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Digital business transformation in transport and logistics companies: a global freight forwarder case study

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Master Thesis

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Dedicated to my beloved grandparents

Abstract

The potential for automated negotiation in transport and logistics poses as a great opportunity, despite the unarguable associated challenges. As the complexity of modern supply chains, customers expectations and competitive pressures increase, so does the demand and interest for such digital transformation. Technological innovations are impacting the industry allowing real-time information flows throughout the entire shipment process. Large investments are being made in Electronic Logistics Marketplaces that act as an intermediary, providing online support for transactions between shippers and carriers. In order to leverage technology and Big Data, established players are revisiting their business models.

Via case study, the present research aims to study the approach to the design and implementation of these marketplaces and understand how are the new digital business models being appropriated by global freight forwarders. Interviews, observation and document analysis were the combined methods to gather internal data among the major stakeholders. Business Process Modelling served as an enabler to a systematized representation of the key processes and identification of the current problems.

Bearing in mind a holistic view of the service, the application of the Multilevel Service Design methodology lead to the development of proposed improvements to the existing solution. The collaboration of the shipper in value co-creation, through a dedicated service, poses as one of the final suggestions. The inclusion of all modes of transport is a further recommendation to the company.

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List of abbreviations

3PL – Third Party Logistics

4PL – Fourth-Party Logistics

API – Application Programming Interface

D4S – Drive4Schenker

ELM – Electronic Logistics Marketplace

EM – Electronic Marketplace

FEP – Freight Exchange Marketplace

FTL – Full Truckload

LCL – Less than Container Load

LTL – Less than Truckload

SCA – Schenker Carrier Application

SCM – Supply Chain Management

SCN – Schenker CargoNet

SEB – Service Experience Blueprint

SSA – Service System Architecture

SSN – Service System Navigation

STT – Schenker Track and Trace

TMS – Transport Management System

TOC – Transport Order Confirmation

1 Introduction

Levering technology is currently a key success factor in most industries and e-commerce entices companies of all sorts to go global. Simultaneously, as customers become more demanding, logistics solutions are increasingly more customised to different customer segments. This means that organisations must be both efficient and flexible in their logistics operations in order to fulfill different customers' individual needs. In this sense, third-party logistics providers (3PL's), tradicional brokers and carriers are in continuous improvement and innovation both in terms of processes and information technology.

Aiming to address these issues and having in sight the predicted transformation of the freight industry, many startups and established players made serious investments in Electronic Logistics Marketplaces (ELM's) that support the matching between shippers and carriers. The use of ELM's has promised to lower transaction costs, provide greater visibility of freight movement and reduce inefficiencies in the current transportation and logistics processes. Despite the fact that this kind of marketplaces already exist for over twenty years, they have still not impacted the industry as promoted. And altough the efficiencies of implementing these virtual hubs are promising, their success strongly depends on the support of the interactive actors and agents of the transportation ecosystem.

This research intends to understand how the current hype regarding these technologies will affect the transportation and logistics sector, more specifically, in the European region. Furthermore, the key goal is to support the design and implementation of a service that represents one of the company's steps towards the digital transformation of its business model. A holistic approach will be adopted, fostering customer collaboration and co-creation.

1.1 DB Schenker

The Deutsche Bahn Group (also reffered as DB AG) is an international provider of mobility and logistics services, headquartered in Berlin and operating globally in more than 130 countries and over 300,000 employees. Its structure consists in several business units, one of which this project will be focused on.

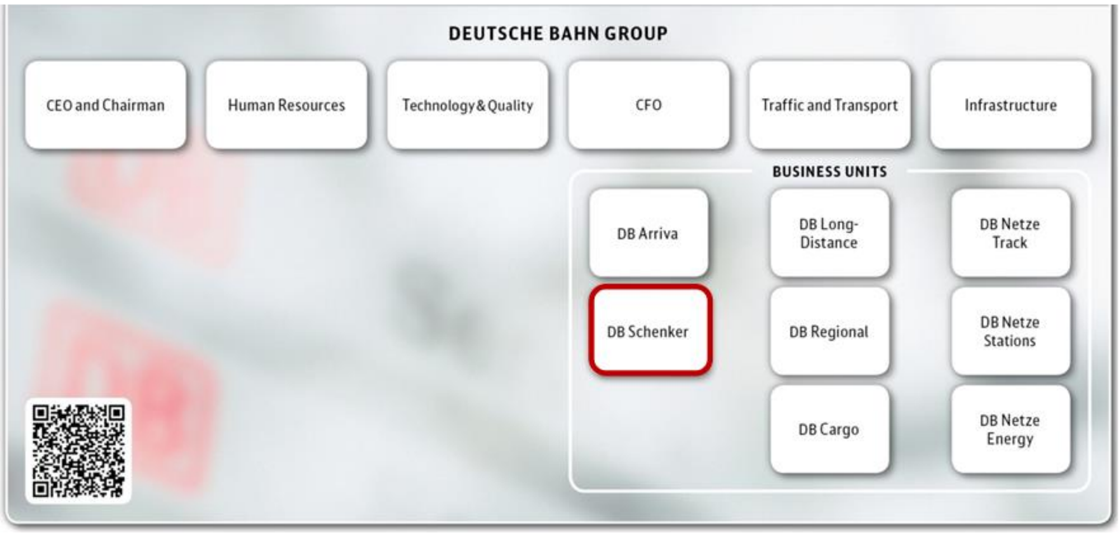

Figure 1 – DB Group's Organizational Structure

DB Schenker is a division of Deutsche Bahn AG (a renowned German railway company) that focuses on transport and logistics activities. The company has over 66,000 employees at 2,000 locations in 130 countries, creating effective connections between various modes of transport and enabling a wide range of value added services. It is a leading global 3PL that supports industry and trade in the global exchange of goods through land, air and ocean freight transport, contract logistics and supply chain management. The company's business holds top positions worldwide in automotive, technology, consumer goods, trade fair logistics, special transports, and special events logistics.

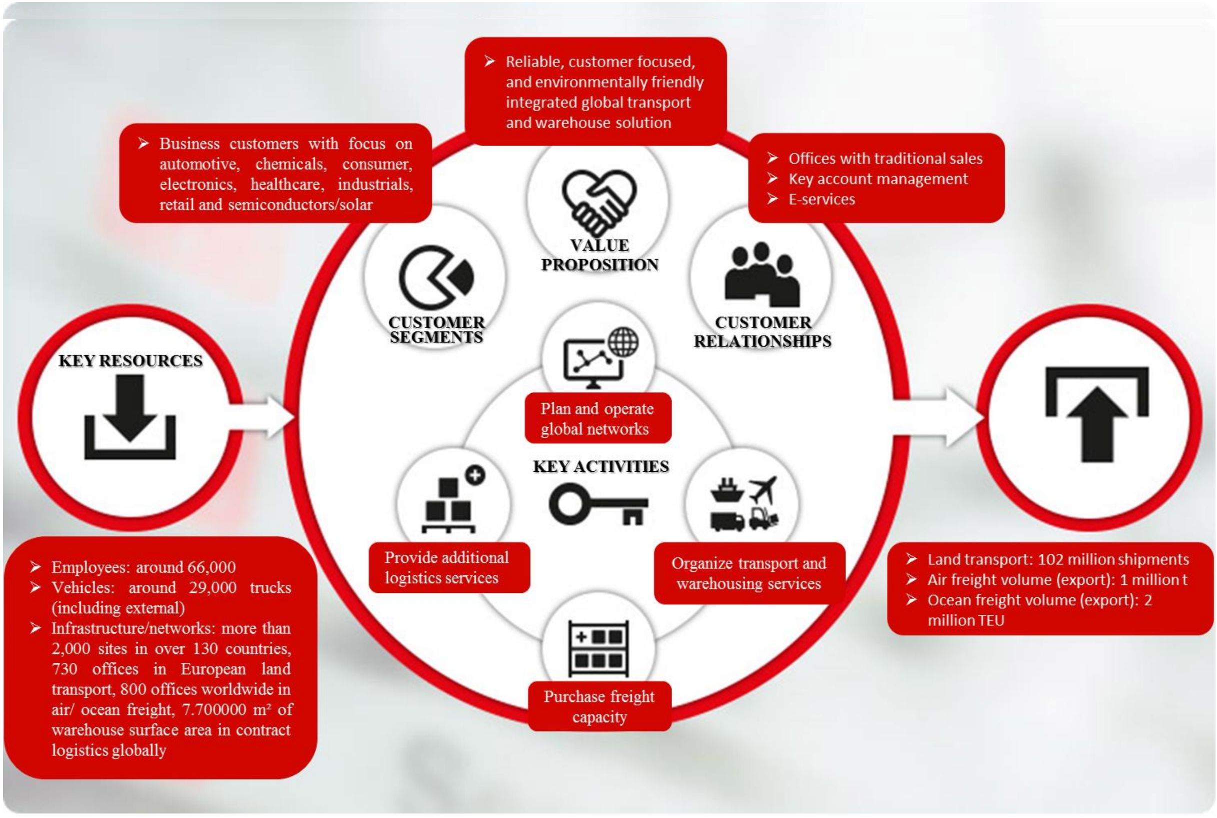

Figure 2 – DB Schenker's Business Model

The wide range of offerings are divided in 6 macro product categories: Land Transport, Air Freight, Ocean Freight, Contract Logistics, Lead Logistics and Special Products. In land transport, the dense network combines the most important economic european regions. Services include time and cost-optimized services for general cargo, partial and full load transport along with door-to-door solutions across Europe. As a global leader in air and ocean freight, DB Schenker offers the entire range of services in this segment. In contract logistics, the services offered cover all stages of the value chain from the supplier to the producer/trade, to the end customer and spare parts service. The core area of expertise is the planning and handling of complex global supply chains.

The present report details a project developed within the Land Transport department. This division ecompasses three services: Parcel Delivery (DB SCHENKERparcel – packages up to 30kg), Part and Full Loads (DB SCHENKERdirect – occupying over 2,5m of truck space) and Multimodal Solutions (DB SCHENKERintermodal and DB SCHENKERrailog).

