indicators is mainly due to the tight connection of these with customer satisfaction and perceived customer value of the product, that is the ultimate goal of a firm and its supply chain (Gunasekaran et al., 2004).

The steps of a supply chain with the relative performance indicators are shown in the table below.

Figure 5: Performance indicators

Figure 6: Performance indicators and studies

Planning	Sourcing	Production	Delivery	Customer
Order entry method	Price competition	Range of products	Lead-time	Number of faultless notes invoiced
Order lead-time	On-time delivery	Capacity utilization	On-time delivery	Delivery reliability
Customer order path	Quality	Scheduling effectiveness	% of finished goods in transit	Delivery flexibility
	Delivery reliability		Vehicle scheduling	
			Distribution center locations	

STUDIES				
Christopher (2020); Gunasekaran et al. (2001); Gunasekaran et al. (2004); Mason-Jones & Towill	Cormican & Cunningham (2007); Shin, Collier & Wilson (2000)	Gunasekaran et al. (2001); Mapes, New & Szwejczewski (1997); Slack (1998)	Bowersox et al. (2020); Gunasekaran et al. (2001); Gunasekaran et al. (2004);	Bowersox et al. (2020); El-Adly (2019); Gunasekaran et al. (2001); Gunasekaran et al. (2004); Novich

(1997); Towill (1997)			Stewart (1995)	(1990); Sarmiento et al. (2007)

2.4.Performance indicators affected by distribution network design

Decisions concerning the distribution channel layout are long-term strategic decisions, which given their nature involve a high commitment of resources and are able to heavily influence the firm's performance and cost structure (Inderfurth, 2000; Stevenson, 2011). Hence, selecting the right network design and the optimal locations of the DCs, constitutes a real competitive advantage for firms, not just in terms of achieving the desired service level while minimizing costs, but concerning the overall performance (Thai & Grewal, 2005).

Distribution network performance must be assessed considering the trade-off that is at the base of designing a transportation network, namely between the ability of meeting customer needs and the cost of meeting them (Chopra, 2003). The ability of a company to meet customer needs through its distribution network will decide the profitability of the delivery network, along with its cost. Chopra (2003) measures customer needs met as response time, so the time between placing an order and receiving it; product variety, that is very desired by customers and product availability. Furthermore, the author also considers customer experience, so the ease of placing and receiving an order; order visibility and returnability. Given these measures, having a highly responsive network is preferable to customers, but it is very expensive for firms to deliver it (Bowersox, 1969). Indeed, the cost of meeting customer needs, that is determined by the sum of inventories costs, transportation costs, facilities and handling costs and information costs, increases with the firm's willingness of meeting those needs (Chopra, 2003). Therefore, firms must find a balance between these two opposing dimensions.

Considering also other authors' view on the indicators necessary to evaluate the warehouse performance, some similarities are evident with the dimensions highlighted by Chopra. Khan, Dweiri and Chaabane (2016) focus on on-time delivery, storage utilization, inventory turnover, inventory level, order fulfilment rate and order accuracy. From these indicators it is possible to understand the tightness of the link between the distribution network design and its warehouses and customer satisfaction. In fact, these measures,

together with the ones highlighted by Chopra, are all part of the components of the perfect order. The latter should be delivered complete, on time, at the right location, in perfect condition, with complete and accurate documentation. Hence, to be able to deliver perfect orders, a high amount of resources is required, like high inventory, customer alliances, IT, postponement strategies and inventory stocking strategies. All these are needed in order to match logistical resources to core customer requirements (Bowersox et al., 2020).

Lastly, under the firm's point of view, the delivery performance indicators mostly considered are the quality of goods and services delivered, on time delivery, flexibility in meeting customer's demand and cost-related indicators, as the transportation and inventory costs (Gunasekaran et al., 2004). In this regard, the distribution planning schedule and the channel layout play an important role in influencing the achievement of these measures (Chopra, 2003).

3. Methodology

3.1.Research Design

The objective of the research is to analyse the impact of a new DC for Risparmio Casa and understand the dynamics that underlie the decision-making. Hence, the aim is to find a solution to improve the efficiency of the distribution network. The latter will consequently increase the delivery performance, bringing to the achievement of the desired service level while minimizing costs. The research of the empirical problem is supported by the literature studies on similar problems and through data collection and analysis in the company. This research can be defined as an inductive study since it has the aim of exploring a new phenomenon (Gabriel, 2013). Indeed, the study will focus on the decision-making factors that contribute to the introduction of a new DC and how the latter will impact on the distribution network and on the delivery performance of the company. Hence, for the company taken into consideration this is a new phenomenon, since its distribution network will be studied under a different perspective of a new DC. However, the approach will not be purely inductive, because literature studies on relevant topics for the empirical case will constitute a base in the resolution. Hence, this research will follow the approach of a theory supported inductive study.

The strategy that will be used is the case study, since the problem is studied in its empirical context. Through a case study the phenomenon will be understood in its real-life context (Dul & Hak, 2008; Robson, 2002). Hence, considering the empirical problem we need to solve, the case study strategy will be the most appropriate. In fact, analyzing the distribution network of a company is a very practical and unique issue that varies significantly for each company, since it is strictly related to its organization and objectives (Dybskaya & Sverchkov, 2017). In this specific setting, the case study strategy is the most adequate also because it aims at studying the impact of factors on decision-making. More in-depth it will look also at two new decision-making factors, that have not been previously studied in the literature. Nonetheless, these affect heavily the delivery performance of the company. Therefore, given the peculiarity and specificity of the situation analysed, the case study strategy is the most pertinent.

3.2.Data Collection

To investigate the empirical problem statement both primary and secondary data will be used. Primary data is the data collected for the purpose of the specific study at hand.

Secondary data is data collected for other purposes, but it might be still used for the research (Hox and Boeije, 2005). Primary data will be collected mainly through interviews and observations of company processes. Secondary data will mainly concern the records of the company, its service level, its distribution model and delivery performance. For the purpose of this study, qualitative data will be used. Qualitative data involves collection and interpretation of data of textual material deriving from observations and interviews (Maltreud, 2001).

The data collection process started with a tour of the company, hence an unstructured observation. In this tour also, an unstructured interview about the general organization of the company was conducted. Going more in detail, the observations will be designed and structured to understand fully the actual distribution network functioning.

For what concerns the interviews, these will be conducted in a semi-structured way. The interviews will possibly be face-to-face, but given the pandemic crisis, in case these will not be possible, they will be done in video conference. In a semi-structured interview, a pre-defined list of questions will be made, based on the theoretical framework, and then these will be asked to the interviewee, but leaving some freedom in answering. The advantage of this method is its flexibility, in fact, the researcher can address specific topics in depth but also leave space for the participants to add their considerations (Galletta, 2013). The aim of the interview questions is to understand the impact of the various decision-making factors on DC opening evaluation. In addition, the objective is to understand how this change in the distribution network will affect the delivery performance. Hence, the studies on which the questions will be based are the ones focusing on the factors, such as Onstein et al. (2019) but also the ones that analyse the indicators of performance as Gunasekaran et al. (2004). To be able to quantify the importance of the factors, the questions will be formulated asking the interviewees to rank the drivers on a scale from 1 to 5 and to explain in depth their motivations. Then through similar types of questions also the link between these drivers and the performance indicators will be analysed, always asking “why” type of questions to get a more complete view. The interviews will be recorded with the consent of the interviewee and then transcribed for the data analysis.

A preliminary interview face-to-face was already conducted with the logistics manager to discuss the thesis topic and to present the ideas. This can be considered a semi-structured interview since it was based on the exposition of some relevant research topics and a pre-defined list of questions was used too. Moreover, other two semi-structured interviews

took place with the logistics manager to obtain more details concerning the structure of the company's distribution network and new information about the future DC.

3.3.Sampling strategy

To increase the reliability of the study, having the right sampling strategy is fundamental. The sample size should be selected appropriately to get relevant and reliable results and to not incur in misleading conclusions (Cleary, Horsefall & Hayter, 2014). Hence, to obtain relevant results, for this study, non-probability sampling is more adequate. Moreover, non-probability sampling is frequently used in case studies and in qualitative research (Taherdoost, 2016). In these two categories the sample size is small enough that it permits the researcher to choose who to interview and include in the research. In qualitative research, the quality of the sample size is more important than the quantity of people included, so the focus is on the quality of the information and not on the generalization of it (Taherdoost, 2016; Yin, 2003). For this reason, non-probability sampling matches perfectly with this research. In particular, purposive sampling will be applied. Purposive sampling is a strategy that allows the researcher to select specific people or processes to interview or study so to obtain the relevant information for the empirical study (Maxwell, 1996, Taherdoost, 2016). From the purposive sampling criteria, the sampling strategy selected will be critical case sampling, since the interviewed people will be the ones whose expertise is coherent with the research. Indeed, the selected sample will be heterogeneous and critical, so to collect information from people who know more about the case but also having different points of view, to increase the reliability of the study. In fact, the people selected will be the logistics manager, the CBO, the manager of the transportation company, the purchasing manager, the sales manager, marketing manager, the area managers and also a director of a store in Lazio, compared to a store in Northern Italy.

Figure 7: Interviewees

Interviewee ID number	**Role inside company**	**Date interview**	**Length interview**
1	Logistics Manager	21/04/2021	40 minutes
2	Manager of Transportation Company	06/05/2021	35 minutes
3	Chief Business Officer	23/04/2021	25 minutes
4	Purchasing Manager	03/05/2021	20 minutes

5	Area Manager stores in Lazio	29/04/2021	30 minutes
6	Director of store in Lazio	27/04/2021	25 minutes
7	Area Manager stores in Northern Italy	30/04/2021	30 minutes
8	Director of store in Northern Italy	26/04/2021	25 minutes
9	Marketing Manager	22/04/2021	20 minutes
10	Sales Manager	28/04/2021	30 minutes

3.4.Data analysis

Once the data has been collected, it will be analysed in order to develop a solution for the empirical problem. Following the method of Miles and Huberman (1994), in the first step, the data will be inserted in a coding scheme (Appendix B) that is based on the theoretical framework. The first two categories under which data will be coded, are based on the conceptual model. Hence, the two categories are decision-making factors and impact on performance. Then, subcategories are created, together with definitions and labels, that will be useful later for the codification.

The next step will be codifying the empirical data in the categories. This phase is also necessary to verify if the categories are reasonable for the empirical data, and if the literature is suitable. The data from the interviews will be inserted in a data display and for this reason, it will be reduced and shortened from the original transcripts. In this step, similarities and differences between the data will be observed. Hence, the patterns that emerge from the data will be analysed also considering the literature studies.

3.5.Validity and Reliability

Reliability focuses on the consistency of a study, if the study or the method is replicated, it will lead to the same results (Briggs, Coleman & Morrison, 2012; Price, Jhangiani & Chiang, 2014). Having a high reliability in the study is fundamental for the future usefulness of the study. There are multiple ways to increase the reliability of a study, one of them is through triangulation. The latter will be necessary to guarantee the verification of the validity of the findings and so their reliability (Meijer, Verloop & Beijaard, 2002). Scott (2007) highlights that the triangulation principle assumes that, investigating some data using different sources or viewpoints will increase its truthfulness. There are five types of

triangulation, by data source, by method, by researcher, by theory, and by data type (Miles and Huberman, 1994). For this study various types of triangulation will be applied, ranging from data to methodological triangulation. Indeed, a variety of data sources will be used, for instance interviewing different people that have similar roles. Nonetheless, different methods will be used to study the same problem, as observations and interviews. Moreover, to reduce bias in the interviews, agreements will be signed with the interviewee so to make the subject feel comfortable in answering. Feedback during the interviews will be asked frequently, so to check that the information obtained is true and not mistakenly interpreted. Indeed, asking for feedback is an important step in assuring the reliability of the study, since the truthfulness of the information is confirmed. Hence, bias is reduced through a reducing of misleading interpretation (Saunders et al., 2009).

External validity refers to the possibility to generalize the study to other contexts too. Being this a case study, the findings will be strongly linked to the empirical problem of the company. However, these may still be generalizable to other firms facing similar problems. Indeed, the research will focus on the decision-making factors that are taken into consideration in distribution network design, trying to also evaluate the impact of additional factors not considered by previous literature studies. Even though the findings will be inserted in the context of Risparmio Casa, these may be relevant also for other companies facing issues with their distribution network design. Moreover, external validity will be possible also through the theoretical contribution that this study will bring, as it can be a starting point for future research.

4. Analysis and Findings

This chapter is focused on analysing the data collected during the interview process. The interviews are based on the theoretical framework, that is also the base for the whole analysis. Initially, the company will be described, then the decision-making factors and the delivery performance relative to the company will be studied. In this chapter the fourth and fifth research questions will be answered.

4.1.The case setting: Risparmio Casa

Risparmio casa is an Italian company operating in the retail sector with a special focus on the selling of household products. The first shop of Risparmio Casa was opened in 1987, however, the first shop of stationery and perfumery opened in the '60s. Going forward, in the '90s Italy experienced the explosion of the large-scale retail trade which was pushed mainly by the multinational corporations (Viviano et. al., 2012). In this perspective, Risparmio Casa decided to enter in this competitive market, believing in the high relevance and competitiveness of the Made in Italy brand.

The company currently acts in 114 stores, of these 113 are in Italy and one in Lugano, Switzerland. Moreover, 2500 employees work for Risparmio Casa. The company sells different product lines, in fact in the stores you can find products for cleaning and caring of the home, beauty and personal care, pet products, toys, and stationery. Risparmio Casa is organized as a centralized company, all the decisions come from the headquarters. The promotions that the stores apply and also the number of employees per stores are all decided centrally. In addition, its distribution network is centralized, in fact, all the products arrive to the DCs located in Pomezia, near Rome.

The organization is composed as a group of firms, indeed there is Rica Trade is in charge of receiving the imports from China and then shipping them to all the stores. Being it a long-distance shipment of low value items, the capital lock up costs are low (Bowsersox, et. al., 2020), hence shipping by sea is the ideal mode. Moreover, containerization allows for high consolidation and economies of scale (Rodrigue, 2020). The freight arrives in containers, in average 8 containers per day arrive in the DC in Pomezia. Moreover, the other firm in the group of Risparmio Casa is Rica Distribuzione, which receives articles from the multinational corporations such as Henkel, Unilever or Johnson & Johnson. The trade unit of the freight is pallet, in fact, the shipment is mainly done through trucks. In this context, is fundamental to consolidate and ship full-truck loads so to decrease the variables costs

(Rodrigue, 2020). Hence, Rica Distribuzione can be considered as receiving more 'national' products, since these come from the plants situated in Italy. On a delivered shipment to a customer, 70% of the products are of Rica Distribuzione and 30% of Rica Trade. For this thesis, only Rica Distribuzione will be considered since the precise data is available. However, we can affirm that the results will be valid also for Rica Trade, being it a minority of the financial income of Risparmio Casa.

For what regards the company's distribution network, it is composed of two DCs in Pomezia, one serving Rica Trade and one Rica Distribuzione. In 2020 the company sent from the two DCs in Pomezia 14,605,823 packages, for a corresponding revenue of €183,084,768.

The company has also nine stores in Sardinia, an Italian island. Shipping the freight to Sardinia is done by sea and there are only two companies that are authorized to do liner shipping. Hence, it frequently happened that the products arrived at the stores later than agreed because of problems with the shipment. In fact, in summer the touristic passengers are given priority on the boats and in winter due to weather conditions frequently the shipping is delayed. Consequently, the company decided to open a new DC in 2020 in Sardinia. This DC solved the inefficiencies of the distribution network towards the island.

Regarding the deliveries on the mainland, the company has a fixed weekly schedule. The schedule is divided between deliveries in Lazio and in the rest of Italy. To the stores in Lazio the firm manages to deliver four times in a week, compared to the two times a week the company delivers in Northern Italy. Moreover, the stores in Lazio are served according to category, meaning that two times a week detergency and perfumery is delivered and the other two days products concerning the household are delivered. On the other hand, the shipments to Northern Italy cover all the products, in order to try to reduce variable costs. However, the incidence of transportation cost for the stores in Lazio, in May 2020 was only 1,9% compared to 6% in Switzerland or 3,7% in Piedmont. Hence, in Lazio, even though the store is serviced better with more deliveries per week, the transportation cost is lower.

Shipping the goods in Lazio is very affordable compared to Northern Italy. Furthermore, the delivery reliability in the shipments towards the North is lower, because of the frequent delays compared to the scheduled time. Consequently, there are evident differences in the service level between the areas, causing loss in potential sales for the company. Thus, the issue Risparmio Casa is facing is concerned with high transportation costs and not achieving the desired service level in Northern Italy. This problem acquires

higher relevancy also given the expansion objectives of the company, that aims at strengthening its position in Northern Italy.

4.2.Risparmio Casa's Distribution Network

During the interviews, questions concerning the actual distribution network design were asked. In particular, these concerned the current problems with the deliveries to the North and the alternatives considered for the opening of the new DC.

The topic was approached first asking about the company's current delivery time. In this regard, it was underlined that it varies between the mainland. The routine deliveries are done considering an A x C time (day 1 order, day 2 process the order, day 3 deliver), but in Lazio they manage also to do A x A orders. In fact, in Lazio, the deliveries are done four times a week and they are divided according to product categories. On the other hand, in the North the products are delivered two times a week and following the policy of realizing full-truck loads.

As Christopher (2020) highlights responsiveness concerns the flexibility in satisfying customer demand. Risparmio Casa's policy of realizing full-truck loads brings to a lower responsiveness towards the North and consequently a lower service level. The logistics manager (1) underlined: *"When trying to consolidate the costs, it is fundamental that the trucks directed to the North have a high occupancy. It follows that, if the client in Turin orders ten pallets with high urgency, these cannot be delivered because it would be too expensive."*

However, opening the new DC will make the addressing of these difficulties more affordable. Leading to higher responsiveness and higher sales.

The major problems faced with the clients in the Centre-North is the delivery delay and the lower service level, even though these have higher sales. The managers have stressed the importance of the shops located in the North and how it is fundamental to serve them more efficiently and rapidly.

Chief Business Officer (3): *"The company is starting a new expansion phase, that is particularly directed towards the North. Hence, this discrepancy in the service level between the different regions must be smoothened out."*

Also, the sales manager (10) has confirmed the importance of those stores.

Sales manager (10): *"The concept is that there are shops in the North that make more revenues than the ones in the Centre of the peninsula. However, the first are currently served worse than the latter."*

For what concerns, the alternatives considered for the opening of a new DC, these were confirmed by the various respondents, in particular these are: Bologna and Piacenza. The logistics manager (1) and the transportation company manager (2), who are daily living the problem of the deliveries towards the North, explain this decision highlighting the accessibility of these cities. Indeed, their position, that is central in the mainland, allows the firm to easily arrive to the stores either in Piedmont and in Tuscany. Piedmont is taken as a reference when considering the distances, because is one of the stores that has the highest revenue but is also, momentarily, one of the most difficult to serve, given its geographical distance. Piacenza is the preferred location because of its closeness to Turin.

The DC opened in 2020 in Sardinia was highly mentioned during the interview process. Indeed, the managers confirmed its relevance for the company, and especially how the opening of the DC changed radically the relationships and the service level of the points of sale on the island. The purchasing manager (4) underlined that on one hand, the transition was not complicated, since the suppliers were informed of the change of the delivery location. On the other hand, the advantages of this transition were enormous, since the service got faster, more responsive and with lower costs. More importantly, this new DC also permitted the delivery of same-day orders.

4.3.Decision-making factors: Risparmio Casa's point of view

During the interviews each interviewee was asked to rank on a scale from 1 to 5 the importance of the decision-making factors of the literature, so to verify their applicability also on the case study situation. The factors that were recognized having pushed Risparmio Casa to consider the decision of opening a new DC are mainly linked to service level. Indeed, there is the necessity to increase the service level offered to the stores in the North and being more reactive to demand.

In particular, the factors on which the questions mainly focused on were demand-related, service level factors, product characteristics, logistic costs, proximity-related factors and accessibility-related factors. In addition to these, some questions on two new decision-making factors were asked, so to understand the impact they had on the decision-making of

the company. These are institutional-related factors, namely the legislation concerning freight transportation and the saturation of the current distribution network.

4.3.1. Demand factors

The demand related factors, that in the interviews were explained as being the demand level, the demand dispersion and demand volatility, are given a high ranking by the interviewees. However, not all agreed on its importance. Indeed, the logistics manager (1) scored it at level two. This difference in ranking is driven by the point of view under which demand is seen.

Logistics manager (1): *"When talking about demand, under the logistics point of view of Risparmio Casa, it is conceived as the demand from the points of sale. Currently, we are not having particular problems in fulfilling the orders coming from the North. Nevertheless, reducing the distance from the DC to the points of sale, may lead to an increase in demand. In fact, if today we deliver two times a week, with the new opening we may also deliver four times a week."*

In this regard, the chief business officer (3) and the manager of transportation company (2) agreed that Risparmio Casa can efficiently deliver to the North following the schedule, hence all the planned deliveries. Nonetheless, frequently these deliveries experience delays. Moreover, inefficiencies and lost sales rise also when the points of sale require some urgent material. These are usually needed on the same day of the order, but delivering a truck not being fully loaded to the North, is nearly impossible.

When the same question was addressed to the area managers they underlined strongly the necessity of a new DC given the increasing demand, especially during promotions.

The Area Manager in Lazio (5): *"Geographic dispersion of demand is highly influent in the decision-making of opening a new DC. Indeed, the points of sale closer to Pomezia experience also deliveries in 24 hours, so to avoid out-of-stock in promotion time."*

This point of view agrees fully with what Mangiaracina et al. (2015) underline. Indeed, a decentralized distribution network design is more suitable when geographical dispersion is high.

The table below shows the values given from 1 to 5 by the respondents, when classifying the importance of the demand factors. The factors given score five are considered extremely more important than score 1.

Figure 8: Demand factors

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Demand factors	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	2	4	4	3	5	5	4	4	4	5	4

4.3.2. Service level factors

The service level can be seen as the principal focus of the thesis as well as the main objective to be addressed through the new opening. Customer satisfaction is heavily affected by service level. However, a high service level is costly for companies to guarantee (Bowersox et al., 2020). All the interviewees focused on the importance of having a high service level, that is addressed through a low delivery time, high reliability in the deliveries and high responsiveness towards the customers. Nonetheless, currently the service level has some discrepancies in the mainland, that brings to inefficiencies especially towards the North.

Area Manager North (7): *"We frequently experience delays in the deliveries from the DC in Pomezia. Moreover, usually more deliveries to different shops are combined together, increasing the delay."*

In this regard, the two directors of stores, respectively in Northern Italy (8) and in Lazio (6), added that diminishing the delivery time may permit a better management of the stock. The latter leading to a higher responsiveness to clients' needs, that become more volatile when promotions are active. As Onstein (2019) explains, substitutable products, as the ones of Risparmio Casa, require a more decentralized network, to enable a faster delivery.

When the stores order to the central company, they usually try to achieve a full truck load. However, this is not true for all regions.

Area Manager Lazio: (5) *"Being so close to the DC in Pomezia, we receive deliveries even four or five times a week. This allows the stores in our Region to avoid experiencing over or understock. Moreover, we manage also to satisfy the requests of the single final consumer, with customized orders."*

Thus, distance plays a major role on the service level, and a new DC is seen as the necessary solution the service level.

In the table we can see the values given to service level by the respondents.

Figure 9: Service level factors

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Service level factors	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	5	4	5	4	5	5	5	5	5	5	4.8

4.3.3. Product characteristics

The characteristics of the product sold are conceived by the previous literature as strategic factors to consider when designing a distribution network. Indeed, Chopra (2003) and Ashayeri & Rongen (1997) highlight that low value density products are usually easily substitutable products, that require a decentralised network design. However, in this case study these are not seen as particularly relevant. In the interview process, the product characteristics were explained using the sub-categories: product value density and package density.

The importance of this factors is conflicting. Indeed, some gave it a high score, and some a very low one.

Manager of the transportation company (2): *"The products transported for Risparmio Casa are very voluminous, hence the truck fills up more rapidly. At the same time the products have a low cost, hence being more locally available will highly decrease the cost of transportation."*

On the other hand, the logistics manager (1), together with the area managers gave this factors a much lower score.

Logistics manager (1): *"When opening a new DC in the North, the product characteristics will not be considered. If the truck departs from the new DC, the transportation will cost less, because of the minor distance travelled, but not because of the product characteristics."*

Hence, we can see that this significative difference in importance of this factor, mainly depends by the point of view under which it is considered. The latter depending on the area of supply chain specialization.

The table below shows how this decision-making factor is ranked by the respondents.

Figure 10: Product characteristics

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Product characteristics	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	1	4	3	2	1	2	2	2	4	3	2.4

4.3.4. Logistic cost factors

In logistics trade-offs are predominant. In the case of distribution network design, the biggest trade-off is between the ability to meet customer needs and the cost of meeting them (Chopra, 2003). These are divided in transportation costs, inventory costs and warehousing costs.

All the interviewees highlighted the importance of this factor in the decision-making at the base of a new DC opening. As Onstein (2019) highlighted when the outbound transportation costs are high, a decentralized network structure is preferable.

Marketing manager (9): *"Even though the costs might rise, these will surely be compensated by a better and more personalized service given to the client."*

Costs will surely diminish, but not in a uniform way.

Purchasing manager (4): *"For what concerns the purchasing costs, these will remain unchanged, since our current contracts are not based on the distance from the supplier to the DC."*

Not only the transportation costs have an impact on the decision-making, but also the warehousing costs must be considered.

Chief Business Officer (3): *"The warehousing costs are crucial to be considered, because of the differences in the costs of personnel between North and South of Italy. Usually, the personnel is more costly in Northern Italy."*

Below we can see the ranking assigned by the interviewees.

Figure 11: Logistic costs

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Logistic costs	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	4	4	4	3	4	3	4	5	5	5	4.1

4.3.5. Proximity and Accessibility Related Factors

These two types of factors are associated more specifically to distance from or to the DC. Proximity factors are the ones related to the distance of the DC to the points of sale. On the other hand, accessibility is linked to the easiness in reaching the DC. These factors are also strictly related to the service level and delivery time (Onstein et al., 2019).

Director of store in Northern Italy (8): *"The more the DC is accessible, the faster the deliveries will proceed. Through faster deliveries, the stores can guarantee a better service to the final customer, thanks to a quicker replenishment."*

Risparmio Casa's distribution network is mainly organized through trucks. Hence, the closeness to motorways is the most considered sub-category.

Director of store in Lazio (6): *"The DC must be positioned close to the motorways, so to avoid possible delays in the deliveries due to the traffic in the cities."*

In addition, the logistics manager (1) underlined the importance of being close to the points of sale. In this regard, Bologna is the preferred option thanks to its central position, that enables to heavily shorten the delivery time.

Figure 12: Proximity and accessibility related factors

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Proximity related	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	5	4	4	4	3	5	4	3	5	4	4.1

Accessibility related	4	5	3	3	3	5	2	4	5	4	3.8

4.3.6. New decision-making factors

The aim of the thesis is to study the impact of these factors in the decision-making on distribution networks. Nonetheless, also the impact of two new decision-making factors is considered. These are the European regulation on freight transportation and the perception of distribution network saturation. The first can be considered as a new subcategory of the institutional factors. It is important to research it since the institutional factors are usually overlooked by the academic literature studying decision-making factors. However, regulations heavily influence the operations of companies.

This new decision-making factor concerns the European legislation on road freight transportation. This factor assumes greater relevance in this specific case study because of the importance of road transportation in Italy. In fact, it constitutes one of the most important sectors of the Italian economy, more than 80% of the freight is transported on road (ANIFA, 2020). However, this sector needs to respect the European Regulation 2020/1054 that legislates on the requirements on maximum daily and weekly driving times, breaks and rest periods. This is a very strict legislation prescribing that the driver may do maximum 9 hours per day, with a break of 45 minutes in the middle. Nonetheless, Italy is the third nation of the European Union for hours spend annually in road congestion, so it may happen that drivers stay various hours in traffic congestion (European Commission, 2017). Yet, these hours are counted as driving hours, causing most of the delays in the deliveries. Currently, it can be considered as causing most of the problems in the deliveries towards the North.

Manager of transportation company (2): *"If the driver faces some congestion on the motorway, it is considered as driving time, bringing inevitably to arriving late at the point of sale."*

Hence, this legislation involves closely Risparmio Casa, since it is the client of the transportation company. As the logistics manager (1) explains it is fundamental that the company respects fully the legislation, because if something happens it will be strongly implicated. Indeed, when assigning the delivery times, the company must consider the break period for the driver and not push to deliver faster than the legislation entails.

Logistics manager (1): *"The service level towards the North is heavily impacted by his legislation. In fact, it usually brings to high delays in the deliveries to the North, because of the frequent traffic on the motorways."*

Indeed, this factor concerning the legislation on freight transportation, can be regarded as the most important factor in the decision-making underlying the opening of a new DC.

Moreover, another factor that is analyzed concerns the individual perception of DC functioning. Namely, whether the interviewees perceive the current distribution network design as saturated given the continuous expansion of the company. Previous studies have debated on the importance of the network design mirroring the expansion of the firm. However, they have not analyzed the topic of the saturation of the current network design to face the growing demand of the firm. More in detail, what will be studied concerns the saturation of the current DC as a factor influencing the decision to open a new DC in Northern Italy, also given the future expansion plans that will see the company more present in the Center-North of the peninsula.

During the interview process, this decision-making factor is uniformly given a high ranking. However, not all the interviewees have the same vision of the saturation. Indeed, the framing and the role of interviewees in the company impact heavily the vision of this factor. The most downstream interviewees in the supply chain, who experience the daily problems with the deliveries, consider it more saturated than the upstream interviewees.