It is important to refer that at its infancy stage, the following service exclusively focuses on the DB SCHENKERdirect service.

1.2 Drive4Schenker

Drive4Schenker (D4S) is a web-based freight brokerage service connecting the dispatchers and carriers. The project comprises a marketplace for part loads (LTL) and full truck loads (FTL) that aims to reduce costs and increase overall efficiency through processes' digitalization and optimization, thus improving communication and reducing task duplication.

On the dispatcher side, the key features of the platform are the submission/postage of loads and respective assignment to carriers (either by choosing the preferred transporter or by auction). Carrier reviews, pricing, quote comparisons and complete transport monitoring and processing are some of the other features included. On the carrier side, there are two types of interfaces: a web-based platform and a mobile driver app. It is possible to visualize and bid for posted shipments. After being assigned, D4S can be used to access all relevant information related to the shipment, supporting the delivery of the goods. Truck drivers can use the app to inform the shipment status and digitalize important documents.

The service's main goal is to facilitate the load-carrier matching and to provide visibility and control of each shipment as well as to reduce empty runnings and staff costs, therefore benefiting both dispatchers and carriers. In this sense, DB Schenker recently changed its organisational structure to a regional cluster-based management system. Hence, the 36 European country organizations were grouped into ten clusters and the previous four management regions were merged into one region – Europe. Drive4Schenker is gradually being implemented throughout European network, within the Land Transport department of each branch.

The underlying project is allocated to the Iberian cluster (DB Schenker Portugal and DB Schenker Spain), more specifically to the Portuguese branch. It was carried out as a support initiative for the design and implementation of D4S, with the purpose of easing the transition from the currently used systems into the new service platform, identifying limitations and potentially suggesting basis for improvements.

1.3 Project background

> "To keep innovating faster, we partner with companies that use promising digital business models" Markus Sontheimer, CIO/CDO at DB Schenker[1].

The corporate strategy of DB Schenker focuses on the further expansion of integrated and innovative solutions for the entire logistics chain. The target is to grow profitably and increase the EBIT margin on a sustainable basis. In the medium term, the company strives towards growing more strongly than the market in all segments and maintaining its leading market positions. There is a particular focus on the expansion and harmonization of its global IT landscape and further enlarging and concentrating its global network.

In 2016, DB Schenker signed partnership agreement with uShip, a US-based online freight shipping marketplace, for exclusive collaboration in Europe. The 25 million dollars investment in the digital future is known to be the firm's largest equity interest in a digital company to date and "shows how serious they are about innovation at DB Schenker" (CEO Jochen Thewes). This strategic partnership aims to harness new, digital innovations that get

[1] https://www.dbschenker.com/global/about/press/db-schenker-signs-agreement-worth-millions-with-uship-4752

freight moved faster and more efficiently, helping optimize services for customers and partners.

Bearing in mind the large investments made by several players in the industry and the fast-paced technological innovation environment, the present research aims to understand how different approaches to the design and implementation impact Electronic Logistics Marketplaces and how are new digital business models being appropriated by global freight forwarders.

1.4 Report Outline

This first section introduces the company, the project at hand and the research problem.

Section 2 consists in a state of the art review in the relevant areas of the research scope as well as a comparison different alternatives and identification of existing gaps. The following themes are addressed: an overall look at Logistics and Supply Chain Management; a contextual introduction to Electronic Marketplaces; the definition and emergence of Electronic Logistic Marketplaces; an overview to the main issues regarding ELM's over the years; and an industry analysis, where the main current and future trends in the freight industry are studied.

Section 3 presents a qualitative approach to data collection, which entails Observation, Interviews and Document Analysis. It lays out why the different methods were chosen and how they were carried out as well as points out some contingencies and limitations of the presented study.

In Section 4, relevant parts of the project are detailed as result of the data analysis. Furthermore, a Business Process Modelling approach is applied in the Direct Freight *Brokerage Process* of DB Schenker Portugal, allowing overall comprehension of the critical processes and inefficiencies. The current problems are specified and the upcoming changes in regard to D4S implementations are reflected upon.

Considering the data analysis and results, Section 5 contains some socio-organizational implications that must be taking into account when undertaking the roll-out within the Portuguese branch.

Section 6 describes the use of the Multilevel Service Design approach, with the purpose of achieving the holistic perspective initially enunciated. Suggestions to be presented to the project director are also made.

Section 7 entails conclusions and final considerations. On top of the main findings, basis for future research is specified.

2 State of the Art Review

The following section is a reflection on of what has been published on relevant topics by accredited scholars and researchers. It also lays out several key definitions and issues that will be present throughout the dissertation. The final subsection provides an overview of the main ideas discussed during the state of the art review.

2.1 Logistics and Supply Chain Management

There are a multitude of definitions to be found in the literature for logistics. Heskett, Glaskowsky, and Ivie (1973) defined it as the management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility. More recently, the Council of Supply Chain Management Professionals[2] (2012) referred to it as a part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements".

> "Logistics is the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in such a way that current and future profitability are maximised through the cost-effective fulfilment of orders." (Christopher, 2016)

Logistics is an integrated and process oriented function, which coordinates and optimizes all logistics activities, as well as interfaces with other functions including marketing, sales, finance and information technology. Logistics Management activities typically include inbound and outbound transportation, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics service providers (Guedes, 2010). That being said, the ultimate mission of logistics management can be summed up into serving customers in the most cost-effective way.

Likewise, many authors have defined Supply Chain Management (SCM) in different ways, like Ellram and Cooper (1990) that consider SCM to be an integrated philosophy to manage the total flow of distribution channel from supplier to ultimate user. Handfield and Nichols (1999) define SCM as the integration of activities associated with the transformation of raw materials to the end user. For Zheng, Yen, and Tarn (2000), SCM is the process of optimising a company's internal practices and improving the interaction with its suppliers and customers. Moreover, Noorul Haq and Kannan (2006) mention SCM as an emerging field that has commanded attention and support from industry. They define supply chain as the link between entity from manufacturing and supply to the end user.

Supply Chain Management is a wider concept than logistics, as well as a more recent one. Logistics is essentially a planning orientation and framework that seeks to create a single plan for the flow of products and information through a business. SCM builds upon this framework

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[2] CSCMP Supply Chain Management Definitions and Glossary

and seeks to achieve linkage and co-ordination between the processes of other entities in the pipeline, i.e. suppliers and customers, and the organization itself. Thus the focus of Supply Chain Management is upon the management of relationships in order to achieve a more profitable outcome for all parties in the chain. This brings with it some significant challenges as there may be occasions when the narrow self-interest of one party has to be subsumed for the benefit of the chain as a whole (Christopher, 2016).

Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the Logistics Management activities, as well as manufacturing operations, and drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology (Guedes, 2010).

On behalf of a company, a third-party logistics provider (3PL) manages, controls, and delivers logistics activities ranging from the direct management of a company's supply chain to the sourcing of capacity for a single shipment in a spot market. The services offered by 3PL providers give firms the opportunity to lower their operating costs, gain greater flexibility in their supply chains, and to further concentrate on their core business activities. Hence, freight forwarders move cargo from one point to another, while 3PL move, store, and process inventory, and in doing so, may provide traditional forwarder services (e.g. DB Schenker). The extensive use of the term freight forwarders in the present research also comprises 3PL’s.

Ploos van Amstel and Van Goor (2001) identifies two main types of orchestrator companies for transportation logistic chains: 3PL, which orchestrate the logistic processes and assure they are well executed according to a current logistic concept and 4PL (fourth-party logistics providers), which orchestrate the supply chain and are responsible for the design of the logistic concepts.

Visser, Konrad, and Salden (2004) consider that 3PL leads the operation, but its client controls the strategy for the basic concepts used in the supply chain. While they improve the effective operation of the chain, they do not get involved in the discussion of strategy and logistics concepts. On the other hand, 4PL suggest how to reconfigure the supply chain in terms of space and functionality in order to cut costs and improve services. The 4PL develop intense knowledge and logistics competence, and provides studies for its client to improve the chain. Thus, they suggest, design and implement new solutions in the supply chain.

There is, however, considerable disagreement about the exact meaning of these terms, both in existing literature and in practice (Van Der Putten, Robu, La Poutré, Jorritsma, & Gal, 2006).

Outsourcing logistics and supply chain management functions to the responsibility of 3PL providers is a strategic move that many companies undertake (Aguezzoul & Pires, 2016). Several studies (Li et al., 2012; Lieb & Bentz, 2004) have indicated that in many industries, the use of 3PL have grown significantly over the last several years.

2.2 Electronic Marketplaces

The use of information technology in business transactions takes many different forms and is widely known as electronic business (e-business). Information technologies are part of the inter-organizational systems that exceed the boundary of a single company (Wozniakowski & Jalowiecki, 2013). The Internet has enabled companies to create new marketspaces that facilitate information exchanges and all sorts of electronic interactions among multiple buyers and sellers. Over the years, numerous authors have discussed such electronic marketplaces (EM's) with different names and definitions under different contexts, such as marketspace, electronic exchange, electronic market, e-hub, electronic network, portal, and auctions.

Bakos (1991) published one of the earliest and broadest definitions, characterizing an EM as "an inter-organizational system that allows the participating buyers and sellers to exchange information about price and product offerings". In a whitepaper published by IBM, i2, and Ariba (2000), an e-marketplace was defined as a many-to-many, web-based trading and collaboration solution that enables companies to buy, sell, and collaborate more efficiently on a global scale. Daniel, Hoxmeier, White, and Smart (2004) narrowed down the definition to "web-based systems which enable automated transaction, trading or collaboration between business partners". He argued that web-based systems have distinct features compared with traditional inter-organizational systems, such as EDI and extranet.

An e-marketplace can be described as a B2B Internet platform providing an Internet-based solution that aims at facilitating new trading relationships between companies, or supporting existing ones. It matches buyers and sellers together in a digital form in order to conduct pre-sales activities, transact sales, and complete post-sales activities. EM's can represent a more efficient and less expensive way to sell products or provide services globally, without geographical barriers. It reshapes the buyer-seller relationships, improves business processes and helps reach new markets or segments through the electronic medium (McIvor, Humphreys, & Huang, 2000). The main idea is to aggregate several market players in a single contact point with real-time information exchanges, allowing participant organizations to enjoy greater economies of scale and liquidity; and to buy or sell anything easily, quickly and cost effectively.