Area Manager Lazio (5): *"Our distribution network is surely saturated, since even when important promotions are in act, the delivery times are frequently not guaranteed. This brings inevitably to a pressure for the stores, that needs to quickly adapt to a new delivery time."*

On the other hand, the Chief Business Officer underlines that the current distribution network is still not saturated, and that they are still managing efficiently the deliveries throughout the peninsula.

Hence, we can see that this difference in views is more generated by the position in the company, than by the geographical position of the stores. The ones more downstream in the distribution network, who live the logistic processes daily, face more problems occurring and a more urgent need for a new DC.

Figure 13: New decision-making factors

(Scale 1-5)	Role of the interviewee										Average value ranking for decision-making factor
Institutional factors	**Logistics manager**	**Manager Transportation Company**	**Chief Business Officer**	**Purchasing manager**	**Area Manager Lazio**	**Director Store Lazio**	**Area Manager North**	**Director Store North**	**Marketing manager**	**Sales manager**	
	5	5	4	4	3	5	4	4	5	4	4.3
Perception DC saturation	2	3	2	3	4	4	4	4	5	5	3.6

4.4.Distribution network design and performance indicators at Risparmio Casa

4.4.1. Dynamics of decision-making factors

In the previous sub-sections, the different factors have been studied, now the dynamics between them are analyzed. During the interview process, it has been observed that all the factors influence each other.

The logistics manager (1) underlined that through the opening of a new DC the delivery time will reduce drastically, this will have an effect on the cost of transportation that will decrease too. Hence, the service level factors and the logistic cost factors move together.

The proximity and accessibility-related factors, also have an impact on the logistic cost factors. Indeed, being the new DC closer to the customers in the North, the transportation costs will decrease. In addition, being closer to the customers results in being able to deliver the products in a more efficient and responsive way.

Area Manager North (7): *"With a new DC closer to us, we will order more frequently the products and we will be able to avoid the out-of-stock situation because of a shorter delivery time."*

Hence, the proximity and accessibility-related factors, on the one hand have an impact on the logistic cost factors, through a decrease of transportation costs. On the other hand, being closer to customers will enable to be more responsive to the stores' needs and will enable the stores to order more quantities to the central company. Hence, the service level and demand factors will be influenced too.

Logistics manager (1): *"The reduction of the distance from the DC to the stores, will enable more deliveries per week. These stores will not be served anymore with two times per*

week deliveries, but they will benefit too of deliveries four times per week. as it already happens in Lazio. Consequently, the stores will order more."

Lastly, it is worth to mention the relation between the regulatory new decision-making factor and the service level. Lowering the travelled distance, will make the company avoid the problems with the European Regulation. Indeed, if the driving hours are less, the probability of incurring in the rest period before arriving to destination is lower. Therefore, the service level will increase thanks to the drastic reduction of delivery delays.

Thus, acting on the proximity factors, allows the company to act on the regulatory ones and consequently on the service level factors. All the factors have some influence on the service level, that it is indeed the main objective in the new opening.

4.4.2. Performance indicators

The analysis of the performance indicators could not be conducted in depth because the company is now starting to use these indicators.

Logistics manager (1): *"We have started recently to use truck occupancy indicators to understand the cost efficiency of the deliveries. We are approximately around 85% of truck occupancy, with some differences in the peninsula. In the North, we see 94% compared to 79% of Lazio."*

This difference in truck occupancy is due how the deliveries are managed throughout the peninsula. Indeed, given the distance from Pomezia and the North, these deliveries are sent as full-truck loads.

Area Manager North (7): *"Given the vast distance from the current DC to the North, it frequently happens that there are delays in the deliveries. These delays are due also to the matching of deliveries to different points of sale, that is done to diminish the costs."*

For Lazio we see a lower truck occupancy because of the more frequent deliveries.

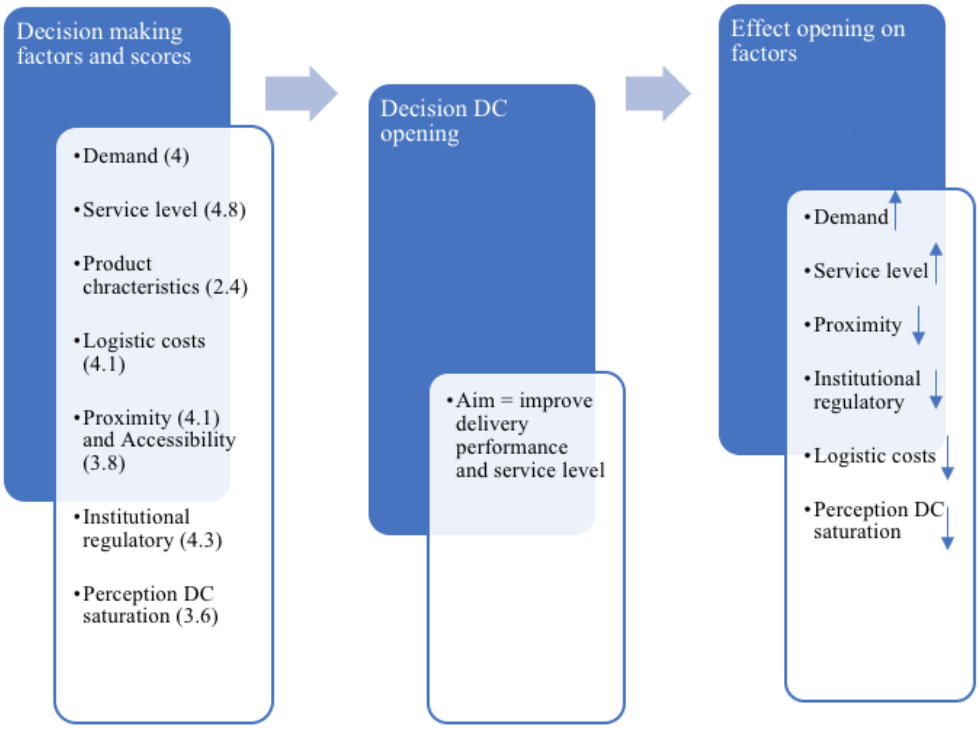
Area Manager Lazio (5): *"Given the closeness of the DC to the points of sale in the region, these receive the freight also 5 times a week. This allows the point of sale to manage more easily the stock and face urgent needs."*

The area managers have highlighted the difference in service level between the regions, this brings to a different capacity of managing the urgencies (A x A deliveries). Indeed, the stores in Lazio can be served promptly in case of need, compared to an impossibility of doing it for the stores in the North. This difference in service level, brings to

a remarkable discrepancy in delivery performance. The latter, however, moves simultaneously with the improvement of the service level. The new DC opening is aimed at improving the service level, that will consequently also boost the delivery performance. As described in the previous sub-section on the inter-relations between the factors.

Chief Business Officer (3): *"In the future of Risparmio Casa we conceive the opening of this new DC. Indeed, given the current pace of new opening of points of sale, it will become necessary in our future strategy. It will bring to a dramatic increase in the service level towards the North coupled with a reduction in transportation costs. Hence, the new DC will be essential in filling the gap with the North."*

Figure 14: Dynamics between decision-making factors and delivery performance



This figure is useful to understand the dynamics underlying the relation between the decision-making factors and the DC opening. In fact, it highlights the average score for each factor, given by the interviewees. These different factors push towards the opening of a new DC, of which the aim is to improve the service level and consequently the delivery performance. Lastly, the same opening has an effect on the decision-making factors. Indeed, through the new DC the service level will improve, together with the demand and the proximity to the stores. Moreover, the logistic costs will decrease, coupled with the perception of the

distribution network saturation. In addition, the issues related with the European Regulation on freight transportation will be solved, lowering the delivery delays and resulting in an enhancement of the delivery performance and service level.

5. Conclusion, Limitations and Future Research

This chapter of the thesis gives an answer to the problem statement, based on the results of the empirical research. Furthermore, recommendations to the company are given and limitations of the study are explored. These will constitute the base of future research.

5.1. Conclusion

The purpose of the study was to understand the dynamics underling the decision-making of a new DC opening, and how it affects the service level and delivery performance of the company. Risparmio Casa is an Italian company operating in the retail sector. It is a very centralized company with its headquarters and DCs located in Pomezia, near Rome. However, the company is facing a very rapid expansion, that has started to create issues with its current distribution network design. Indeed, the stores located in Lazio have a faster, more responsive and higher service level, compared to the stores in the North. Consequently, given the future expansion in that area, the company is considering the opening of a new DC. In this regard, the problem statement aims at understanding what are the factors that are at the base of these decisions for companies.

These factors were previously explored in the theoretical framework. Indeed, this topic had been already studied in depth by other authors, such as Gergin and Peker (2019), Onstein et al. (2019) and Mangiaracina et al. (2015). Subsequently, these factors have been explored under an empirical point of view.

Most of the literature findings have been confirmed, however, the importance given to the decision-making factors varied significantly depending on the interviewee's role in the company. The interviewees were asked to rank on a scale from 1 to 5 - with 5 being the highest score of importance - the relevancy of the different decision-making factors. The most highly ranked factor was the service level. Indeed, all the interviewees agreed that improving the service level towards the North is the main reason for opening a new DC. After that, logistic cost factors and proximity related factors are the most important ones. As a matter of fact, through the opening of a new DC, the transportation costs will decrease and a lower delivery time will be achieved. Moreover, to enable the reduction of the delivery time the new DC must be positioned in a central location, easily accessible from the points of sale in the interested area.

The research had also the aim of studying the impact of new decision-making factors, not previously highlighted by the academic literature. In particular, these were the European Regulation 2020/1054 which legislates on the requirements on maximum daily and weekly

driving times, breaks and rest periods. This factor can be considered as a sub-category of the institutional factors. The second criterion is the impact of the saturation of the current distribution network and DCs for the decision of opening a new one.

The first decision-making factor mentioned, concerning the regulation, has obtained a very high ranking. Indeed, Risparmio Casa considers it one of the main reasons pushing towards the opening of the DC. The new DC will solve the issues with the delivery delays currently created by the law. Consequently, the service level will improve enormously. The second factor considered is the importance of the saturation of the current distribution network and DC for the opening of a new one. Surprisingly, the ranking was of medium level. However, it was observed that the people who lived daily the problems with the current distribution network gave to the factor a higher score. For instance, the area mangers gave to it double the importance compared to the chief business officer.

5.2. Recommendations

Given the empirical and theoretical study conducted, this research has some recommendations for the company.

5.2.1. Consider opening a new DC

Even though, the interviewees, especially the more upstream ones in the company process, have underlined that the delivery process is still doable with the current network. It is evident that the performance is starting to suffer. Hence, the decision to open a new DC must seriously be taken into consideration. Indeed, the advantages that it will bring are enormous compared to the disadvantages. The delivery performance and responsiveness will increase highly.

5.2.2. Bottom-up approach in decisions

Moreover, the company should try to have a more bottom-up approach in decisions. Trying to listen more to its employees and area managers, since they live on a daily basis the functioning of the distribution network. In this view, it is remarkable to underline that the upstream managers have always highlighted that the company manages still well enough the deliveries towards the North. On the other hand, the more local managers and director of the stores have reported many issues with the deliveries. In addition, they focused on the opening of a new DC as soon as possible.

5.2.3. Use performance indicators

The last recommendation is to start using delivery indicators. Currently, the company is starting to use the truck occupancy indicator. However, the performance is mainly assessed using the feedbacks of the local managers. For a more complete view of the delivery performance, it would be preferable that the company starts using more indicators, such as truck occupancy, joint deliveries or on time deliveries. Especially, when the new DC will be opened, it will be fundamental to use these indicators so to be able to compare the performance of this DC with the one in Pomezia.

5.3. Managerial and theoretical implications

This research has several theoretical and managerial implications. For what concerns the theoretical part, it constitutes a new point of view for the study of the institutional decision-making factors. Indeed, in the previous academic articles these have usually been overlooked and not studied in depth compared to other factors, like the demand or service level ones. However, the regulations and the policies of a country may constitute very strict barriers for the expansion of a company. Especially in the logistic area, there are many regulations to respect for the safety of the workers, hence companies need to find alternative ways to be profitable respecting those regulations. In this specific research, the regulations on freight transportation and the dynamics between logistics and regulatory policies have been studied.

Moreover, this research has also theoretical implications for the other new decision-making factor studied. In fact, it concerns the effect of framing and perception on the saturation of a distribution network. Namely, how the role covered in a company frames the perception workers have of the saturation of the current distribution network. Hence, logistics has been studied under a more behavioral point of view.

For what concerns the managerial implications, these are very linked to the behavioral aspect aforementioned. It has highlighted the importance of listening more to the workers. Having a more bottom-up approach may help companies and managers to highlight some problems. Hence, future managers should try to consider the workers' opinions since they live daily the companies issues and inefficiencies.

5.4.Limitations

The limitations of this research are mainly linked to the qualitative nature of it. Hence, the real impact of a new DC cannot be quantified, to make comparisons or a full cost-benefit

analysis. Furthermore, this study does not analyse empirically all the sub-categories of the decision-making factors. Including all the sub-categories in the interviews, would have resulted too confusing for the interviewees and would have bought to biases.

Lastly, this research is based on a single case study of a specific company, hence the point of view might be limited. Nonetheless, this same study can be expanded to other companies to understand the factors pushing to a change in the distribution network and how these interact with the expectations of the delivery performance. It might be useful, especially for companies facing an expansion phase on a geographically dispersed area.

5.5. Future research

Future research should complete the gaps left by the limitations of this study. It would be useful to quantify the impact of a new DC on the delivery performance of companies, so to underline the economic benefit, also by using digital technologies like Blockchain (De Giovanni, 2020b). Moreover, through a quantitative study it will be possible also to confirm or not the importance of the decision-making factors. Hence, if the ones more highly ranked, are actually the ones that will be more affected by the new opening.

Concerning the theoretical contribution, this research leaves space for a more in-depth study of the new decision-making factors introduced. It would also be useful to do a comparative study of the impact of the European Regulation 2020/1054 on freight transportation through the European nations. So, to understand how this law impacts companies and delivery performance throughout the European Union. This may set the stage for new emerging theories.

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Appendices

Appendix A: Interview protocol

- Introduction of the researcher and of the research topic

- Do you consent to use your data for academic purposes?
- Do you consent to use data collected through this interview?
- Could you please describe yourself and your role inside the company? Which are your responsibilities? Which tasks do you perform?
- How long have you worked for Risparmio Casa?

- What delivery time do you currently guarantee?
- What are the main problems observed for the deliveries towards the Center-North of Italy? What consequences do these problems have on the sales and on the service level?
- What locations are you taking into consideration for the opening of the new DC?
- The different alternatives have been determined using a particular procedure?
- What benefits are you hoping to gain with the opening of the DC? (faster service, lower costs, higher service level, higher efficiency and responsiveness towards demand…)
- How has the DC recently opened in Sardinia changed the supply of the Sardinian shops?

- What are the main drivers that pushed Risparmio Casa towards the decision of opening a new DC in the Center-North? Are the drivers related to a particular benefit you wanted to obtain? (example: higher productivity, lower costs, faster deliveries….)
- I will list some of the main factors, found in the academic literature, that are recognized having an impact on the decision-making of opening a new DC. For each one of them, could you tell me if it was considered by Risparmio Casa for the decision? If yes, could you explain the motivations?
    - Demand factors (demand level, demand dispersion, demand volatility)
    - Service level factors (delivery time, delivery reliability, responsiveness)
    - Product characteristics (product value density, package density)
    - Logistic costs (transportation costs, inventory costs, warehousing costs)
    - Proximity-related location factors (distance from DC to suppliers, distance from DC to customers)
    - Accessibility-related factors (distance from DC to motorways, seaports, rail terminals, congestion between DC and market)
- Could you quantify, using a scale from 1 to 5, the importance of the factors previously mentioned, in the decision-making process of the new DC opening?
    - Demand factors:
    - Service level factors:
    - Product characteristics:
    - Logistic costs:
    - Proximity-related location factors:
    - Accessibility-related factors:

- How do the laws concerning the security in freight transportation, namely permitted hours of driving and of rest, impact on the current delivery performance?
- The current laws for freight transportation are taken into account in the decision-making of the new DC opening? In what way?
- On a scale from 1 to 5 could you quantify the importance of the current driving hours needed to serve the clients in the Center-North on the decision of a new DC opening? What is the importance of this factor in this choice?
- The current distribution network/DCs can be considered saturated? If yes, why?
- On a scale from 1 to 5 could you quantify the importance of the saturation of the current DCs in the choice of opening a new one?

- How is the delivery performance currently measured?
- How do you think will the delivery performance change after the opening of a new DC in the Center-North?

- How is the current supply network managed? How will the supply change with the new DC? (will the products arrive directly to the new DC?)
- In what way is Risparmio Casa intending to implement the decision of opening a new DC?
- What will be the main difficulties that will be faced in implementing this decision?
- How will the stock of products in the platform initially be constituted?
- In what way and what departments will determine the stock to keep in the new DC?

Appendix B: Coding scheme

Category	Subcategory	Label	Definition	Citations
Decision-making factors	Demand Factors	DF	The extent to which demand factors (DF) affect decision-making.	Demand factors are divided in demand level, demand dispersion and demand volatility (Christopher, 2020).
Decision-making factors	Service Level Factors	SLF	All data related to how service level factors (SLF) affect the decision-making of the company.	"Five important service level factors are: supplier lead-time, delivery time, delivery reliability, responsiveness and returnability." (Onstein et al., 2019)
Decision-making factors	Product Characteristics	PC	How the product characteristics (PC), e.g. product-value density and package density, influence the decision-making of opening a new DC.	A centralized distribution design is more suitable for high value products with higher inventory cost than transportation ones (Bowersox et al., 2020).
Decision-making factors	Logistic Costs	LC	The importance of logistics costs (LC), so transportation, inventory and facility costs, in designing the distribution network.	"Four leading logistic costs factors can be identified: inbound transport costs, outbound transport costs, inventory costs and warehousing costs" (Onstein et al., 2019).
Decision-making factors	Proximity and Accessibility-related	PAR	All data aiming at considering proximity and accessibility-related (PAR) factors as fundamental in the network design decision-making.	Location must be well connected and accessible, meaning that they can be reached easily (Rodrigue, 2020).
Decision-making factors	Institutional Factors and Perception Saturation DC	IF	The importance of institutional factors (IF), mainly regulatory ones, in decision-making.	"Institutional factors relate to the legal and fiscal conditions that apply to DC locations" (Onstein et al., 2019)

Impact on Performance	Delivery Performance	DP	How the delivery performance (DP) is measured in the company, and what decision-making factors (DMF) have the greatest impact on it.	"The link in a supply chain that directly impacts customers is delivery. It is a primary determinant of customer satisfaction (…)" (Gunasekaran et al., 2004).

Appendix C: Data Display

	Decision-making factors						**Impact on Performance**
	Demand Factors	**Service Level Factors**	**Product Characteristics**	**Logistic Costs**	**Proximity & Accessibility**	**Institutional & Saturation**	**Delivery Performance**
Logistic Manager	- score: 2 - demand of the points of sale - distance reduction → more demand - difficulty in managing urgent demand	- score: 5 - new DC → higher service level → more responsiveness, less delivery time	- score: 1 - not influence on the decision, because these do not influence on the transportation costs	- score:4 - transportation cost will go down - inventory costs stay equal - warehousing costs maybe higher	- score: 5; 4 - distance to point of sale important, impact on transportation cost - importance of location close to motorways	- score:5 ; 2 - law is cause of many delays in deliveries - service level heavily impacted - platform not saturated	- truck occupancy indicators - very different between Lazio and North
Manager of Transportation Company	- score: 4 - difficulty in managing urgent demand towards North → impossible to travel with empty truck	- score: 4 - with DC lower delivery time, because less distance and more on time delivery	- score: 4 - voluminous products, truck fills up quickly, with low-cost products	- score: 4 - transportation cost will go down, less km - but more deliveries possible	- score: 4 ; 5 - importance of location close to motorways, so arrive quickly to point of sale	- score:5 ; 3 - law is cause of many delays in deliveries - driving hours counted also in traffic jam	- possibility of arriving faster to North, more deliveries, better management of transportation
Chief business Officer	- score: 4 - difficulty in managing urgent demand towards North - expansion in North	- score: 5 - discrepancy service level North and Center	- score: 3 - not influence on the decision, replicate structure of Pomezia	- score: 4 - warehousing costs maybe higher because of higher personnel costs in North	- score: 4 ; 3 - closer to point of sale → lower transportation costs	- score: 4 ; 2 - law is cause of many delays in deliveries - platform not saturated	- with current opening pace, we need new platform to fill gap in service level

Purchasing Manager	- score: 3 - expansion in North - everything can be managed in new platform, no more direct suppliers to points of sale	- score: 4 - more responsiveness to demand, so more service level	- score: 2 - not influence on the decision, replicate structure of Pomezia	- score: 3 - purchasing costs stay equal - transportation costs go down	- score: 4 ; 3 - closer to point of sale → lower transportation costs - lower delivery time, more efficiency	- score: 4 ; 3 - also supplier have delays because of distance and law to respect	- better to be closer also to supplier, so to receive freight in case of urgent promotions - possibility of facing better promotion needs
Area Manager Lazio	- score: 5 - points of sale in Lazio → delivery time also 24 hours	- score: 5 -geographic dispersion very influent on delivery time and responsiveness	- score: 1 - not influence on the decision, because these do not influence on the transportation costs	- score: 4 - transportation costs go down	- score: 3 ; 3 - important to be close to motorways to arrive quickly to stores	- score: 3 ; 4 - distribution network saturated, delivery times not always respected, pressure on stores	- lower truck occupancy, because of more frequent deliveries - easier management of stock
Director Store Lazio	- score: 5 - if demand is higher in a specific region, better to open DC there	- score: 5 - if distance is shorter to client, the delivery time diminishes, so more deliveries	- score: 2 - given the voluminous nature of products, truck fills up quickly	- score: 3 - warehousing costs will rise, but company can do better and faster distribution	- score: 5 ; 5 - DC needs to be close to motorways, to avoid delays in deliveries because of traffic jam	- score: 5 ; 4 - more distance, more probability of delay because of rest hours	- we have frequent deliveries, also with less than full truckload because we are very close to Pomezia - this leads to good responsiveness to final client needs during promotions
Area Manager North	- score: 4 - dispersion of stores influent on delivery time and responsiveness → delivery reliability is also affected	- score: 5 - frequent delays in deliveries because of distance and effort to combine orders	- score: 2 - given the voluminous nature of products, truck fills up quickly	- score: 4 - warehousing costs will rise - transportation costs go down - so need for evaluation	- score: 4 ; 2 - being close to points of sale would make stock management easier and better service level	- score: 4 ; 4 - network close to saturation, so not so productive and efficient anymore	- delivery performance will improve, with more frequent deliveries - now truck occupancy very high
Director Store North	- score: 4 - dispersion of stores influent on delivery time and responsiveness → delivery reliability is also affected	- score: 5 - frequent delays in deliveries because of distance - low responsiveness towards client needs	- score: 2 - given the voluminous nature of products, truck fills up quickly, but not very relevant for DC	- score: 5 - high impact on transportation cost with new DC opening	- score: 3 ; 4 - DC more accessible, close to motorways → faster deliveries → higher service level	- score: 4 ; 4 - more distance, higher cost for company because more driving hours	- delivery performance will improve, with more frequent deliveries - more personalized deliveries with new DC opening

Marketing Manager	- score: 4 - if demand is higher in a specific region, better to open DC there - expansion in North	- score: 5 - necessity to be responsive and reliable in deliveries so to not lose any sales	- score: 4 - low value products and voluminous so more incidence on transportation cost	- score: 5 - higher logistics costs, because of new DC, but compensated by more responsiveness	- score: 5 ; 5 - closer to point of sale → lower transportation costs and faster deliveries	- score: 5 ; 5 - is lower distance, there is also lower risk of accidents, and lower risk of delays	- with current opening pace, we need new platform to fill gap in service level and not lose sales in the North
Sales Manager	- score: 5 - points of sale in the North are increasing their annual demand, but do not face increased service level	- score: 5 - diminishing the delivery time is fundamental to increase service level	- score: 3 - low value products and voluminous so more incidence on transportation cost	- score: 5 - transportation costs go down - more warehousing costs because of new DC, but faster service	- score: 4 ; 4 - DC must be accessible so to reduce delivery time → lower delivery time, higher service for final clients	- score: 4 ; 5 - distribution network is close to saturation, because of continuous expansion of company	- delivery performance will be better with new opening, easier manager of stock and incoming of products - better service to customers

Appendix D: Example of Interview (English)

- *Introduction of the researcher and of the research topic*

My name is Roberta Cristin, I am 23 years old and I am attending the master in Supply Chain Management at Tilburg University. The following questions are aimed at writing my master thesis. The goal is to obtain data on the impact of opening a new distribution center in Northern Italy. Specifically, the focus is to investigate the factors involved in making the decision to open a new distribution center and what impact it will have on the service level. In addition, the thesis is amied at understanding if the current legislation on freight transportation (EU Regulation 2020/1054) has an impact on the current distribution network and on the decision to open a new DC. In this regard, many academic studies have focused on decision-making factors, but not on the impact of this specific factor.

- *Do you consent to use this data for academic purposes?*

Yes, I do.

- *Could you please describe yourself and your role inside the company? Which are your responsibilities? Which tasks do you perform?*

My role is manager of logistics and transportation, so I am responsible for coordinating the logistics and transportation of the Risparmio Casa group.

The activities we carry out as logistics and transport management are: pure logistics and distribution activities, understood as distribution to points of sale. In fact, the customers are all the Risparmio Casa stores.

- *How long have you worked for Risparmio Casa?*

12 years, from April 2009.

- *What delivery time do you currently guarantee?*

With regard to the delivery time, we guarantee delivery A x C, if the day of dispatch of the order is considered (understood as day A). Instead A x B if we consider the day of the fulfil of the order. For example, on Monday afternoon the store sends the order, on Tuesday it is processed, and on Wednesday it goes to delivery.

Exceptionally, A x A delivery is also made for Rome and Lazio, therefore within the day, as they are very close to the Pomezia DC. Instead, A x C from Pomezia to all the shops of the group. So, this can be considered the timing in normal situations, everyday life.

- *What are the main problems observed for the deliveries towards the Center-North of Italy? What consequences do these problems have on the sales and on the service level?*

The main problem is the distance, meaning that driving from Pomezia for Tuscany is feasible, with 3 or 4 hours of travel you can get there easily. The problem in the North are the more distant shops such as Savona, Turin, Cormons, as far as the North-East is concerned.

The main difficulties are related to the transportation regulations, as the driver can do 9 hours of driving halved by a 45-minute break. So, if the driver finds an accident on the road and remains stationary for a couple of hours, he will inevitably arrive late at the point of sale.

In fact, the legislation specifies that, after 9 hours of driving, the driver must necessarily stop for 11 hours and must stop for 48 hours at the weekend. This legislation is important because it also involves Risparmio Casa, which is the client. As, if an accident occurs, it is necessary to carry out the analysis of the supply chain, therefore by the customer who has entrusted the carrier X with the shipments, up to the verification on the driver if he has complied with the legislation. Risparmio Casa, therefore, is personally involved, as it is the client, and there are checks to verify that it complies with the legislation in giving the delivery.

As for the service level, we are able to guarantee it also in the North but with greater difficulties, as these delays in delivery affect it. Consequently, the main problem is the length of the route which leads to significant delays in deliveries.

- *What locations are you taking into consideration for the opening of the new DC?*

From the point of view of strategic positioning, Bologna and Piacenza are the most suitable. As from Bologna, for example, you can head towards the North-West and the North-East and also go down towards Tuscany. Padua or Milan are also considered, but from Milan it is more distant from the North-East and from Padua you are far away from the North-West. So, I think Bologna is the best connected.

- *The different alternatives have been determined using a particular procedure?*

No particular procedure was used, the choice is dictated by the geographical position. Surely ,what affects the opening of a DC in the North are the costs, in fact, if we

compare the cost of logistics and that of transportation, with the same service level of today, the cost should be slightly higher in the Center-North.

- *What benefits are you hoping to gain with the opening of the DC? (faster service, lower costs, higher service level, higher efficiency and responsiveness towards demand…)*

Surely the speeding up of distribution is one of the greatest benefits of the new opening. As for the costs, those of transportation would be drastically reduced. Currently, they have a significant impact, so there would also be a reduction in costs. The level of service would also increase, as a distribution with a shorter distance than today would be managed. The distances would no longer be 700 km but, for example, 200 or 300 km. So, this would greatly increase the level of service.

As for the efficiency in response to demand, the advantage may be that an A x A order could also be managed towards the North, thus increasing the efficiency in response to the demand in the case of urgencies or special needs. Normally A x C deliveries are handled well from Pomezia. However, when there are emergencies, with loads less than a full truck, it becomes complicated to manage them from Pomezia, and it would be more useful to have a platform in the North. Trying to consolidate the costs, it is fundamental that the trucks directed to the North have a high occupancy. It follows that, if the client in Turin orders ten pallets with a high urgency, these cannot be delivered because it would be too expensive. With the new DC, A x A deliveries for the North could also be managed, which today are impossible.

- *How has the DC recently opened in Sardinia changed the supply of the Sardinian shops?*

The platform in Sardinia has brought about a big change. In fact, the service has speeded up, leading to an increase in the level of service. As there is no longer the sea to divide us, making the products arrive directly to the new DC, the distance created by the sea has been closed. Transportation costs have been significantly reduced, and we have become more efficient and responsive to demand, as A x A deliveries can also be managed, which otherwise from Pomezia to Sardinia would not have been possible.

If there are promotions, that require urgent deliveries to the points of sale, with the new DC we can manage them, without losing any sales.

- *What are the main drivers that pushed Risparmio Casa towards the decision of opening a new DC in the Center-North? Are the drivers related to a particular benefit you wanted to obtain? (example: higher productivity, lower costs, faster deliveries….)*

The opening of a platform is linked to the need to increase the service level, reduce costs and be more efficient in responding to demand. All of this becomes even more relevant given our prospect of rapid growth. Meeting these needs efficiently is complicated with the current law on transport. Consequently, in order to obtain a competitive advantage, the opening of the platform will become necessary in the future, to ensure speed of delivery and compliance with the law.