EM's perform the same functions as real world marketplaces. The difference lies in the outcome, which can be presented as more efficient markets, with increased effectiveness and reduced transaction costs. There is competition between suppliers and buyers, but the e-marketplace provides a space which also facilitates cooperation. This is important especially for logistic networks, where coopetition is essential for binding members together and for creating value. Also, in contrast to traditional marketplaces, in electronic markets buyers and sellers are not physically present in these markets and can make transactions from any location with internet access. Goods are not physically present in the electronic marketplace which has to be compensated by an appropriate description of the goods in the electronic catalog.

In order to describe an EM, there are six dimensions that help differentiate it from the traditional markets and need to be taken into account: business model, order processing mechanism, revenue model, market characteristics and product specifics and e-marketplace services. These diverse dimensions are partially related to each other, but they are important for an integrated marketplace characterization (Nedelea & Baditoiu, 2010).

As it was previously referred, electronic marketplaces are a kind of inter-organizational information systems, which connect information systems of many companies. Inter-organizational systems differ in the degree of integration of information between companies and the degree of transaction completion. In particular, these differences are noticeable among the EM's, which vary from one another in the degree of complexity, type and scope of services offered to companies and the scope of support for transaction (Grieger, 2003).

2.3 Electronic Logistics Marketplaces

Although a great deal of research concerning electronic marketplaces has been carried out throughout recent years, there are only a few studies which investigate EM's specifically in logistics. This scarcity of relevant literature regarding the development of electronic logistics/transport marketplaces is partially related to the fact that publications on multimodal transports do not yet focus on the trading of freight transports, but rather deal with their efficient routing and handling (SteadieSeifi, Dellaert, Nuijten, Van Woensel, & Raoufi, 2014).

Still, both in the literature and business practice, electronic marketplaces for transport and/or logistics are also referred in various distinct terms: online freight exchanges, online freight marketplaces, electronic transport exchanges, freight exchange marketplaces, transportation electronic marketplaces, among many others. In this paper, it has been chosen to refer to them as Electronic Logistics Marketplaces (ELM's).

2.3.1 ELM definition

An ELM is a specific EM model, which acts as an intermediary facilitating the exchange of logistics services. The basic role of these marketplaces is to bring multiple carriers and shippers together in a virtual market space and provide software, tools and services to facilitate communication and transactions between them (Marasco, 2004). They are usually constituted by three key parties: shipper, carrier and the technology provider, with the primary objective of reliable delivery. As the functions offered by ELM's differ, there may be other parties involved such as freight forwarders and financial service providers (Wang, Potter, & Naim, 2007). Being so, the use of the term Freight Exchange Platforms (FEP's) is related to a specific type of ELM's that strictly handle the relationship between freight forwarding companies and carriers.

Since the 1990's, two types of ELM have emerged: open and closed (Skjøtt-Larsen, Kotzab, & Grieger, 2003). The former refers to marketplaces where offers for and demands after transport services find one another without having formal entry requirements, being spot trading a typical example of such. Open systems adopt "many-to-many" transactions and utilise fixed and/or dynamic pricing. In this type of approach, any shipper or carrier can sign up and make use of the system as often as they like.

A closed ELM tends to be more focused in the needs of particular shippers and/or carriers. While an open ELM focuses on identifying and selecting trading participants, a closed one tends to concentrate in the transport planning and execution and long-term value-added activities between shippers and carriers. In the latter, transport rates are usually pre-defined through contracts and one of the partners will normally act as the "lead" partner in any ELM. Furthermore, membership is only available to those who are invited to collaborate.

To a certain degree, open ELM's have the same operational model as generic trading EM's, which have already been previously mentioned and well discussed in the literature (Eng, 2004; Howard, Vidgen, & Powell, 2006; Kathawala, Abdou, & Von Franck, 2002; Rayport & Sviokla, 1994). Early studies of ELM implementation from the logistics service providers' perspective pointed out a limited adoption of such platforms within the industry (Lynagh, Murphy, Poist, & Grazer, 2001). It has also been argued that the logistics dimension of EM has been largely neglected and there is a very real need for empirical research to fill the gap. Furthermore, (Kale, Evers, & Dresner, 2007) claimed through a theoretical model that shippers may benefit from establishing private communities. Overall, there has been limited research on closed ELM's, especially when it comes to empirical studies (Wang et al., 2007).

The first ELM's were open platforms such as, for example, www.teleroute.com. Despite the advantages of lower search and coordination costs, obtaining a large volume of transactions is no longer enough for this type of intermediaries. It has been observed an increasing need for companies, namely shippers, to preserve their linkages with preferred business partners (Qizhi Dai, 2002). This lead to the recent development of closed ELM's based on relational line, emphasizing the extent of their services (similar to what has happened when the 3PL's strategies moved from offering several fragmented services to providing "one stop shop" solutions). Hence, the operational scope provided by these marketplaces goes beyond basic load posting and matching tasks, evolving towards complex offerings that go as far as complete order fulfilment services. The expected results are improved pipeline visibility and more efficient planning, execution and responsiveness, impacting the entire supply chain (Cruijssen, Cools, & Dullaert, 2007).

Moreover, it is also notable the increasing awareness that logistic operators must offer tailor-made solutions for each customer segment, to avoid underserving or overcharging customers. Those who attempt to satisfy all marketing needs are vulnerable to developing non-differentiated offerings when specific customization is required, consequently becoming exposed to higher costs and poor customer service (Fuller, O'Conor, & Rawlinson, 1993). In order to deliver tailored logistics, is necessary to adopt a proactive approach to the management and execution of the underlying activities, rather than a reactive one. Companies have to streamline their operations, build flexible system configuration and connectivity with different business partners and ensure complete real-time visibility of the information flows to support decision making (Murtaza, Gupta, & Carroll, 2004).

2.3.2 ELM's mismatch between expected benefits and real benefits

In late 1990's-early 2000's, during the "dot.com boom", ELM's went through a period of consolidation. Although plenty of initiatives were launched, many failed to attract the sufficient mass of market participants in order to sustain their operations and ceased trading. This proliferation was driven by the promise of a dynamic integration of transportation into the supply chain and improvements in the operational efficiency, and further stimulated by the revolutionary potential of the Internet. Despite claims of significant value creation opportunities, high rates of failure were experienced by most of these new web-based intermediaries which resulted in many bankruptcies, mergers and acquisitions (Wise and Brennan, 2000). On the other hand, some players survived this market downturn and remained operational. Evidence of such phenomena is found when comparing the marketplaces identified by e-logistics Magazine in 2001 (comprising a total of 236) with the number of companies operating on the web on January 2005. Only 104 ELM's were still working, whereas the rest of them quickly exited during the so-called "dot.com bust" (Regan & Song, 2001).

The transportation sector has lived through several stages throughout the years. Nevertheless, it is considered to be a heavily fragmented and fiercely competitive industry, which operates on low margins. Hence, it has historically been relatively slow to adopt technologies (Nandiraju & Regan, 2008). With the current configuration of the market and climate of disruptive technological advances, it becomes relevant to study their business model, explore potential features that can positively affect their ability to survive in such a competitive environment and build long-term profitability, as well as industry acceptance.

Nowadays, new markets are rising and the customer base is growing due to the increasing globalization and flow of goods, people and information. Moreover, regulatory measures support easier and smoother international trade. As a consequence of the 2008 economic crisis, many industries reengineered their business processes aiming to reduce costs and increase performance. Consequently, shippers, carriers and logistics service providers were forced to operate under lower costs, while maintaining the same quality standards. In order to achieve such goal, several companies implemented cooperation and integration strategies, thus making a more efficient use of their resources and capabilities (SteadieSeifi et al., 2014).

When comparing to traditional marketplaces, the role played by ELM's may result in a wide range of advantages for shippers and carriers, namely in smoothening the complex negotiation process and reducing its transaction costs. Both parties can get access to more business opportunities and geographical scope without incurring huge expenses on advertising. Shippers can experience lower freight bills and carriers benefit from a significant reduction of empty backhauls, thus improving utilization of their transport assets. Agents come together in a single platform and current market clearing prices are available in real-time, resulting in a reduced complexity of the decision-making, higher price transparency and savings on purchasing costs due to the increased competition in the supply market (Nandiraju & Regan, 2008). Online marketplaces are able to gather large amounts of data, which can be pro-actively used by carriers to leverage and improve service efficiency and lower costs (Goldsby & Eckert, 2003). Moreover, these companies may also experience gains stemming from automation of internal processes (process efficiency, staff reduction, time savings, improved quality of information flows, etc.) and from access to technological upgrading without high initial investments (Marasco, 2004).

But there has been a mismatch between the value creation potential of ELM's and the actual reality of these marketplaces, which can be traced to several drawbacks that exceeded the attractiveness of their latent advantages (Marasco, 2004).

Despite the announced merits of online marketplaces, some shippers believe that trust, which is vital for maintaining good business relationships, is hard to build without person-to-person negotiations. The spot nature of transactions is not consistent with the emphasis on stable relationships with providers that mostly characterizes the procurement of transportation and logistics services. The vast majority of transport rates are negotiated under long-term contracts that secure several aspects of service level beyond price for the procurement of transportation services. In this respect, it becomes clear that as quality requirements for logistics services are increasing (accurate timing, treatment of shipment, etc.), shippers are less inclined to hand their shipments to unknown carriers (Alt & Klein, 1998). It has been noted that, while for years buyers have moved towards a consolidation of the supplier base and a stronger emphasis on long-term, collaborative relationships with transportation providers, ELM's are driving in the opposite direction, by extending the supplier base and fostering price-based competition (Pompeo & Goulmy, 2001).

Additionally, some shippers struggle to embrace ELM's as they usually do not assume responsibility for the actual movement of freight. In fact, matching the shipper with the best carrier based on the shippers' criteria is their only task (the exception being, of course, 3PL's that own marketplaces or carriers who host private marketplaces). In neutral marketplaces, monitoring the execution and performance of business entities is not an easy job (Nandiraju &

Regan, 2008). This issue can only be overcome if ELM's avail reliable information about agents that work within their network. Otherwise, assuring safe transactions, which is mandatory if these marketplaces want to reach the masses, will be impossible to accomplish and their viability will be compromised.

From the carriers' perspective, the greater amount of information available with the marketplaces results in high pricing pressures, which make them reluctant to participate. On top of this price transparency, the use of reverse auctions[3] to close transactions with shippers is likely to significantly reduce the profit margins of carriers. Likewise, participating in such marketplaces may negatively affect the pricing strategy of the carrier, as lower prices sold online may undermine the contract prices (Chow, 2001).

Technological issues are also part of the reason why these marketplaces have not been used more extensively. While rushing to enter the market, many operators have given little attention and made conservative investments in technology. This has proven to be among the main inhibitors of wider participation (Marasco, 2004). Other factors contributing to the low use of these portals are their lack of compatibility and inoperability with the shippers and carriers legacy information management systems. Furthermore, another major hindrance of ELM's is suggested to be the poor quality in terms of navigability, content comprehensibility and quality and grade of interaction (Sweeney et al., 2004).

Föhring and Zelewski (2015) undertake a modern-day discussion on the complex endeavor related to the development of an ELM. The ORFE prototype posted notable challenges in an early development stage, related with the reconciliation of contradictory opinions about functions and processes of the different potential users. This complexity can also be seen by the failure in launching the commercial platform within the scheduled date of both "Cargo Platform" and "Freight-One".

Additional problems that pose as obstacles to the successful establishment of e-logistic marketplaces are debated. According to Föhring and Zelewski (2015), lacking acceptance and providing a mediation rate of less than 5% will lead to the failure to reach the critical mass. This will make the automation of processes irrelevant because forwarders and transport carriers will keep settling their transactions in the traditional way. May this obstacle be overcome, there is still the problem related to the fact that ELM's are more suited for the mediation of transport services that are dealt with through spot markets. But contracts are still the most utilized way to carry out transport services. In this sense, these marketplaces have to either control the existing spot market or to strengthen the "spot character" of transport services in general.

Endemann, Tracksdorf, and Kaspar (2012) summed up the challenges in the implementation of ELM's to four central real problems: loss-free operating, disclosure of competition-sensitive data, required experience from the operator and necessary inclusion of multimodal transportation.

The first two problems post the challenge of minimizing operation costs and assuring the reliability, professionalism and discretion of the operator. The optimal situation would be a

[3] A reverse auction is a type of auction in which the roles of buyer and seller are reversed. In an ordinary auction (also known as a 'forward auction'), buyers compete to obtain a good or a service by offering increasingly higher prices. In a reverse auction, the sellers compete to obtain business from the buyer and prices will typically decrease as the sellers underbid each other. (Michael, L. (2010). Marketing: Defined, Explained, Applied. Pearson Education India.)

marketplace that encompasses an auction system with multimodal transport services, runs with the lowest possible initial costs for users, operates loss-free by an impartial party, strives for information transparency and supports pre- and on-carriage via other traffic carriers.

Taking into account the expected tendencies to happen in the logistics scene, it is logical to consider that a promising ELM has to be able to link several carriers in a multimodal transport network. Moreover, it is clear that the first, second and third problems are due to the central nature of the marketplace. A single operator has to bear the costs for the provision of the infrastructure, disposes of the data of all members and has to reassure potential users about their expertise for the purpose of customer acquisition (Föhring & Zelewski, 2015).

2.4 Current Industry Trends

The freight industry is undergoing through deep changes in the present, with digitalization as the common denominator. The recent surge in technological innovation and adoption, frequently referred as the Uberization of Freight (see Appendix A), lays out the possibility of a transformation similar to what happened to other industries, namely the Taxi or Hotel business. This becomes even more critical when considering that carrier/forwarder relationships frequently function as a bottleneck for otherwise optimized supply chains. Three key emerging trends threatening traditional business models:

2.4.1 Eroding margins and commoditization of core logistics services

Declining oil prices, raising labor costs and increased competition have shifted market dynamics. In addition, overcapacity and freight rate volatility create opportunities for spot rate shipment business and make room for new entrants who easily get more attractive rates from carriers.

The global survey of industry leaders (Freightos, 2016) featured respondants from top 100 logistics companies, out of which 19 were top 20 global 3PL's. The survey results point out that the core freight forwarding components (land, ocean and air transport) are significantly less profitable than other business operations (value-adding services being the most lucrative).

Eroding margins in commoditised and fragmented forwarding services make it harder for 3PL's to increases their sales. Differentiation and cost optimisation can be achieved through improved online customer experience and automation, especially for medium-size shipper business and spot shipments. This mid-size customer segment and spot shipment market are at the core of the digital move.

According to Roland Berger[4] (2016), for several years now experts have questioned the long-term sustainability of forwarder business models. With future profitability at stake, large forwarders are forced to make use of their experience at managing market dynamics. In short to medium term, they must leverage their resources and capabilities to squeeze profit margins from air and ocean freight. But, when looking at a long term prespective and bearing in mind the continuity of overcapacity and a growing modal shift from air to the less profitable sea shipping[5], the situation appears to be chronic.

[4] http://www.rolandberger.ch/media/pdf/Roland_Berger_Challenges_in_sea_freight_forwarding_20130514.pdf

[5] http://www.joc.com/air-cargo/international-air-freight/shift-ocean-erodes-air-cargo-marketshare_20140319.html

2.4.2 Shifting customer expectations

The rapid growth of cross border e-commerce is forcing change and innovation. Automation starts from the purchase order and follow a pattern where service level is key. Sellers can sell overseas with built-in online freight services offered by marketplaces or forwarders (as part of their e-commerce suite). Furthermore, the so-called “millennials” are entering the workforce. In 2020, 50% of the workforce will be millennials, who are more comfortable handling activities in a mobile, instant and network connected way (Drewry, 2016).

As a consequence of such, customers are becoming more demanding with higher and more volatile expectations. They expect transparency, more frequent, market-relevant pricing and enhanced supply chain IT support (Meidutė-Kavaliauskienė, Aranskis, & Litvinenko, 2014). This also exacerbates profitability and creates a vicious cicle, where expectations drive innovation and force forwarders to continuously match each others offerings, further driving customer demands to the next level (e.g. track and trace technology).

The inquirees of the above cited survey rate *reliability* and *cost* as the most critical factors for shippers when selecting providers, while communications, crisis management and a personal relationship rate well behind (Freightos, 2016). While the other factors are people-intensive (therefore increasing expenses to already tight margins), improving cost can be attained through identifying and eliminating inefficiences. Additionally, the respondants elected *tracking* and *real-time booking* as the two IT capabilities most demanded by shippers, both which give customer transparency and can save time (thus reducing cost) for forwarders and shippers while improving service reliability.

Shippers are expecting logistics providers to find those efficiencies by automating processes. These changing supply chain trends are primarily manifested in shorter contract lengths, increased spot quoting, and provider consolidation (Freightos, 2016).While service providers are ever more focused in customer retention and in their customers’ needs, the success in processes optimization is yet to be a reality in the industry (Drewry, 2016).

2.4.3 New emerging entrants

New players are gaining market traction and established businesses are either resisting change or adapting. Among the new business models are: online sales platforms, cloud-based freight forwarders, e-commerce and tech giants, mid-size forwarders technology-driven networks, rate automation technology providers, TMS providers and carriers (see Appendix B for a detailed description)

Several large 3PL’s are investing in the transformation to online business with tariffs under control with dynamic sourcing, automating pricing, routing and sales, online portals with instant quote and easy execution through automated process handling; and electronic feeds with marketplaces and carriers to provide dynamic pricing efficiently. Some of the leading freight forwarders are:

- Hellmann that currently uses Freightos AcceleRate, a rate management and auto-quote system that optimizes operational efficiency across all modes[6].

[6] https://www.freightos.com/freight-rate-management-hellmann/

- Kuehne+Nagel which introduced KN Freightnet, an online platform for placing air freight orders that cuts down the time spent on obtaining quotes, placing bookings and tracking shipments[7].
- DHL with the recently launched ELM named Saloodo! that aims to give shippers end-to-end (E2E) control of their FTL and LTL shipment processes (order matching, tracking, documentation and payment processes) within a single platform. A dynamic transport quote calculator, derived from a continuously growing real-time database combined with analysis of substantial transacted data collected over the years, will assist transport companies to make competitive quotes for each shipment and help them succeed in winning the loads they need[8].
- M.E. Dey & Co, a freight forwarder that provides web-based, 24/7 shipment status updates adopted CargoSphere Rate Mesh, a connected network of industry parties that receive and distribute updated freight rates confidentially online. CEVA logistics and MIQ Logistics also implemented the CargoSphere rate platform[9].

However, a clear gap has been identified between the few forwarders fully embracing digitization and an online experience and the others who show even slower service response time.

A mystery shopping survey[10] of twenty top forwarders (including DB Schenker) was conducted by Freightos (2017). It tested how well the forwarder supported online sales with their website infrastructure (specifically in driving website visitors and pushing them through the sales cycle), how well the forwarder dealt with the inbound lead (namely through responsiveness through automated confirmation email or salesperson contact) and how well the forwarder was in following up and closing the sale. The results show that for most forwarders, automation and online sales are not yet a reality:

- Most forwarder’s processes are still manual. It took on average 101 hours (4 days) to provide a simple manual spot quote, 11 hours longer than in 2015.
- It took an average of 15 hours to personally follow up a quote request (7 hours in 2015), only 9 out of 20 forwarders provided a quote (the same number as in 2015), and only three subsequently followed up (one less than in 2015).
- Kuehne + Nagel is the first major forwarder to instantly quote multiple modes on their website without a paywall.

2.5 Future Challenges

For decades, the international freight industry saw consistent growth. However, the last five years have been unstable for the entrenched players. Despite that, logistics experts and freight forwarders are confident that the key role of 3PL and forwarders will remain as crucial as it is.