- *I will list some of the main factors, found in the academic literature, that are recognized having an impact on the decision-making of opening a new DC. For each*

one of them, could you tell me if it was considered by Risparmio Casa for the decision? If yes, could you explain the motivations?

- *Demand factors (demand level, demand dispersion, demand volatility)*

Demand, when dealing with the logistics of Risparmio Casa, means the demand from the points of sale. Compared to the demand we receive from the stores in the North, we have no particular problems managing it from Pomezia, as we are able to manage everything. Nevertheless, the reduction of the distance from the warehouse to the point of sale, and the possibility of making more midweek deliveries, could increase the demand of the points of sale. If today, in fact, it is delivered twice a week to the store, with a new platform it is possible to assume delivery even 4 times a week.

- *Service level factors (delivery time, delivery reliability, responsiveness)*

This is the central point that makes us lean towards the opening of the new center, in fact the delivery time would decrease, and there would be the possibility of making more deliveries in the week, making us more responsive to customer needs.

- *Product characteristics (product value density, package density)*

When opening a new DC in the North, the product characteristics will not be considered. Indeed, the current structure in Pomezia will be replicated. If the truck departs from the new DC, the transportation will cost less, because of the minor distance travelled, but not because of the product characteristics.

- *Logistic costs (transportation costs, inventory costs, warehousing costs)*

Yes, these are relevant in the decision underlying opening of a new DC. In fact, the transportation cost would drop dramatically. The inventory costs would be replicated in the new platform, but they would follow the same pattern, so they are not very important. Instead, warehouse costs could be higher in the North, as personnel costs are higher than in the Center-South. Surely, the biggest savings will be given by the transportation costs.

- *Proximity-related location factors (distance from DC to suppliers, distance from DC to customers)*

As for the suppliers, nothing changes for us, as we communicate to the supplier that he must deliver to Bologna instead of Pomezia. So clearly, they would have a reduction in costs, but Risparmio Casa does not tanged. Instead, the distance from the new warehouse to the store is an important factor to consider, because it will have the greatest impact on the transportation cost and therefore on the efficiency of logistics. A shorter distance would increase the level of service. Let's say that the most impacting factor is distance, as it brings with it many other factors to consider.

- *Accessibility-related factors (distance from DC to motorways, seaports, rail terminals, congestion between DC and market)*

Positioning yourself in a central area, such as Bologna, is certainly advantageous as far as the motorways are concerned. So yes, the distribution center must be easily accessible from the motorway and well connected. We work mainly with highways, and not with ports and railways. The location must be close to the highways.

- *Could you quantify, using a scale from 1 to 5, the importance of the factors previously mentioned, in the decision-making process of the new DC opening?*
    - Demand factors: 2
    - Service level factors: 5
    - Product characteristics: 1
    - Logistic costs: 4
    - Proximity-related location factors: 5
    - Accessibility-related factors: 4

- *How do the laws concerning the security in freight transportation, namely permitted hours of driving and of rest, impact on the current delivery performance?*

These laws have a considerable impact especially towards the Center-North, because the distance increases considerably. Such as upper Piedmont, upper Lombardy, Liguria and tri-Veneto.

- *The current laws for freight transportation are taken into account in the decision-making of the new DC opening? In what way?*

Yes, they are taken into consideration because the new DC opened in the Center-North allows a better service level, always respecting the law on freight transportation, thus avoiding possible delays. The service level towards the North is heavily impacted by his legislation. In fact, it usually brings to high delays in the deliveries to the North, because of the frequent traffic on the motorways.

- *On a scale from 1 to 5 could you quantify the importance of the current driving hours needed to serve the clients in the Center-North on the decision of a new DC opening? What is the importance of this factor in this choice?*

5, because opening in the Center-North reduces driving hours, increases the service level, and reduces transportation costs.

- *The current distribution network/DCs can be considered saturated? If yes, why?*

Not yet, but there is a risk that by opening other stores so quickly, as we are doing now, it becomes saturated and deliveries slow down. Consequently, with a saturated warehouse the service level drops.

- *On a scale from 1 to 5 could you quantify the importance of the saturation of the current DCs in the choice of opening a new one?*

Currently: 2, because we haven't reached saturation yet, so we don't have an urgent need to open a new platform. But when saturation is reached, the importance will grow to 5.

- *How is the delivery performance currently measured?*

We have started recently to use truck occupancy indicators to understand the cost efficiency of the deliveries. We are approximately around 85% of truck occupancy, with dome differences in the peninsula. In the North, we see 94% compared to 79% of Lazio. This difference is due to the urgent deliveries we make in Lazio. We also rely heavily on feedback from the point of sale. The manager informs us of any delay in delivery or disservice.

- *How do you think will the delivery performance change after the opening of a new DC in the Center-North?*

We will have an increase in the service level and we will be able to manage emergencies more efficiently and quickly.

- *How is the current supply network managed? How will the supply change with the new DC? (will the products arrive directly to the new DC?)*

Nothing will change in the management of supplies, as the supplier will be told to deliver to the new platform with the same timing. Hence, the products will come directly to the new platform.

- *In what way is Risparmio Casa intending to implement the decision of opening a new DC?*

It is necessary to analyze the costs related to a new opening, suppliers will also be taken into consideration to see the possible economic offers. Future warehouse costs must also be thoroughly analyzed, if they meet our targets.

- *What will be the main difficulties that will be faced in implementing this decision?*

The main difficulties are related to timing, as the corporate culture is often characterized by decisions made within the day and which want to be made active in two months, or in any case very quickly. But in this case, it is unthinkable. Such a choice cannot be taken promptly and above all it needs longer times to be implemented, it takes time to start a new DC. In any case, we always have the example of the Norbello platform in Sardinia and that of Pomezia, so their structure can be replicated.

- *How will the stock of products in the platform initially be constituted?*

It will be the buyers who must replicate the stock that exists on the other platforms, including the one in the North. They will see the sales of the points of sale involved in the new platform, and based on their sales, they will make the stocks in the warehouse. It is all related to the sales of the store.

In this case, buyer means the purchasing office of the headquarters, which purchases for the whole group.

- *In what way and what departments will determine the stock to keep in the new DC?*

The buyers will determine the stock to keep in the new DC. It is not the logistics that makes the orders, but the buyers, we execute them. They carry out analysis to see how much stock is needed, the timing between the order placed and delivery, the current stock and the needs of the stores, also given the promotions. So, with the data by hand, they decide the quantity to order for the stock as well as for the points of sale. Obviously if there are promotions, they will have to buy more stock to guarantee the needs of the points of sale.

Appendix E: Example of interview (Italian)

- *Presentazione del ricercatore e dell'argomento della ricerca*

Mi chiamo Roberta Cristin, ho 23 anni e sto frequentando il master in Supply Chain Management all'Università di Tilburg. Le seguenti domande sono volte alla stesura della mia tesi. L'obiettivo è di ottenere dei dati sull'impatto dell'apertura di un nuovo centro di distribuzione nel Nord Italia. Nello specifico, si indagheranno i fattori che intercorrono nel prendere la decisione di aprire un nuovo centro di distribuzione e che impatto avrà sul livello di servizio. Inoltre, si cercherà di capire se l'attuale legislazione in materia di trasporti (Regolamento dell'UE 2020/1054) ha un impatto sull'attuale network di distribuzione e sulla decisione di aprire una nuova piattaforma. A tal proposito, molti studi accademici si sono focalizzati sui fattori decisionali, ma non sull'impatto di questo fattore specifico.

- *Acconsente all'uso dei dati per scopi accademici?*

Si, acconsento.

- *Potrebbe fare una breve presentazione di lei e del suo ruolo nell'azienda? Che responsabilità ha? Di quali attività si occupa?*

Il mio ruolo è responsabile della logistica e di trasporti, mi occupo quindi del coordinamento della logistica e dei trasporti del gruppo Risparmio Casa.

Per quanto riguarda la responsabilità, si intende la responsabilità del conto economico della direzione logistica.

Le attività che svolgiamo come direzione logistica e trasporti sono: attività di logistica pura, e di distribuzione, intesa come distribuzione ai punti vendita. Infatti, i clienti sono tutti i negozi Risparmio Casa.

- *Da quanto tempo lavora per Risparmio Casa?*

Lavoro a Risparmio Casa da 12 anni, ovvero da aprile 2009.

- *Che tempo di consegna riuscite a garantire attualmente?*

Per quanto riguarda i tempi di consegna, noi garantiamo consegna A x C, se viene considerato il giorno di invio dell'ordine (inteso come giorno A). Invece A x B se consideriamo il giorno dell'evasione. Quindi ad esempio, il lunedì pomeriggio il punto vendita invia l'ordine, il martedì viene lavorato, e il mercoledì va in consegna.

In via eccezionale, per Roma e Lazio viene fatta anche consegna A x A, quindi in giornata, in quanto sono molto vicini alla piattaforma di Pomezia. Invece, A x C da Pomezia verso tutti i negozi del gruppo, quindi questa può essere considerata la tempistica in situazioni normali, la quotidianità.

- *Quali sono i principali problemi che riscontrate nelle consegne verso il Centro-Nord? E che ripercussioni hanno sulle vendite e sul livello di servizio?*

La principale problematica è la distanza, nel senso che partire da Pomezia per la Toscana è fattibile, con 3 o 4 ore di viaggio ci si arriva facilmente. Il problema del Nord sono i negozi più lontani come Savona, Torino, Cormons, per quanto riguarda il Nord-Est.

Le principali difficoltà sono legate alla normativa del trasporto, in quanto l'autista può fare 9 ore di guida dimezzate da 45 minuti di pausa. Quindi se l'autista trova un incidente lungo la strada e rimane fermo un paio di ore, arriverà inevitabilmente in ritardo al punto vendita.

La normativa infatti specifica che, dopo le 9 ore di guida, l'autista deve fare obbligatoriamente 11 ore di sosta e nel fine settimana si deve fermare per 48 ore. Questa normativa è importante perché coinvolge anche Risparmio Casa, che è il committente. In quanto, se dovesse succede un incidente, bisogna fare l'analisi della filiera, quindi dal committente che ha incaricato il vettore X delle spedizioni, fino alla verifica sull'autista se ha rispettato la normativa. Risparmio Casa, quindi, è coinvolto in prima persona, in quanto è il committente, e ci sono controlli per verificare che rispetti la normativa nell'impartire la committenza.

Per quanto riguarda, il livello di servizio, riusciamo a garantirlo anche al Nord ma con maggiori difficoltà, in quanto questi ritardi nella consegna incidono su di esso. Di conseguenza, il principale problema è la lunghezza della tratta che porta a ritardi notevoli nelle consegne.

- *Quali luoghi state considerando per l'apertura della nuova piattaforma nel Centro-Nord?*

Dal punto di vista di posizionamento strategico, Bologna e Piacenza sono le più idonee. In quanto da Bologna, ad esempio puoi dirigerti verso il Nord-Ovest e il Nord-Est e anche scendere verso la Toscana. Vengono considerate anche Padova o Milano, ma da Milano si è più distante dal Nord-Est e da Padova sei più distante verso il Nord-Ovest. Quindi, ritengo che Bologna sia la miglior collegata.

- *Le diverse alternative sul luogo dell'apertura sono state determinate utilizzando una particolare procedura?*

Non è stata utilizzata nessuna particolare procedura, la scelta è dettata dalla posizione geografica. Sicuramente quello che influisce sull'apertura di una piattaforma al Nord, sono i costi, infatti, se andiamo a paragonare il costo della logistica e quello del trasporto, a parità di servizio, al Centro-Nord dovrebbe essere leggermente più elevato il costo.

- *Che benefici sperate di ottenere attraverso l'apertura di una nuova piattaforma? (velocizzazione servizio, riduzione costi, aumento livello di servizio, più efficienza di risposta alla domanda…)*

Sicuramente la velocizzazione della distribuzione è uno dei più grandi benefici della nuova apertura. Per quanto riguarda i costi, quelli di trasporto si ridurrebbero drasticamente. Ad oggi, essi incidono in maniera significativa, quindi si verificherebbe anche una riduzione dei costi. Aumenterebbe anche il livello di servizio, in quanto si gestirebbe una distribuzione con una distanza inferiore rispetto a quella odierna, non più 700 km ma ad esempio si percorrerebbero 200 o 300 km ad ogni bilico in consegna. Quindi questo aumenterebbe notevolmente il livello di servizio.

Per quanto riguarda l'efficienza di risposta alla domanda, il vantaggio può essere che si potrebbe gestire un ordine A x A anche verso il Nord, quindi aumenta l'efficienza in risposta alla domanda nel caso di urgenze o particolari necessità. Le consegne quotidiane vengono gestite bene da Pomezia, ma nel momento in cui si riscontrano delle urgenze, con carichi minori di un bilico intero, diventa complicato gestirle da Pomezia, e sarebbe più utile avere una piattaforma nel Nord. Cercare di diminuire i costi è una missione della logistica, e di conseguenza i bilici verso il Nord sono quasi pieni. Quindi se viene un ordinato un carico minore per il Nord, abbiamo difficoltà del consegnarlo, per l'elevato costo. Con la nuova piattaforma, si potrebbero gestire anche le consegna A x A per il Nord, che ad oggi sono infattibili.

- *La piattaforma aperta in Sardegna come ha cambiato la gestione delle forniture verso i negozi sardi?*

La piattaforma in Sardegna ha portato ad un grande cambiamento. Infatti, il servizio si è velocizzato, portando a un aumento del livello di servizio. In quanto, non vi è più il mare a dividerci, facendo arrivare i prodotti direttamente alla nuova piattaforma, la distanza creata dal mare è stata colmata. I costi di trasporto si sono ridotti notevolmente, e siamo diventati più efficienti e reattivi verso la domanda, in quanto possono essere gestite anche le consegna A x A, che altrimenti da Pomezia verso la Sardegna, non sarebbero state possibili. Qualora ci fossero promozioni, con urgenze da parte dei punti vendita, con la nuova piattaforma possiamo gestirle, senza perdere nessuna vendita.

- *Quali sono i principali fattori che hanno spinto Risparmio Casa verso la decisione di aprire un nuovo centro di distribuzione nel Centro-Nord? Questi fattori sono legati ad un particolare beneficio che vorreste ottenere attraverso l'apertura della piattaforma? (per esempio: velocizzazione consegna, incremento produttività, riduzione costi….)*

L'apertura di una piattaforma è legata alla necessità di aumentare il livello di servizio, ridurre i costi ed essere più efficienti nel rispondere alla domanda. Tutto questo, acquisisce ancora più rilevanza, data la nostra prospettiva di crescita rapida. Soddisfare queste necessità in maniera efficiente risulta complicato con l'attuale legge in materia di trasporti, di conseguenza, per poter ottenere un vantaggio competitivo l'apertura della piattaforma, nel futuro diventerà necessario, per garantire velocità di consegna e rispettando la normativa.