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[7] https://www.kn-portal.com/airfreight/kn_freightnet_for_airfreight/kn_freightnet_overview/

[8] http://dhl-freight-connections.com/en/freight-fast-forward/

[9] http://cargosphere.com/pressreleases/me-dey-adopts-cargosphere-frictionless-rate-networking/

[10] The mystery shopper posed as a rapidly expanding US-based importer, requesting a quote for a door-to-door LCL shipment from a city in China to Chicago

Additional results from the global survey of industry leaders, show that 60% of the senior logistics decision makers that were inquired believe that the they will play an expanded role in five years time, while 18% believe they will hold their existing market share. nearly 90% of the inquired forwarders believe that technology will secure their future, which indicates a changing tide within a supposably tech-adverse industry Also, they believe data will have much more impact than hardware technology

The complexity of their tasks such as customs and compliance is undenyable and success requires sensitivity, trust, orchestration and troubleshooting. In this sense, experience is core and new comers lack years of field knowledge. But while scepticism about new entrants is still a reality, the industry might be in the verge of disruption.

Transactions that are now performed by traditional freight forwarders can rapidly go digital (towards comoditization), in the form of online sales, instant orders and automated processes, including crossdocking. This investment in e-business will first affect sales before reaching the complete automated execution of all aspects of services. Customs and compliance will remain complex. Moving to online sales requires automated competitive pricing and re-engineered sales processes which is not easy to achieve at global level. These current and upcoming changes must be watched closely and acted upon as they simultaneously post as threats and opportunities for both current intermediaries and new entrants.

According to SCM consultants Drewry (2016), the industry data revolution will start with:

- API technology development as an accelerator with the dynamic real-time integration of pricing, schedules, bookings, shipment visibility with customers, carriers and marketplaces;
- Rate automation technology, externalised schedule information and shipment visibility sources facilitating online sales and marketplaces expansion with easy quote/book/track functions;
- TMS vendors supporting the transition and providing end to end integrated process and flexible B2B capacity to integrate with partners' community and marketplaces at a global level. For large forwarders, decision tools and deeper integration with carriers will further facilitate shipment and allocation optimisation.
- Better informed shippers using Big Data solutions, with access to a simplified spot rate market and to insights sources providing rate transparency, carriers' service schedules, shipment execution visibility and performances. Moving further, insights on empty equipment stock and availability could be expected to assist shippers and their forwarders in their shipment planning.
- Large shippers with access to more procurement options, benchmarking and insight capabilities and will continue to tender their sea-freight and land transport, directly with their core carriers and with their forwarders for some part of their volumes. This practice will be available to many at a lower transactional cost with more flexibility using tailored e-RFQ tools.
- The small and mid-size shipper, spot shipment and LTL segment moving online extensively through complete web based forwarding services as well as online sales platforms which dynamically push public and customer-specific rates. These platforms may only target and penetrate specific markets where a certain degree of automation can be achieved.

3PL's who miss their digital transformation may see their business limited to customs and documentation service or consolidation. Mid-size forwarders are also at risk, but can expand through specialisation and collaborative technology driven networks. The 4PL model is subject to change with the ability of specific expert teams to orchestrate transport through cloud solutions and B2B portals. 4PL for e-tailers is likely to grow. Technology can facilitate the emergence of "high tech" 3PL niche players (vertical market) who can provide shippers with tailored shipment planning, control tower dashboards and integration services.

2.6 Overview

The following section contains a synthesis of the main ideas to withdraw from the state of the art review:

- The transport and logistics sector is heavily fragmented, fiercely competitive and historically slow to adopt technologies.
- Electronic Logistics Marketplaces are specific Electronic Marketplaces that brings together multiple carriers and shippers in a virtual market space and provide software, tools and services to facilitate communication and transactions between them.
- Freight Exchange Platforms are a type of ELM's that strictly handle the relationship between freight forwarding companies and carriers.
- There is limited research, especially when it comes to empirical studies, on the logistics dimension of EM's and on closed ELM's (offer transport planning and execution and long-term value-added activities suited to the particular needs of shippers and carriers),.
- The mismatch between the expected and real benefits of ELM's lead to high rates of failure in their adoptions in the late 1990's-early 2000's
- The reasons for shippers' unwillingness to adopt them were lack of trust in virtual transactions, reluctance to share important data and problems with the non-accountability of the ELM's for the transported goods.
- Carriers were also averse to ELM's because of the high pricing pressures and reservation in sharing competition-sensitive data.
- Technological issues such as conservative investments, lack of compatibility/operability with some information management systems and poor quality in terms of navigability, content comprehensibility and quality and grade of interaction.
- The necessary industry know-how of the operator and the multimodal transport complexity represent further challenges to the adoption of ELM's.
- Current industry trends are going towards eroding margins and commoditization of core logistics services (land, sea and air transport), shifting customer expectations (more demanding) and threating new entrants with disruptive business models (online sales platforms, cloud based services, rate automation services providers, tech giants and other already established players).
- Future challenges to freight forwarders include adapting to the digital business transformation (in the form of online sales, instant orders and automated processes) and being attentive to the competition.

3 Methodology

The present research has the main objective to understand what is the response of global freight forwarders to up surging disruptive business models and how the design and implementation approach affects ELM's.

As previously identified, there is a shortage of relevant literature regarding the logistics dimension of EM's. Another gap identified in the state of the art review is related to the lack of empirical studies of closed ELM's. Only few (Andres Figliozzi, Mahmassani, & Jaillet, 2003; Marasco, 2004; Wang & Naim, 2007) draw experimental conclusions on these types of marketplaces. Still, they are ancient and therefore do not encompass the transformations throughout the following years which are vital to the validity of the results.

Additionally, there is also research gap in studies of ELM's through a Service Design perspective, enticing a holistic perspective and customer collaboration in value co-creation. Value co-creation has been thoroughly conceptualized in the service field, but empirical studies are scarce (Pinho, Beirao, Patrício, & P. Fisk, 2014). Filling these three literature gaps represents another research objective.

Moreover and also aiming to understand what will be the positive and negative implications of the implementation of D4S in the Portuguese branch, as well as to provide basis for support in the transition towards a digital business model, a qualitative research was designed. This type of research consists in the development of concepts which help us understand social phenomena in natural (rather than experimental) settings, giving due emphasis to meanings, experiences and views of the users (Pope & Mays, 1995).

As already used by Wang et al. (2007) in the production of concrete empirical evidence while evaluating different types of ELM's, associated business models and relationship with tailored logistics, the present research will use a case study methodology, involving semi-structured interviews, data analysis and process mapping. Once more, to achieve the main goals of the present research, a Service Design approach was used to study the topic in a holistic way.

3.1 Data Collection

The elected techniques to gather qualitative data from the stakeholders were Observation, Semi-structured Interviews and Document Analysis. This decision was made bearing in mind the need for feasibility, convenience and efficiency due to the complex, fast paced company environment. Furthermore, the lack of a sampling process is related to the fact that the corporate reality had to be studied has a whole. Thus, participation requests were sent to most collaborators of the Portuguese branch.

3.1.1 Observation

Observation is used as a research method in two distinct ways – structured and unstructured (Pretzlik, 1994). Structured observation is a discrete activity whose purpose is to record physical and verbal behaviour. Observation schedules are predetermined using taxonomies developed from known theory. In contrast, unstructured observation is used to understand and interpret cultural behaviour. It is based within the interpretist/contructivist paradigm that acknowledges the importance of context and the co-construction of knowledge between researcher and 'researched' (Mulhall, 2003). For that reason, the chosen approach for this research was the unstructured observation. Field notes were the most important tangible item supporting the data collection and were usually whenever an incident occurred and in the end of each day.

Observation was important in order to gain a close and intimate familiarity with the Department employees and their practices. An intensive involvement with people in the users' cultural environment was easier within the Direct Freight department, when comparing with the carriers and respective drivers, since the relationship with the dispatchers was developed under an extended period of time than with the latter. Moreover, it is important to refer that the willingness to collaborate was much more noticeable within the company's personnel.

Throughout the observation, a total of 17 professionals were invited to participate. As visible in Appendix C, 14 DB Schenker collaborators from multiple departments were part of the study, with more focus on the Land Transport department. Nonetheless, the study of the *status quo* of other departments was also targeted due to the criticality of the communication among different collaborators. The fact that there is departments that perform activities covering the full range of transport modalities (land, sea and air), such as the Finance or IT department, adds up to the importance of having a holistic approach in studying the corporate reality. Furthermore, the observation of links with other branches and clusters was also a key point when applying this method.

Additionally, aiming to build a more solid understanding of the business itself, 3 drivers were also observed during one day. These drivers belong to a carrier that does not work with DB Schenker. Several company partners were invited to participate but all failed to provide a response. Although it is not a representative sample of the platform's potential users, it was valuable to explore some particularities common to the generality of truck drivers.

With both target groups, the main goal was to develop a complete understanding of their day-to-day activities, consequent pains and underlying attitudes, opinions and perspectives on today's situation and future changes. This type of knowledge may be extremely useful in designing the correct implementation approach, thus ensuring the success of the platform from the get-go.

3.1.2 Interviews

Simultaneously, interviews were used to gather in-depth information around the topic, complementing the observation studies and grasping the participant's opinions and experiences. They also served as basis for the Business Process Modelling approach and further considerations of the next section. All the interviews were recorded without any objections from the participants.

Semi structured interviewing provides a greater breadth than the other types, given its qualitative nature. The former aims at capturing precise data of a codable nature in order to explain behaviour within pre-established categories, whereas the latter is used in an attempt to understand the complex behaviour of members of society without imposing any a priori categorization that may limit the field of inquiry (Fontana & Frey, 1994).

That being said, the chosen method was the unstructured interview, supported by both field notes and audio recording. A total of 21 participants (13 being employees and 8 being from the external carrier) were interviewed, most of which participated in the observation studies (Appendix C).