- *Di seguito elencherò alcuni dei principali fattori, analizzati nei precedenti studi accademici, che vengono riconosciuti avere un impatto sulla decisione di aprire un nuovo centro di distribuzione. Per ognuno di essi potrebbe dirmi, se nella decisione di aprire una nuova piattaforma nel Centro-Nord, verrà preso in considerazione da Risparmio Casa? Se si, potrebbe spiegarmi il perché?*

- *Fattori legati alla domanda (livello di domanda, dispersione geografica della domanda e volatilità):*

Per domanda, quando stiamo trattando la logistica di Risparmio Casa, si intende la domanda da parte dei punti vendita. Rispetto alla domanda che riceviamo dai punti vendita del Nord, non abbiamo particolari problematiche a gestirla da Pomezia, in quanto riusciamo ad evadere il tutto. Nonostante ciò, la riduzione della distanza dal magazzino al punto vendita, e la possibilità di fare più consegne infrasettimanali, potrebbe aumentare la domanda dei punti vendita. Se oggi, infatti si consegna due volte a settimana al punto vendita, con una nuova piattaforma si può ipotizzare di consegna anche 4 volte a settimana.

- *Fattori legati al livello di servizio (tempo di consegna, affidabilità delle consegne, reattività verso le esigenze cliente):*

Questo è il punto centrale che ci fa propendere verso l'aperura del nuovo centro, infatti diminuirebbe il tempo di consegna, e ci sarebbe la possibilità di fare più consegne nella settimana, rendendoci più reattivi verso le esigenze del cliente.

- *Caratteristiche del prodotto (valore del prodotto data la densità, e densità dell'imballaggio)*

No, questi fattori decisionali non vengono considerati, in quanto aprire una nuova piattaforma implicherebbe la replicazione della struttura della piattaforma di Pomezia. Se il bancale parte da Pomezia o da Bologna, costerebbe meno il trasporto, per una motivazione legata ai chilometri, ma non per le caratteristiche del prodotto.

- *Costi logistici (costi di trasporto, costi di inventario, costi di magazzino):*

Si, questi sono rilevanti nella scelta di aprire una nuova piattaforma. Infatti, il costo di trasporto diminuirebbe drasticamente. I costi di inventario, sarebbero replicati nella nuova piattaforma, ma seguirebbero lo stesso schema, quindi non sono molto importanti. Invece, i costi di magazzino, potrebbero essere più alti al Nord, in quanto il personale ha un costo più elevato rispetto al Centro-Sud. Sicuramente, il più grande risparmio sarà dato dal costo di trasporto.

- *Fattori legati alla prossimità della location (distanza dal nuovo magazzino ai fornitori e ai punti vendita):*

Per quanto riguarda i fornitori a noi non cambia nulla, in quanto si comunica al fornitore che deve consegnare a Bologna invece che a Pomezia, quindi chiaramente loro avrebbero una riduzione dei costi, ma a Risparmio Casa non tange. Invece, la distanza dal nuovo magazzino al punto vendita è un fattore importante da considerare, perché avrà il maggior impatto sul costo di trasporto e quindi sull'efficienza della logistica. Una distanza inferiore farebbe aumentare il livello di servizio. Diciamo che il fattore più impattante è la distanza, in quanto porta con sé molti altri fattori da considerare.

- *Fattori legati all'accessibilità alla nuova piattaforma (distanza del magazzino alle autostrade, porti, stazioni ferroviarie, ingorghi stradali dalla piattaforma ai punti vendita):*

Posizionarsi in una zona centrale, tipo Bologna, per quanto le autostrade è sicuramente vantaggioso. Quindi si, il centro di distribuzione deve essere facilmente raggiungibile dall'autostrada e ben connesso. Noi lavoriamo principalmente con le autostrade, e non con i porti e le ferrovie. La posizione deve essere vicina alle autostrade.

- *Potrebbe quantificare su una scala da 1 a 5 l'importanza dei vari fattori decisionali sopramenzionati, nel processo decisionale alla base della scelta di aprire una nuova piattaforma? (ovvero: Quanto è impattante ogni fattore, su una scala da 1 a 5, nel prendere la decisione di aprire un nuovo magazzino? Quali sono i fattori che spingono più verso questa scelta?)*
  - Fattori legati alla domanda: 2
  - Fattori legati al livello di servizio: 5
  - Caratteristiche del prodotto: 1
  - Costi logistici: 4
  - Fattori legati alla prossimità della location: 5
  - Fattori legati all'accessibilità alla nuova piattaforma: 4

- *In che modo le attuali leggi in materia di ore di guida e ore di sosta impattano sulla vostra attuale performance nella delivery?*

Queste leggi impattano in maniera considerevole soprattutto verso il Centro-Nord, perché la distanza aumenta notevolmente. Quali Piemonte alto, Lombardia alta, Liguria e tri-Veneto.

- *Le attuali leggi in materia di ore di guida e ore di sosta vengono tenute in considerazione per la scelta di aprire una nuova piattaforma? In che modo?*

Si, vengono tenute in considerazione perché la piattaforma aperta al centro-nord permette un livello di servizio migliore, sempre rispettando le legge in materia di guida e di sosta, quindi evitando possibili ritardi.

- *Su una scala da 1 a 5 quanto sono importanti le ore di guida impiegate attualmente dal magazzino ai negozi del centro-nord, nella decisione di aprire un nuovo centro di distribuzione? Quanta importanza ha questo fattore in questa scelta, e perché?*

5, perché aprire al centro nord riduce ore di guida, aumenta il livello di servizio, e riduce i costi di trasporto.

- *L'attuale network di distribuzione/piattaforme possono considerarsi saturi? Se si perché?*

Non ancora, ma c'è il rischio che aprendo così velocemente altri punti vendita, come stiamo facendo ora si satura e si rallentano le consegne. Di conseguenza, con un magazzino saturo scende livello di servizio.

- *Quanto è importante su una scala da 1 a 5 la saturazione dell'attuale piattaforma per la scelta di aprirne un'altra?*

Attualmente: 2, perché non abbiamo raggiunto la saturazione ancora, quindi non abbiamo la necessità urgente di aprire una nuova piattaforma Nonostante ciò, quando si raggiungerà la saturazione, l'importanza crescerà a 5.

- *Come viene misurata attualmente la performance nella delivery?*

Abbiamo iniziato recentemente ad utilizzare degli indicatori per la truck occupancy, per capire se riusciamo a consolidare al meglio i viaggi per risparmiare sui costi. Al momento, siamo sulla penisola intorno all'85%. Per quanto riguarda il Lazio siamo sull'79% e per il North sul 94%. Questa differenza è dovuta alle consegne anche urgenti che effettuiamo nel Lazio.

Inoltre, ci basiamo molto anche sui feedback dal punto vendita. Il direttore ci segnala l'eventuale ritardo nella consegna o disservizio.

- *Come pensa cambierà la performance nella delivery dopo l'apertura della nuova piattaforma nel Centro-Nord?*

Si avrà un aumento del livello di servizio e si riusciranno a gestire le urgenze in maniera più efficiente e rapida.

- *Come è strutturata l'attuale gestione delle forniture dei prodotti? E come cambierà con la nuova piattaforma? (esempio: i prodotti arriveranno direttamente al nuovo magazzino)*

Non cambierà nulla nella gestione delle forniture, in quanto si dirà al fornitore di consegnare alla nuova piattaforma con le stesse tempistiche. Quindi, i prodotti arriveranno direttamente alla nuova piattaforma.

- *In che modo Risparmio Casa intende implementare la decisione di stabilire un magazzino nel centro-Nord?*

Bisogna analizzare i costi relativi a una nuova apertura, verranno presi in considerazione anche i fornitori per vedere le possibili offerte economiche. Bisogna analizzare approfonditamente anche i futuri costi di magazzino, se sono conformi ai nostri target.

- *Quali sono le principali difficoltà che ritiene dovranno essere affrontate nell'attuare questa decisione?*

Le principali difficoltà sono le tempistiche, in quanto la cultura aziendale è spesso caratterizzata da decisioni prese in giornata e che vogliono essere rese attive in due mesi, o comunque con un tempo molto rapido. Però in questo caso, è impensabile, una scelta del genere non può essere presa con tempestività e soprattutto ha bisogno di tempi più lunghi per essere messa in atto, ci vuole del tempo ad avviare una nuova piattaforma. Ad ogni modo abbiamo sempre l'esempio della piattaforma di Norbello in Sardegna e quella di Pomezia, quindi la loro struttura può essere replicata.

- *Inizialmente come verrà costituita la giacenza di prodotti nella piattaforma?*

Saranno i buyer che devono replicare la giacenza che c'è sulle altre piattaforme anche a quella al Nord. Loro vedranno le vendite dei punti vendita coinvolti nella nuova piattaforma, e sulla base delle loro vendite, faranno le giacenze nel magazzino. È tutto legato alle vendite del punto vendita. In questo caso per buyer si intende l'ufficio acquisti di sede, che acquista per tutto il gruppo.

- *In che modo e quali dipartimenti determineranno lo stock da mantenere nel magazzino?*

I buyer determineranno lo stock da tenere in magazzino. Non è la logistica a fare gli ordini, ma sono i buyer, noi li eseguiamo. Loro fanno delle analisi per vedere quanto stock è necessario, le tempistiche tra l'ordine effettuato e la consegna, lo stock attuale e il fabbisogno dei punti vendita, date anche le promozioni. Quindi con i dati alla mano, decidono la quantità da ordinare anche per lo stock oltre che per i punti vendita. Ovviamente se ci sono delle promozioni, dovranno acquistare più stock per garantire il fabbisogno dei punti vendita.

Appendix F: Example of interview (English)

- *Introduction of the researcher and of the research topic*

My name is Roberta Cristin, I am 23 years old and I am attending the master in Supply Chain Management at Tilburg University. The following questions are aimed at writing my master thesis. The goal is to obtain data on the impact of opening a new distribution center in Northern Italy. Specifically, the focus is to investigate the factors involved in making the decision to open a new distribution center and what impact it will have on the service level. In addition, the thesis is amied at understanding if the current legislation on freight transportation (EU Regulation 2020/1054) has an impact on the current distribution network and on the decision to open a new DC. In this regard, many academic studies have focused on decision-making factors, but not on the impact of this specific factor.

- *Do you consent to use this data for academic purposes?*

Yes, I accept.

- *Could you please describe yourself and your role inside the company? Which are your responsibilities? Which tasks do you perform?*

I am the area manager of Risparmio Casa for Piedmont. In the company I take care of the management of the Piedmont points of sale. I coordinate with the various managers of the points of sale for personnel management, freight management, orders, promotion management and relations with the headquarters. I am also responsible for the implementation and compliance with all company procedures.

- *How long have you worked for Risparmio Casa?*

I have worked for Risparmio Casa since July 2016.

- *With what delivery time do the product arrive?*

The deliveries of all external suppliers are scheduled on a daily basis. In addition, twice a week we receive the goods from the centralized warehouse, precisely on Tuesday and Friday, with orders placed on Sunday and Wednesday. It is not always easy with the current timing to obtain a correct rotation of the goods and optimization of the stock. Furthermore, it happens to run out of stock as it is not always easy to place targeted orders.

- *What are the main problems observed for the deliveries towards the Center-North of Italy? What consequences do these problems have on the sales and on the service level?*

With external suppliers we arrange a fulfilment for orders placed through the delivery calendar. As for the delivery from our company warehouse, there may be time delays as the warehouse is distant and sometimes to optimize the loads of the vehicles, they are also combined between shops. Shortening the timing between order placement and delivery would allow better management of the goods.

- *What benefits are you hoping to gain with the opening of the DC? (faster service, lower costs, higher service level, higher efficiency and responsiveness towards demand…)*

Through a new opening we can certainly achieve a speed up of the service, and a reduction in transportation costs for the company. Above all, the points of sale will see the goods delivered more frequently and with less delay. This will result in an improvement of the service for the final customer, we would be more prepared to be responsive to demand.

- *I will list some of the main factors, found in the academic literature, that are recognized having an impact on the decision-making of opening a new DC. For each one of them, could you tell me if it was considered by Risparmio Casa for the decision? If yes, could you explain the motivations?*
    - *Demand factors (demand level, demand dispersion, demand volatility)*

The stores geographically closest to the platform have deliveries no later than 48 hours. In view of promotions, they can also enjoy delivery within 24 hours. Today, with the company's current expansion in the North, a new platform is needed to ensure the same readiness to meet the demands of the stores.

    - *Service level factors (delivery time, delivery reliability, responsiveness)*

With the development in Northern Italy, opening a new platform becomes crucial as the movement of goods will always increase and the service to the points of sale must also be optimized in terms of timing. We are currently experiencing delays in the deliveries from the centralized DC in Pomezia, because of the high distance between us. Moreover, it may happen that delays are driven by the attempt to

optimize the delivery through full-loaded trucks. This is done by combining more deliveries towards different shops, but this may increase the delay.

- *Product characteristics (product value density, package density)*

The most important volume managed by the platform concerns two sectors: detergent and disposable paper. A shop that has a high turnover can receive an average of 33 pallets divided as follows: 7 perfumery and 26 of detergent. A pallet can consist of 6/12 packages per layer for bulky items, such as bleach and 4lt products, but they arrive at a more important composition. Consequently, as these are very voluminous items, the truck fills up quickly.

- *Logistic costs (transportation costs, inventory costs, warehousing costs)*

Logistic costs must be carefully considered for this kind of opening. They would increase with the new opening, but at the same time the transportation cost decreases and there is more timeliness of deliveries, therefore a higher service level.

- *Proximity-related location factors (distance from DC to suppliers, distance from DC to customers)*

As for suppliers, the important thing is that the logistics is well connected. As for the distance from the points of sale, it would be better to be closer to the points of sale in the North to make stock management easier and guarantee a better service to the final consumer.

- *Accessibility-related factors (distance from DC to motorways, seaports, rail terminals, congestion between DC and market)*

Obviously, it is better to stay close to the motorway or the harbours, to be better connected and get to the points of sale faster. By decreasing the delivery time, the service given to customers is improved.

- *Could you quantify, using a scale from 1 to 5, the importance of the factors previously mentioned, in the decision-making process of the new DC opening?*
  - Demand factors: 4
  - Service level factors: 5
  - Product characteristics: 2
  - Logistic costs: 4
  - Proximity-related location factors: 4
  - Accessibility-related factors: 2

- *How do the laws concerning the security in freight transportation, namely permitted hours of driving and of rest, impact on the current delivery performance?*

They have a great impact. It often happens that the goods arrive late because the driver has exceeded the possible driving hours, due to a traffic jam.

- *The current laws for freight transportation are taken into account in the decision-making of the new DC opening? In what way?*

Yes, I believe that they will be taken into consideration as to date they are creating the biggest problem. Therefore, the opening of the DC would serve precisely to avoid that the driver needs to start the rest hours before having delivered the freight.

- *On a scale from 1 to 5 could you quantify the importance of the current driving hours needed to serve the clients in the Center-North on the decision of a new DC opening? What is the importance of this factor in this choice?*

4, by reducing travel times, making shorter journeys, you can make more daily deliveries.