3.1.3 Document Analysis

The third selected method was Document Analysis, which consists in a systematic procedure for reviewing or evaluating document, often used in combination with other qualitative research methods as a means of triangulation – ‘the combination of methodologies in the study of the same phenomenon’ (Denzin, 1970). According to Yin, the qualitative researcher is expected to draw upon multiple (at least two) sources of evidence; that is, to seek convergence and corroboration through the use of different data sources and methods (Yin, 1994). Document Analysis was used to gather additional information and crosscheck hypothesis drawn from the other methods. Several internal and confidential documents were analysed, on top of the previous literature review and industry analysis.

3.2 Data Analysis

The analytical process began during data collection, as the data already gathered was being continuously analysed throughout and between interviews and observations, as schematized in Figure 3. Hence, every action shaped the ongoing data collection. This interim analysis has the advantage of allowing the researcher to go back and refine questions, develop hypotheses, and pursue emerging avenues of inquiry in further depth.

According to Pope, Ziebland, and Mays (2000), it also enables the researcher to look for deviant or negative cases; that is, examples of talk or events that run counter to the emerging propositions or hypotheses and can be used to refine them. Such continuous analysis is almost inevitable in qualitative research, since the researcher is “in the field” collecting the data, making it is very difficult not to start thinking about what is being heard and seen.

The collected data was subject to a careful investigation leading to the development of patterns, which mainly consisted in the explanation, understanding and interpretation of the current reality, people, tasks, attitudes and situations. Moreover, several ideas were generated with some degree of validation by relevant stakeholders (namely, the Head of Land Transport in Portugal and the D4S project owner in Iberia). The results of such analysis are presented in the following section.

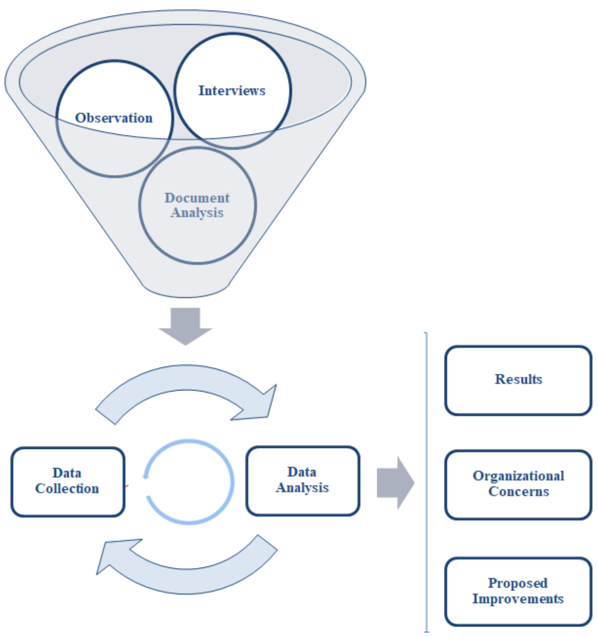

Figure 3 – Research Design

4 Results

The triangulation of all the qualitative research allowed an enhanced knowledge regarding the Direct Freight team. Information regarding its day-to-day practices, task allocation and internal procedures were part the data analysis results. The following section is organized according to the main dimensions of the results:

- Description of the Land Transport department in Portugal
- Description of the D4S project roll-out
- Current *Brokerage Process* modelling (AS-IS)
- Analysis of the current problems of the *Brokerage Process*
- Analysis of the future changes of the *Brokerage Process* (TO-BE)
- Current carrier matching and order execution processes modelling (AS-IS)
- Analysis of the current problems of the carrier matching and order execution processes
- *Carrier Matching* and *Order Execution* – TO-BE
- Analysis of the future changes of the carrier matching and order execution processes (TO-BE)

Understanding the two perspectives of the user is crucial to support the design and implementation of an interface that benefits both parties and makes their activities easier, more standard and less error prone.

4.1 Land Transport department - Portugal

The Land Transport collaborators are divided in two distinct teams: Groupage (parcel shipping) and Direct Freight (Less Than Truckload and Full Truckload shipping).

The Direct Freight team handles the transport of loads occupying more than 2,5m of truck space either by carrying multiple shipments for different customers in a single truck (LTL) or utilizing the full truck capacity in a direct point-to-point service (FTL). It generally covers International transport. This type of transport is internally denominated Direct Freight (also known as SCHENKERdirect) because it does not encompass a complex hub network and consolidation/deconsolidation points (as in the Groupage service). While FTL is generally more expensive, the load is delivered faster since the truck only stops at one destination (no loss of time in loading/unloading operations).

The Groupage team brings together many small shipments, often from different shippers, and groups them into large shipment quantities, in order to take advantage of economies of scale in transportation costs. Shipments to a single region are consolidated at a terminal facility (e.g. warehouse) and the planning of regular runnings is made. An interview with the network manager provided the insight “that a large client with a long-term, high value contract has a demarked influence on the route planning.”

D4S is being implemented exclusively in the Direct Freight team. Groupage is not a target to implementation because of the previously mentioned hub network and planning predicament, as well as due to the fact that their prices are already competitive. Additionally, according to the network manager, some advantages that will be experienced in the Direct Freight team are already a reality in the Groupage team, namely real-time traceability (since the loads go through the warehouse picking process, the barcode efficiently provides their geo-location). Nonetheless, they are welcome to source for suppliers within the platform.

4.2 Drive4Schenker Project Roll-out

D4S business model aims at a strong and effective collaboration with carriers, levering web technologies. Hence, two key operational goals were defined (as present in an internal high level presentation to all clusters). The first consists in the intensification of carrier management and relationship, thus providing DB Schenker with a large carrier pool and securing capacity and quality. This is set be done by offering innovative services to carriers (using economies of scale and scope), assuring carrier quality with systematic relationship building and profiling and developing local strengths further combined with a collaborative network approach.

The second key goal is the industrialization of the *Brokerage Process* (standardization and automation) through the web platform, connecting carriers as well as providing decision support (to find the best load-carrier match). It encompasses full transparency on carriers, capacity and loads, intelligent matching of capacity and available loads, web-based pricing methods and negotiation, market and business intelligence in the decision process and web-based transaction execution from order to settlement.

As visible in Figure 4, D4S roll-out is divided in 3 releases/milestones:

Standalone	Test environment
- Isolated version of the D4S marketplace without any integration with carrier database - Test version to fine-tune D4S - Run specific suitable businesses on stand-alone as interim if feasible	
Basic	Manual usage of the portal
- 2 Dimensions: Volume (Branches, Shipments, Users) Functional use (from posting to full scope mobile execution) - Accessible for all to replace traditional communication methods with carriers - Compare to actual manual processes and start digitalization - Minimize dependencies with IT Infrastructure - Reach out to dispatchers across the full organization - Self-intuitive and focus on awareness	
Integrated	Fully integrated with the standard planning system iTMS
- One common iTMS process in combination with D4S – valid for all - Develop, test and implement with two iTMS locations (Kassel and Prague)	

Figure 4 – D4S Roll-out Releases

Drive4Schenker software development was already in process when the present research started. Its development has been carried out under the agile methodology (using the SCRUM framework[11]). The Standalone version was deployed end of 2016 with a stronger test environment character than a production one. Currently, the roll-out is in the Basic release. According to a project responsible, "some of the planned functionalities are already in place and the platform is being improving step by step". Still, the project responsible of the Iberian cluster affirms that it is "really far away from the objective." The integrated version will be delivered at the end of this year or beginning of 2018 and will include significantly more professional system development (including some integration of existing systems to D4S).

4.3 *Brokerage Process* – AS-IS

The following sections include the Activity Diagrams of the *Brokerage Process*. Business Process Modelling was the chosen approach because it entails a different methodology than other existing improvement schemes. Most schemes generally fail to go beyond the functional boundaries which exist in organizations structured along traditional lines (namely, departments).

In BPM, a business process is seen as a horizontal flow of (cross departmental) activities while most organizations are formed into vertical functional groupings – sometimes referred to in the literature as "functional silos" (Maull, Childe, & Bennet, 1994). According to the Business Process Modelling Notation (BPMN), a swim lane is a visual element used in process Activity Diagrams (flowcharts) that visually distinguish job sharing and responsibilities for sub processes of a business process.

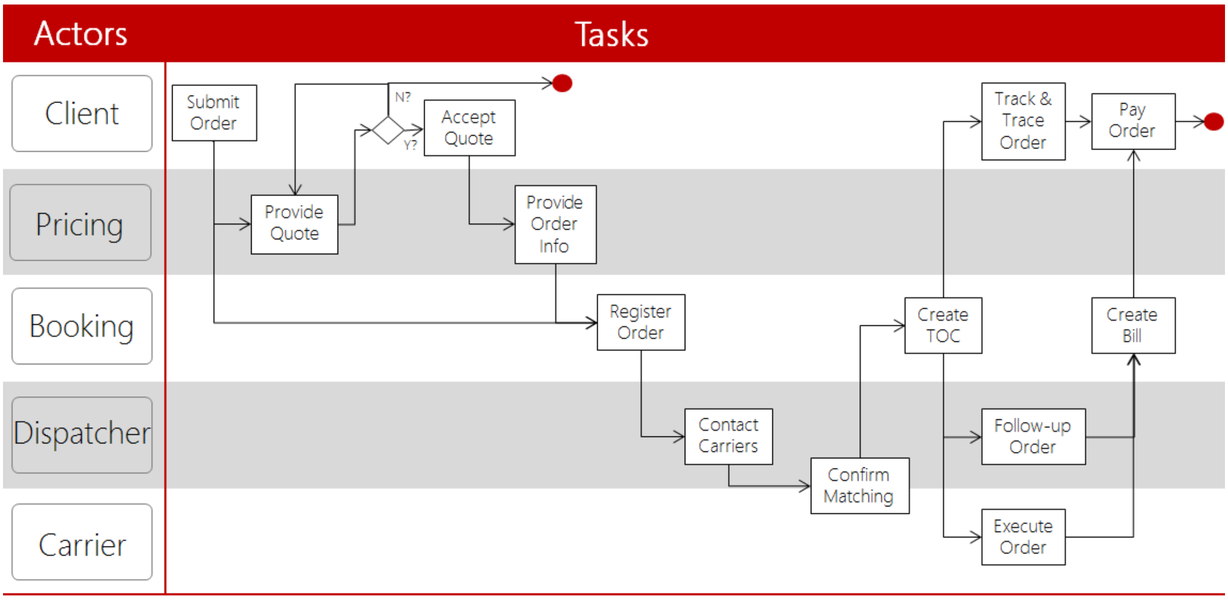

Figure 5 – Brokerage Process Swimlane Diagram

As represented above in Figure 5, the Direct Freight *Brokerage Process* has the following flow of activities:

[11] This methodology aims at being lightweight and adapting to changing requirements and circumstances through an iterative and incremental roll out. It characterized by the constant communication between stakeholders and rapid feedback based on the regular delivery of working software – known as sprints (Beck et al., 2001)

- Submit Order: the submission can be made by a DB Schenker agent from another branch (called e-booking), directly by the client through Enges platform[12] or by contacting DB Schenker's email or telephone (usually through a sales representative or the one of the department entities featured in the Figure 5). The load transport order can be submitted with a previous quote request (spot price quote) or based on contracted prices (in case it is a recurring customer, the tabled price is already known and agreed upon).
- Provide Quote: after receiving the quote request, the pricing agent considers all the order characteristics and elaborates the transport price. The order is only sent to the pricing department whenever a quote is requested; otherwise it goes directly to the booking department (it is mandatory that all orders are sent to the booking department).
- Accept Quote: when the quote is received by the customer he can either accept it or reject it. In case of rejection, negotiation may be opened to find a price that suits both parties. This information exchange is made either by email or telephone. Whenever a consensus is not reached, the process ends.
- Provide Order Info: the accepted order is then sent from the pricing department to the Booking department by email.
- Register Order: the booking department will then assign the order to the respective department. In case it is to be executed by the Direct Freight team, the agent uses CitriX[13] to input the underlying information.
- Contact Carriers: the dispatcher is then responsible to contact carriers in order to find the most suitable option for the order at hand. In a first instance, the order is posted in Schenker CargoNet platform[14] (SCN) for exclusive consultation of Schenker's certified partners. After 20 minutes, if no matching is made, SCN automatically posts the order in several Freight Exchange Marketplaces.
- Confirm Matching: having contacted with the available carriers and decided on the best alternative, the dispatcher confirms the matching and provides the respective information to the booking department (see section 4.5.1 for more detailed info on this sub-process).
- Create TOC: the Transport Order Confirmation is then created in CitriX and sent by email to the client with all the relevant information, such as the reference number, price, load characteristics, loading/unloading date and place, among other important details.
- Execute Order: the carrier executes the order transport and reports to the dispatcher along the process, informing the status and any potential inconvenient. Important to refer that this task is a process itself, therefore it encompasses several complex and linger tasks which are worthy being studied in detail (see Section 3.5.2 for more detailed info on this sub-process).
- Follow-up Order: the dispatcher is responsible for the supervision and follow-up of the order, as well as acting upon necessity if the process does not go according the norm. This contact is mainly done by telephone, with email being another used communication method.

[12] Enges is an interface that allows shippers to submit their orders.

[13] CitriX is an internally used system that manages order submission of some departments.

[14] SCN is the freight exchange platform used to announce loads to carriers (see next section for more info)

- Track and Trace Order: the client can keep track and traceability of the order using Schenker Track & Trace platform (STT).
- Create Bill: the booking department creates the bill in CitriX after the order is delivered and sends it to the client.
- Pay Order: the process ends with the payment by the customer.

4.3.1 Current Problems

Throughout the interviews and observation, several problems limiting the optimization of the *Brokerage Process* were identified. Firstly, it was obvious that current applications do not yet cover the full process. On one hand, the scattered use of multiple platforms throughout the branches is limiting the European integration throughout branches.

Schenker CargoNet (SCN) is used in Portugal and Spain but different applications serve other Clusters (namely, Schenker Cargo Application – SCA). This has direct implications in the costs and capacity management, since the orders cannot be posted to the entire network. There might be alternative carrier solutions for a certain order that are using a different software and will not be notified of the order postage and, therefore, won't be considered for its transport.

On the other hand, as it was previously mentioned, whenever a shipment is not assigned within 20 minutes of its postage, dispatchers pass it through from Schenker CargoNet to Freight Exchange Marketplaces (FEM's). These are third party online marketplaces where forwarders advertise loads and carriers provide capacity. A clear dependency FEP's is observed in the *Brokerage Process* (Figure 6):

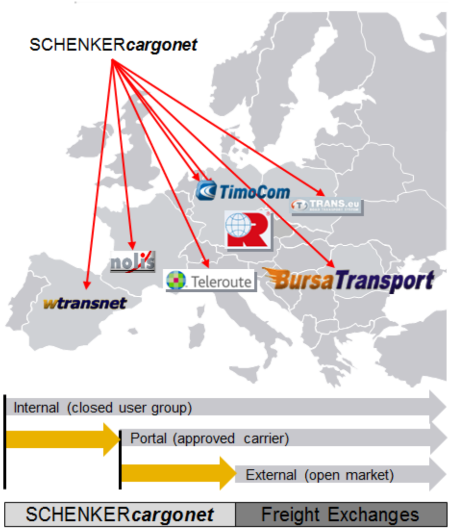

Figure 6 – Freight Exchange Platforms (FEP's)

As read in an internal document, approximately 5.500 shipments per day (30% of European Direct Freight brokerage volumes) are handled by these marketplaces, instead of being carried out internally. Furthermore, a total of 615.000 € is spent in subscription and access to these type of services. The situation becomes is more critical in countries like Germany or France, which are more willing to bear these subscription costs (comparing to countries such as Portugal, Spain or Italy). The dependency on FEM's becomes more relevant as these technologies are entering the "forwarders" space and approaching shippers directly. It poses as a high risk of margin erosion, due to weakening of the intermediary role and increasing internet transparency.

The lack of optimization in the way dispatchers handle load assignment/matching is further evidenced by the use of phone, fax and email on top of the other communication platforms. Additionally, the quality of matching load and capacity is very much depending on expertise of dispatcher and reaches its limits in environment with growing complexity.

Another issue is related to the limited transparency on carrier capacity and capabilities. Bearing in mind that carriers are the backbone of the service, it is necessary that dispatchers have access to real-time information regarding multiple important aspects, such as the status of the truck (full or empty), the need for backload, cost of transport and type of provided equipment. It was evident several times throughout the observation, that often the dispatchers are not able to provide the information requested by shippers on the order execution.

Overall, the *Brokerage Process* has opportunities for industrialization and innovation in order to reduce the current fragmentation of technologies and increase efficiency. The task standardization and automation can be made at three main levels:

- Carrier contact and information exchange;
- Negotiations of capacity and price;
- Order confirmation and payment settlement.

4.4 *Brokerage Process* – TO-BE

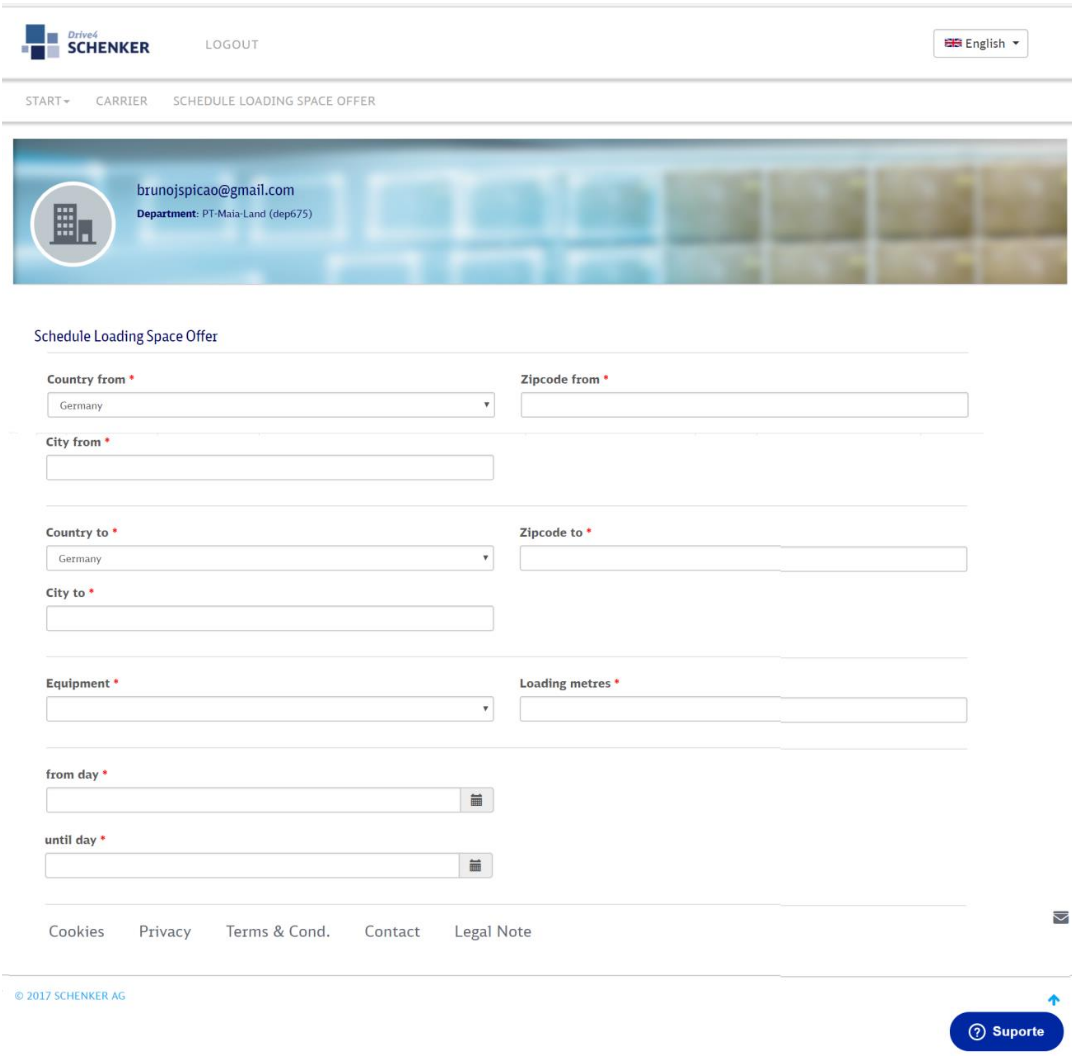

Figure 7 – Drive4Schenker Schedule Loading (Dispatcher interface)

According to the interviewed D4S project owner, “the replacement of SCN with D4S will not drastically change the *Brokerage Process*”. The main difference found is the use of a global tool rather than different tools among branches. This will provide the possibility to reduce costs and optimize truck capacity in a European scale, by promoting the assignment of loads to carriers that are closer to the loading location (which translates in less time travelling without loaded truck and consequent increase on the vehicles’ profitability). The possibility to post empty truck space (in the same way loads are posted) is also set to benefit both carriers and dispatchers, inducing economies of scale.