- *The current distribution network/DCs can be considered saturated? If yes, why?*

Of course, with the continuous expansion we are used to, with the continuous opening of new stores and the consequent increase in sales, it involves the need for a greater stock of goods, and therefore tends to send warehouses and platforms into saturation. Furthermore, the current network fails to fully comply with delivery times, leading to fatigue of the stores.

- *On a scale from 1 to 5 could you quantify the importance of the saturation of the current DCs in the choice of opening a new one?*

4

- *How do you think will the delivery performance change after the opening of a new DC in the Center-North?*

Positively. Of course, delivery performance will improve, but there will be cost increases due to the DC and logistics. The delivery service will be better for the various points of sale and times. By reducing time, it is much easier to manage the receipts of goods and therefore to guarantee a better service to customers.

Appendix G: Example of interview (Italian)

- *Presentazione del ricercatore e dell'argomento della ricerca*

Mi chiamo Roberta Cristin, ho 23 anni e sto frequentando il master in Supply Chain Management all'Università di Tilburg. Le seguenti domande sono volte alla stesura della mia tesi. L'obiettivo è di ottenere dei dati sull'impatto dell'apertura di un nuovo centro di distribuzione nel Nord Italia. Nello specifico, si indagheranno i fattori che intercorrono nel prendere la decisione di aprire un nuovo centro di distribuzione e che impatto avrà sul livello di servizio. Inoltre, si cercherà di capire se l'attuale legislazione in materia di trasporti (Regolamento dell'UE 2020/1054) ha un impatto sull'attuale network di distribuzione e sulla decisione di aprire una nuova piattaforma. A tal proposito, molti studi accademici si sono focalizzati sui fattori decisionali, ma non sull'impatto di questo fattore specifico.

- *Acconsente all'uso dei dati per scopi accademici?*

Si, accetto.

- *Potrebbe fare una breve presentazione di lei e del suo ruolo nell'azienda? Che responsabilità ha? Di quali attività si occupa?*

Sono l'area manager di Risparmio Casa per il Piemonte. In azienda mi occupo della gestione dei punti vendita del Piemonte. Mi coordino con i vari direttori dei punti vendita per la gestione del personale, gestione della merce, ovvero ordini, gestione delle promozioni e rapporti con la sede. Sono responsabile, inoltre, dell'attuazione e rispetto di tutte le procedure aziendali.

- *Da quanto tempo lavora per Risparmio Casa?*

Lavoro in Risparmio Casa dal luglio 2016.

- *Con che tempo di consegna riceve i prodotti?*

In maniera giornaliera vengono calendarizzate le consegne di tutti i fornitori esterni. In più due volte a settimana riceviamo la merce dal deposito, precisamente il martedì ed il venerdì con ordini effettuati la domenica ed il mercoledì. Non è sempre facile con le attuali tempistiche ottenere una giusta rotazione delle merci ed ottimizzazione dello stock. Inoltre, capita di rimanere senza stock in quanto non è sempre semplice fare ordini mirati.

- *Quali sono i principali problemi che riscontrate nelle consegne verso il Centro-Nord? E che ripercussioni hanno sulle vendite e sul livello di servizio?*

Con i fornitori esterni provvediamo ad una prenotazione degli ordini effettuati tramite calendario di consegna. Per quanto riguarda la consegna dal nostro magazzino aziendale ci possono essere ritardi di orario in quanto il magazzino è distante ed a volte per ottimizzare i carichi dei mezzi, essi vengono anche abbinati tra negozi. Accorciare le tempistiche fra ordine e consegna permetterebbe una migliore gestione della merce.

- *Che benefici sperate di ottenere attraverso l'apertura di una nuova piattaforma? (velocizzazione servizio, riduzione costi, aumento livello di servizio, più efficienza di risposta alla domanda…)*

Attraverso una nuova apertura possiamo sicuramente ottenere una velocizzazione del servizio, e una riduzione dei costi di traporto per l'azienda. Soprattutto, i punti vendita vedranno la merce recapitata più frequentemente e con minor ritardo. Ciò si ripercuoterà in un miglioramento del servizio per il cliente finale, saremmo più preparati a rispondere alla domanda.

- *Di seguito elencherò alcuni dei principali fattori, analizzati nei precedenti studi accademici, che vengono riconosciuti avere un impatto sulla decisione di aprire un nuovo centro di distribuzione. Per ognuno di essi potrebbe dirmi, se, secondo lei, nella decisione di aprire una nuova piattaforma nel Centro-Nord, verrà preso in considerazione da Risparmio Casa? Se si, potrebbe spiegarmi il perché? (In che*

modo questi fattori hanno contribuito a prendere la decisione di aprire una nuova piattaforma?)

- *Fattori legati alla domanda (livello di domanda, dispersione geografica della domanda e volatilità):*

I negozi geograficamente più vicini alla piattaforma hanno consegne non oltre le 48 ore. In vista di promozioni, possono godere anche di consegne entro le 24 ore. Oggi, con l'attuale espansione nel Nord dell'azienda, si ha necessità di una nuova piattaforma per garantire la stessa prontezza di fronte alle richieste dei punti vendita.

- *Fattori legati al livello di servizio (tempo di consegna, affidabilità delle consegne, reattività verso le esigenze cliente):*

Con lo sviluppo nel Nord Italia, aprire una nuova piattaforma diventa determinante in quanto la movimentazione della merce sarà sempre in aumento ed il servizio verso i punti vendita deve essere ottimizzato anche nelle tempistiche. Spesso accade di ricevere la merce in ritardo, data la grande distanza che ci separa da Pomezia, o per cercare di massimizzare i carichi sui mezzi.

- *Caratteristiche del prodotto (valore del prodotto data la densità, e densità dell'imballaggio)*

Il volume più importante gestito dalla piattaforma riguarda due settori: detersiva e monouso carta. Un negozio che ha un alto fatturato, può ricevere una media di 33 bancali così divisi: 7 profumeria e 26 di detersivo. Un bancale può essere composto da un 6/12 colli a strato per gli articoli voluminosi, come candeggina e prodotti 4lt, ma arrivano ad una composizione più importante. Di conseguenza, essendo questi degli articoli molto voluminosi il bilico si riempie velocemente.

- *Costi logistici (costi di trasporto, costi di inventario, costi di magazzino):*

I costi logistici devono essere considerati attentamente per questo genere di apertura. Aumenterebbero in quanto si apre una nuova piattaforma, ma allo stesso tempo diminuisce il costo di trasporto e si ha più tempestività delle consegne, quindi un livello di servizio più alto.

- *Fattori legati alla prossimità della location (distanza dal nuovo magazzino ai fornitori e ai punti vendita):*

Per quanto riguarda i fornitori l'importante è che la logistica sia ben collegata. Per quanto riguarda la distanza dai punti vendita, sarebbe meglio essere più vicini ai punti vendita del Nord per rendere più agevole la gestione dello stock e garantire un servizio migliore al consumatore finale.

- *Fattori legati all'accessibilità alla nuova piattaforma (distanza del magazzino alle autostrade, porti, stazioni ferroviarie, ingorghi stradali dalla piattaforma ai punti vendita):*

Ovviamente è meglio stare vicino all'autostrada o ai porti, per essere collegati meglio ed arrivare più veloce ai punti vendita. Diminuendo il tempo di consegna, si migliora il servizio dato ai clienti.

- *Potrebbe quantificare su una scala da 1 a 5 l'importanza dei vari fattori decisionali sopramenzionati, nel processo decisionale alla base della scelta di aprire una nuova piattaforma?*
    - Fattori legati alla domanda: 4
    - Fattori legati al livello di servizio: 5
    - Caratteristiche del prodotto: 2
    - Costi logistici:4
    - Fattori legati alla prossimità della location:4
    - Fattori legati all'accessibilità alla nuova piattaforma:2

- *In che modo le attuali leggi in materia di ore di guida e ore di sosta impattano sul livello di performance nella delivery?*

Impattano notevolmente. Spesso accade che le merci arrivano in ritardo in quanto l'autista ha superato le ore di guida possibili, per causa di un ingorgo stradale.

- *Le attuali leggi in materia di ore di guida e ore di sosta vengono tenute in considerazione per la scelta di aprire una nuova piattaforma? In che modo?*

Si, ritengo che verranno prese in considerazione in quanto ad oggi risultano creare il problema maggiore. Quindi l'apertura della piattaforma servirebbe proprio per evitare di dover iniziare le ore di sosta prima di aver consegnato.

- *Su una scala da 1 a 5 quanto sono importanti le ore di guida impiegate attualmente dal magazzino ai negozi del centro-nord, nella decisione di aprire un nuovo centro di distribuzione? Quanta importanza ha questo fattore in questa scelta, e perché?*

4, riducendo le tempistiche dei viaggi, facendo viaggi più brevi, si possono fare più consegne giornaliere.

- *L'attuale network di distribuzione/piattaforme possono considerarsi saturi? Se si perché?*

Naturalmente con la continua espansione alla quale siamo abituati, con le aperture continue di nuovi punti vendita e il conseguente aumento delle vendite, comporta la necessità di un maggiore stock di merce, e quindi tende a mandare i magazzini e le piattaforme in saturazione. Inoltre, l'attuale network non riesce a rispettare pienamente gli orari di consegna, portando ad un affaticamento dei punti vendita.

- *Quanto è importante su una scala da 1 a 5 la saturazione dell'attuale piattaforma per la scelta di aprirne un'altra?*

4

- *Come pensa cambierà la performance nella delivery dopo l'apertura della nuova piattaforma nel Centro-Nord?*

Positivamente. Naturalmente la performance nella delivery migliorerà, ma ci saranno degli aumenti di costi dovuti alla piattaforma e alla logistica. Sarà migliore il servizio di consegne per i vari punti vendita e i tempi. Riducendo tempi risulta molto più semplice gestire le entrate delle merci e quindi garantire un servizio migliore alla clientela.

Summary

Distribution is defined as “all the steps involved in the transportation and storage of goods from the supplier stage to the customer” (Chopra, 2003). The distribution network directly impacts the company’s profitability because of its effect on the supply chain costs and the customer service level. (Shang, Yildirim, Tadikamalla, Mittal & Brown, 2009). Its . In fact, its main goal is to satisfy customer demands in the quickest and most efficient way (Murfield, Boone, Rutner & Thomas, 2017).

Problem identification

Companies continuously aim at maximising their flexibility in meeting customer expectations. In this regard, distribution network design is essential, since to be fully efficient it must reflect the firm’s organization and expansion. In this context the company Risparmio Casa integrates perfectly. Risparmio Casa is an Italian company that operates in the retail sector and it currently has 114 stores.

Its distribution network to serve the mainland is organized with two distribution centres (DCs) located in Pomezia, near Rome. Considering the mainland, shipping the products in Lazio is for the company very affordable. However, shipping in Northern Italy is becoming an issue. Hence, the company cannot guarantee the same service level in all the mainland, causing also a loss of potential sales for the frequent delays.

The company’s development strategy aims at strengthening the presence in Northern Italy. So, guaranteeing a high service level while minimizing costs will acquire even more importance. Thence, the objective of this research is to find a feasible solution to address the inefficiencies in the distribution network of Risparmio Casa, towards the stores of Northern Italy.

Problem statement and Research Questions

The objective of the thesis is to investigate the impact for the company of the opening of a new DC. However, when taking the decision of opening a new DC, there are many factors to consider. This thesis will also study the factors that are considered for decision making and trying to identify new factors, for which Risparmio Casa is emblematic in the case study perspective.

This research objective can be summarized in the following problem statement:

What are the dynamics underlying the decision making of opening a new DC for Risparmio Casa and how does it affect the delivery performance and service level?

To guide the research process, five research questions have been formulated:

1. What are the factors considered to make the decision of opening a new DC?
2. What are the indicators of delivery performance?
3. What are the performance criteria that are affected by the distribution network design and the consequent addition of a new DC?
4. What new factors should Risparmio Casa consider in making the decision of opening a new DC?
5. How will these decision-making factors affect the choice of opening a new DC and what impact will it have on the distribution network of Risparmio Casa?

The first three will be answered using literature studies. On the other hand, the fourth and fifth questions will be answered using empirical data collection and analysis.

Theoretical Framework

This section is comprised by four main sub-sections. Firstly, using academic literature, the advantages and disadvantages of having a more centralized or decentralized distribution network design are seen. In second place, this framework will focus on the different factors that are taken into consideration in the decision making of opening a new DC and deciding its location. In the third section, the various indicators of delivery performance for companies are analysed. This section is propaedeutic for the fourth section that focuses on the performance criteria that are affected by distribution network design, and their relationships with the addition of a new DC location.

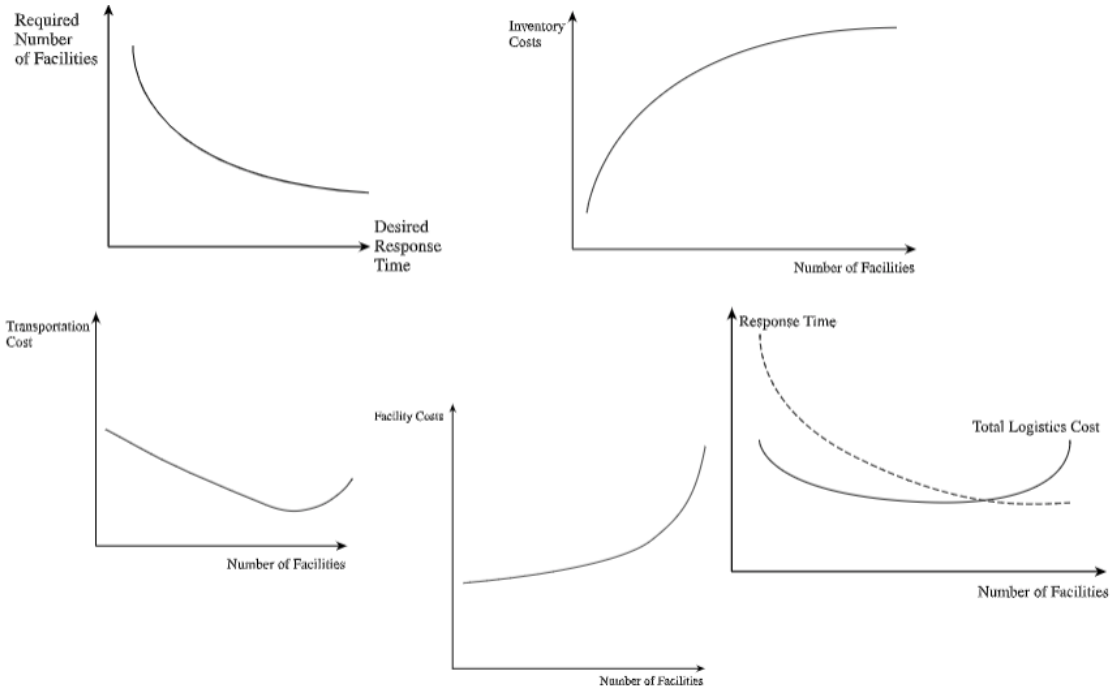
Centralized vs. Decentralized Distribution Network Designs

The major role of physical distribution is to make the product available to the customer where and when the consumer wants. For managers is fundamental to deploy the right quantities of inventory, taking into consideration its costs and the firm's delivery capabilities (De Giovanni and Cariola, 2020). However, the goals for inventory allocation must be compound with a system of facility locations, transportation capabilities and communication network. In this regard, the effectiveness of a distribution network is measured considering a dual standard, composed of total cost and customer service (Bowersox, 1969; Farahani, Rashidi Bajgan, Fahimnia & Kaviani, 2014). Indeed, the main

trade-off that firms have to face is the one between customer service and supply chain costs (Bowersox et al., 2020).

As Chopra (2003) highlights the network types are various. Considering the number of locations of distribution centres and the closeness to the customers, the distribution network types can vary from very centralized to decentralised.

Figure 1: Main trade offs in distribution network design



Decision-making factors

The factors that affect the decision-making of distribution network design and location decisions are: demand factors, service level factors, product characteristics factors, logistic costs factors, proximity-related location factors, accessibility-related location factors and institutional factors (Onstein, et al., 2019).

All the decision-making factors have been schematized in the table below.

Decision-making factors	**Sub-categories**	**Studies**
Demand Factors	Demand level	Chopra (2003); Christopher (2020); Mangiaracina et al. (2015); Onstein et al. (2019)
	Demand dispersion	
	Demand volatility	
Service level factors	Supplier lead-time	Chopra (2003); Christopher

	Delivery time	(2020); Bowersox et al. (2020); Onstein et al. (2019); So & Zheng (2003); Wanke & Zinn (2004)
	Delivery reliability	
	Responsiveness	
	Returnability	
Product characteristics	Product value density	Ashayeri & Rongen (1997); Chopra (2003); Christopher (2020); Bowersox et al. (2020); Onstein et al. (2019); Wanke & Zinn (2004); Xu & Sarker (2003)
	Package density	
	Perishability	
Logistic costs	Inbound transportation costs	Chopra (2003); Christopher (2020); Onstein et al. (2019); Pedersen, et al. (2012); Preeker and De Giovanni (2018); Rouwenhorst et al. (2000); Sople (2010)
	Outbound transportation costs	
	Inventory costs	
	Warehousing costs	
Proximity-related location	Distance from DC to production facilities	Onstein et al. (2019); Pedersen, et al. (2012)
	Distance from DC to suppliers	
	Distance from DC to customers	
Accessibility-related	Distance from DC to motorways	Onstein et al. (2019); Rodrigue, (2020)
	Distance from DC to airports	
	Distance from DC to seaports	
	Distance from DC to inland ports and terminals	
	Distance from DC to rail terminals	
	Transportation infrastructure	

	Congestion between DC and market	
Institutional	Political framework	Bowersox et al. (2020); Onstein et al. (2019)
	Regulatory framework	
	Tax framework	

Given the previously studied factors, this thesis is aiming to identify new factors that affect the decision making of companies in the context of a new DC opening. More specifically, these new decision-making factors will be the impact of the law on freight transportation and the perception of the saturation of the DC. The first can be considered as a sub-category of the institutional factors, since it focuses on the European Regulation 2020/1054.

Indicators of delivery performance

An effective management of the supply chain constitutes a major component of the competitive strategy of a firm, so to increase productivity and profitability. To verify the performance of the supply chain and the achievement of the objectives, the supply chain processes must be measured and compared with a set of standards or performance indicators (Gunasekaran, Patel & McGaughey, 2004). Traditionally, the performance metrics related to supply chain are divided according to the processes to which they refer, namely, planning, sourcing, production, delivery and customer (Gunasekaran, Patel & Tirtiroglu, 2001; Stewart, 1995; De Giovanni and Esposito Vinzi, 2014).

Firms usually focus on the achievement of three measures, that are the quality of delivered goods, on time delivery and flexibility of delivery to meet customer needs (De Giovanni, 2020a). The focus of firms on these three indicators is mainly due to the tight connection of these with customer satisfaction and perceived customer value of the product, that is the ultimate goal of a firm and its supply chain (Gunasekaran et al., 2004).

Performance indicators affected by distribution network design

Distribution network performance must be assessed considering the trade-off that is at the base of designing a transportation network, namely between the ability of meeting customer needs and the cost of meeting them (Chopra, 2003). Therefore, firms must find a balance between these two opposing dimensions.

Under the firm's point of view, the delivery performance indicators mostly considered are the quality of goods and services delivered, on time delivery, flexibility in meeting customer's demand and cost-related indicators, as the transportation and inventory costs (Gunasekaran et al., 2004). In this regard, the distribution planning schedule and the channel layout play an important role in influencing the achievement of these measures (Chopra, 2003).

Methodology

This research can be defined as an inductive study since it has the aim of exploring a new phenomenon (Gabriel, 2013). However, the approach will not be purely inductive, because literature studies on relevant topics for the empirical case will constitute a base in the resolution. Hence, it will follow the approach of a theory supported inductive study.

To investigate the empirical problem statement both primary and secondary data will be used. Primary data is mainly constituted by semi-structured interviews. The advantage of this method is its flexibility, in fact, the researcher can address specific topics in depth but also leave space for the participants to add their considerations (Galletta, 2013). The aim of the interview questions is to understand the impact of the various decision-making factors on DC opening evaluation. To be able to quantify the importance of the factors, the questions will be formulated asking the interviewees to rank the drivers on a scale from 1 to 5 and to explain in depth their motivations. Then through similar types of questions also the link between these drivers and the performance indicators will be analysed, always asking "why" type of questions to get a more complete view.

To increase the reliability of the study, having the right sampling strategy is fundamental. The sample size should be selected appropriately to get relevant and reliable results and to not incur in misleading conclusions (Cleary, Horsefall & Hayter, 2014). Hence, to obtain relevant results, for this study, non-probability sampling is more adequate. In particular, purposive sampling will be applied, that allows the researcher to select specific people or processes to interview or study so to obtain the relevant information for the empirical study (Maxwell, 1996, Taherdoost, 2016). Once the data is collected it will be analysed using a coding scheme.

To increase the reliability of the study, various types of triangulation will be used, ranging from data to methodological triangulation.

Analysis and Findings

During the interviews, questions concerning the actual distribution network design were asked. In particular, these concerned the current problems with the deliveries to the North and the alternatives considered for the opening of the new DC.

The topic was approached first asking about the company's current delivery time. In this regard, it was underlined that it varies between the mainland. The routine deliveries are done considering an A x C time (day 1 order, day 2 process the order, day 3 deliver), but in Lazio they manage also to do A x A orders. In fact, in Lazio, the deliveries are done four times a week and they are divided according to product categories. On the other hand, in the North the products are delivered two times a week and following the policy of realizing full-truck loads. The major problems faced with the clients in the Centre-North is the delivery delay and the lower service level, even though these have higher sales. The managers have stressed the importance of the shops located in the North and how it is fundamental to serve them more efficiently and rapidly. In fact, the alternatives considered for the new DC opening are Bologna and Piacenza.

During the interviews each interviewee was asked to rank on a scale from 1 to 5 the importance of the decision-making factors of the literature, so to verify their applicability also on the case study situation. The factors that were recognized having pushed Risparmio Casa to consider the decision of opening a new DC are mainly linked to service level. Indeed, there is the necessity to increase the service level offered to the stores in the North and being more reactive to demand.

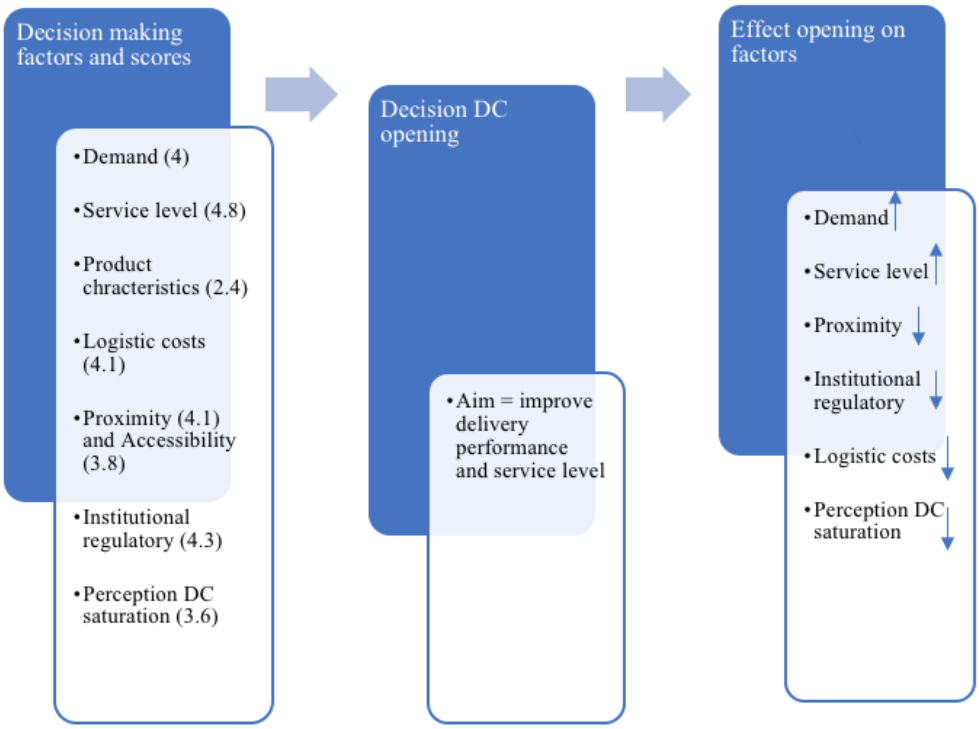
In particular, the factors on which the questions mainly focused on were demand-related, service level factors, product characteristics, logistic costs, proximity-related factors and accessibility-related factors. In addition to these, some questions on two new decision-making factors were asked, so to understand the impact they had on the decision-making of the company. These are institutional-related factors, namely the legislation concerning freight transportation and the saturation of the current distribution network.

The factor concerning the legislation on freight transportation, can be regarded as the most important factor in the decision-making underlying the opening of a new DC. In fact, given the prominence of freight transportation on road in the Italian peninsula, the European Regulation 2020/1054 heavily impact on the delivery time and service level companies can

guarantee. For what concerns, the saturation of the current DC network, not all the interviewees have the same vision. Indeed, the framing and the role of interviewees in the company impact heavily the vision of this factor. The most downstream interviewees in the supply chain, who experience the daily problems with the deliveries, consider it more saturated than the upstream interviewees.

In the following table we can see the dynamics between the decision-making factors and the new DC opening. Moreover, the different average scores obtained by the factors are highlighted.

Figure 3: Dynamics between decision-making factors and delivery performance



This figure is useful to understand the dynamics underlying the relation between the decision-making factors and the DC opening. In fact, it highlights the average score for each factor, given by the interviewees. These different factors push towards the opening of a new DC, of which the aim is to improve the service level and consequently the delivery performance. Lastly, the same opening has an effect on the decision-making factors. Indeed, through the new DC the service level will improve, together with the demand and the proximity to the stores. Moreover, the logistic costs will decrease, coupled with the perception of the distribution network saturation. In addition, the issues related with the

European Regulation on freight transportation will be solved, lowering the delivery delays and resulting in an enhancement of the delivery performance and service level.

Conclusion, Theoretical and Managerial Implications and Future Research

The purpose of the study was to understand the dynamics underling the decision-making of a new DC opening, and how it affects the service level and delivery performance of the company. In this regard, the problem statement aims at understanding what are the factors that are at the base of these decisions for companies. The most highly ranked factor was the service level. Indeed, all the interviewees agreed that improving the service level towards the North is the main reason for opening a new DC. After that, logistic cost factors and proximity related factors are the most important ones. As a matter of fact, through the opening of a new DC, the transportation costs will decrease and a lower delivery time will be achieved. Moreover, to enable the reduction of the delivery time the new DC must be positioned in a central location, easily accessible from the points of sale in the interested area.

The research had also the aim of studying the impact of new decision-making factors, not previously highlighted by the academic literature. In particular, these were the European Regulation 2020/1054 which legislates on the requirements on maximum daily and weekly driving times, breaks and rest periods. The second criterion is the impact of the saturation of the current distribution network and DCs for the decision of opening a new one.

The first decision-making factor mentioned, concerning the regulation, has obtained a very high ranking. Indeed, Risparmio Casa considers it one of the main reasons pushing towards the opening of the DC. The new DC will solve the issues with the delivery delays currently created by the law. Consequently, the service level will improve enormously. The second factor considered is the importance of the saturation of the current distribution network and DC for the opening of a new one. Surprisingly, the ranking was of medium level. However, it was observed that the people who lived daily the problems with the current distribution network gave to the factor a higher score. For instance, the area mangers gave to it double the importance compared to the chief business officer.

Given the empirical and theoretical study conducted, this research has some recommendations for the company. Even though, the interviewees, especially the more upstream ones in the company process, have underlined that the delivery process is still doable with the current network. It is evident that the performance is starting to suffer.

Hence, the decision to open a new DC must seriously be taken into consideration. Moreover, the company should try to have a more bottom-up approach in decisions. Trying to listen more to its employees and area managers, since they live on a daily basis the functioning of the distribution network. In this view, it is remarkable to underline that the upstream managers have always highlighted that the company manages still well enough the deliveries towards the North. On the other hand, the more local managers and director of the stores have reported many issues with the deliveries. In addition, they focused on the opening of a new DC as soon as possible. The last recommendation is to start using delivery indicators. Currently, the company is starting to use the truck occupancy indicator. However, the performance is mainly assessed using the feedbacks of the local managers.

For what concerns the theoretical implications of the research, the latter constitutes a new point of view for the study of the institutional decision-making factors. Indeed, in the previous academic articles these have usually been overlooked and not studied in depth compared to other factors, like the demand or service level ones. However, the regulations and the policies of a country may constitute very strict barriers for the expansion of a company. Especially in the logistic area, there are many regulations to respect for the safety of the workers, hence companies need to find alternative ways to be profitable respecting those regulations.

Moreover, this research has also theoretical implications for the other new decision-making factor studied. In fact, it concerns the effect of framing and perception on the saturation of a distribution network. Namely, how the role covered in a company frames the perception workers have of the saturation of the current distribution network. Hence, logistics has been studied under a more behavioral point of view.

For what concerns the managerial implications, these are very linked to the behavioral aspect aforementioned. It has highlighted the importance of listening more to the workers. Having a more bottom-up approach may help companies and managers to highlight some problems. Hence, future managers should try to consider the workers' opinions since they live daily the companies issues and inefficiencies.

Future research should complete the gaps left by the limitations of this study. It would be useful to quantify the impact of a new DC on the delivery performance of companies, so to underline the economic benefit, also by using digital technologies like Blockchain (De Giovanni, 2020b). Moreover, through a quantitative study it will be possible also to confirm

or not the importance of the decision-making factors. Hence, if the ones more highly ranked, are actually the ones that will be more affected by the new opening.