The carriers connected to the D4S portal will have 20 minutes of exclusivity for the loads posted in D4S (Figure 7 shows the dispatchers’ load posting interface). After that period, the loads will be transferred automatically to the Freight Exchanges (same as with SCN).

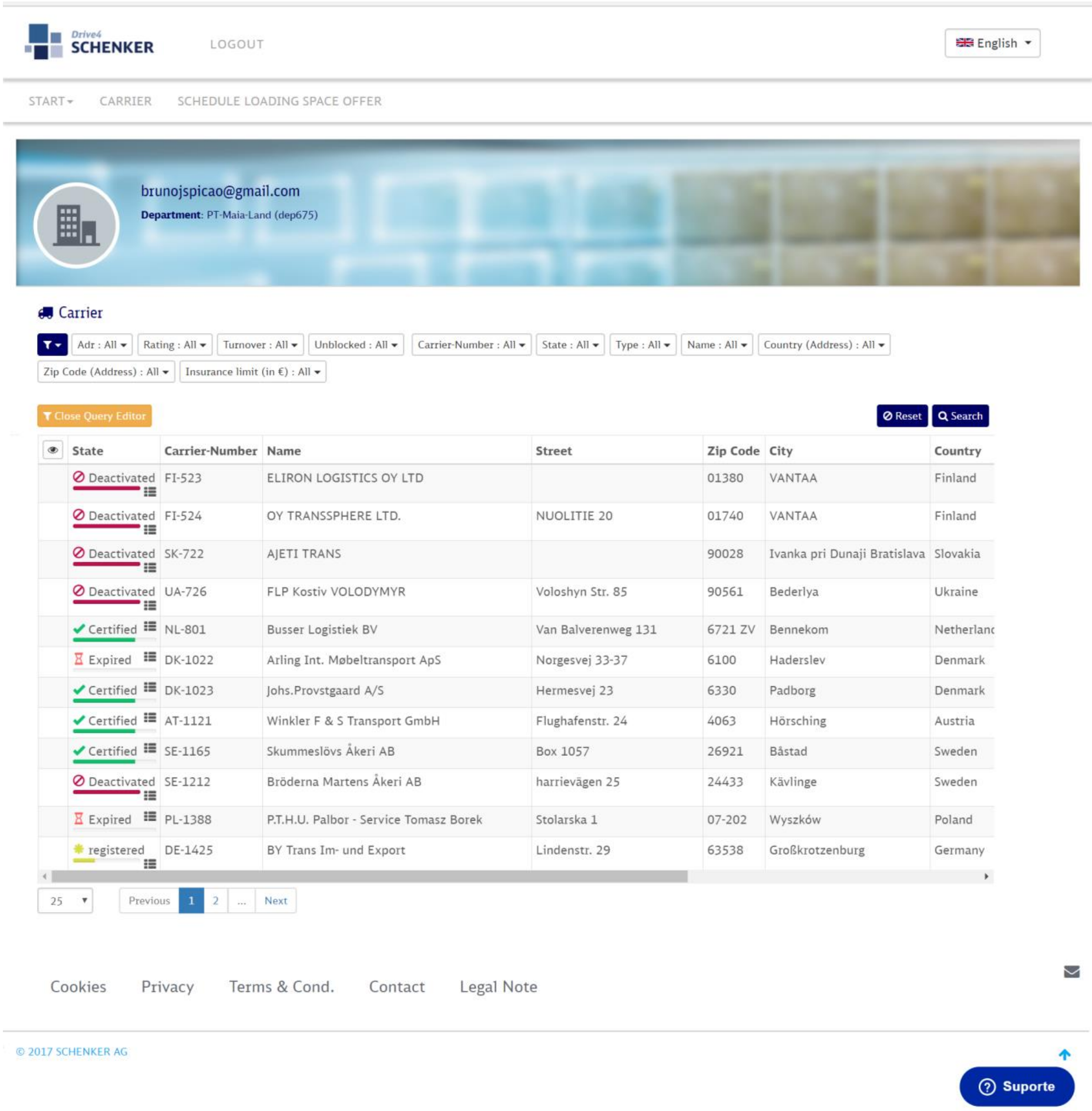

Figure 8 – Drive4Schenker Carrier Search (Dispatcher interface)

When a dispatcher agrees on a price with a carrier outside D4S (through one of the Freight Exchange Marketplaces), the load must be posteriorly assigned to the respective carrier in the D4S service. If the carrier is not registered or certified in D4S, there won’t be option to assign it to the carrier. In that case, the carrier must be told to register or to approve the necessary documents in D4S to be able to receive loads assignation.

The maximum number of loads allowed to be transported by a non-approved carrier is 5. After that, business with that carrier must be ceased until they are certified. Figure 8 displays the search tool where dispatchers are able to browse carriers and check their status, history and rating (among other details).

One main change will be on the dependency of Freight Exchange Marketplaces. D4S European reach will support the business relationship with Schenker qualified and trusted carriers, rather than recurring to third party applications where the reliability of the participants is not guaranteed (thus, service quality cannot be assured). Moreover, there is a rating system that further ensures updated, trustworthy information.

The duplication of some tasks will be eliminated through the use of the D4S, especially related to the postage of loads. The interface provides automatic filling of the information fields, download of automatically created important documents (that had to previously be created manually), allows a dispatcher to duplicate a previously posted load and to create a new load without publishing it (pending), among other functionalities that are increase efficiency. Furthermore and contrary to the currently used platform, D4S only provides the relevant information to the dispatcher at each step of the process (instead of showing unimportant information like SCN).

4.5 *Confirm Matching* and *Order Execution* – AS-IS

As mentioned above, it is crucial to visualize the process from both perspectives. Hereof, this section visualizes the carrier reality in order to better grasp the underlying problems and potential implications of adopting the D4S service. As it is possible to perceive in Figure 5, there are two activities that are carried out by the carrier in the *Brokerage Process*: *Confirm Matching* and *Order Execution* (execute order). These sub-processes will be dissected and analysed in the following sections.

4.5.1 Confirm Matching

This sub-process consists in the negotiation between the two parties – dispatcher and carrier responsible (in the studied case, it is the manager) – as represented in Figure 9 bellow.

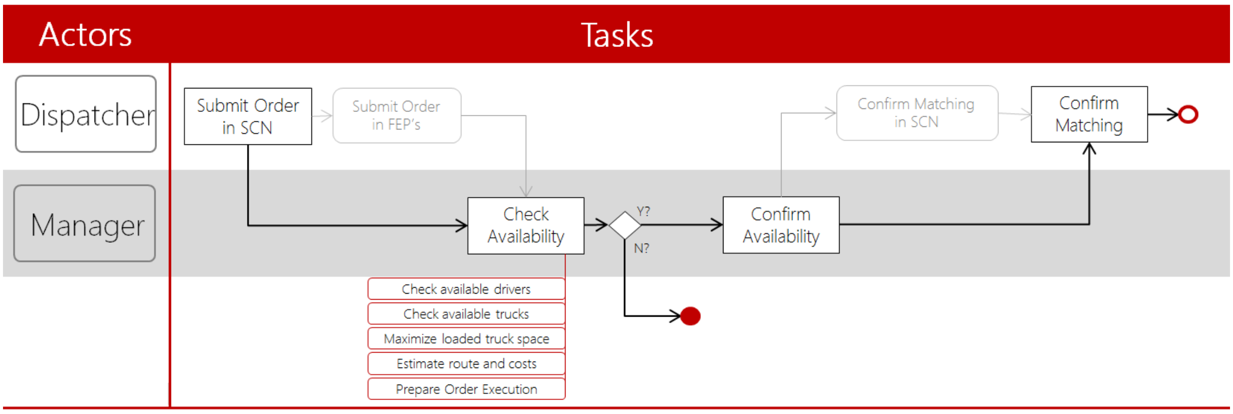

Figure 9 – Confirm Matching Swimlane Diagram

The flow of activities that occur in order to find the best matching for a giver order goes as follows:

- Submit Order in SCN: the dispatcher submits the necessary details regarding the respective order. The grey flow in Figure 9 represents the alternative flow, in case the matching confirmation is not made via Schenker CargoNet (it is automatically send to the subscribed Freight Exchange Platforms).
- Check Availability: the manager examines weather or not it is beneficial for him to accept the order. This analysis encompasses checking which drivers are available, which trucks are ready, the routing and associated costs, among other concerns (as shown in Figure 9). Usually, it is a fairly manual process, although some carriers have sophisticated TMS or Decision Support Systems (DSS) that simplify this task.
- Confirm Availability: when the manager has availability to execute the order, he refers the confirmation to the dispatcher.
- Confirm Matching: the dispatcher then confirms the matching, by assigning the order to the in SCN. In case the order was accepted in a FEP, the dispatcher must input all the required information in SCN. The macro process (Brokerage Process) continues as in Figure 5.

4.5.2 Order Execution

The second activity performed by the carrier - *Order Execution* – is the most important, complex and time-consuming of the entire brokerage process. In involves three other entities not present in the previous analysed processes: the driver, consignor and consignee[15].

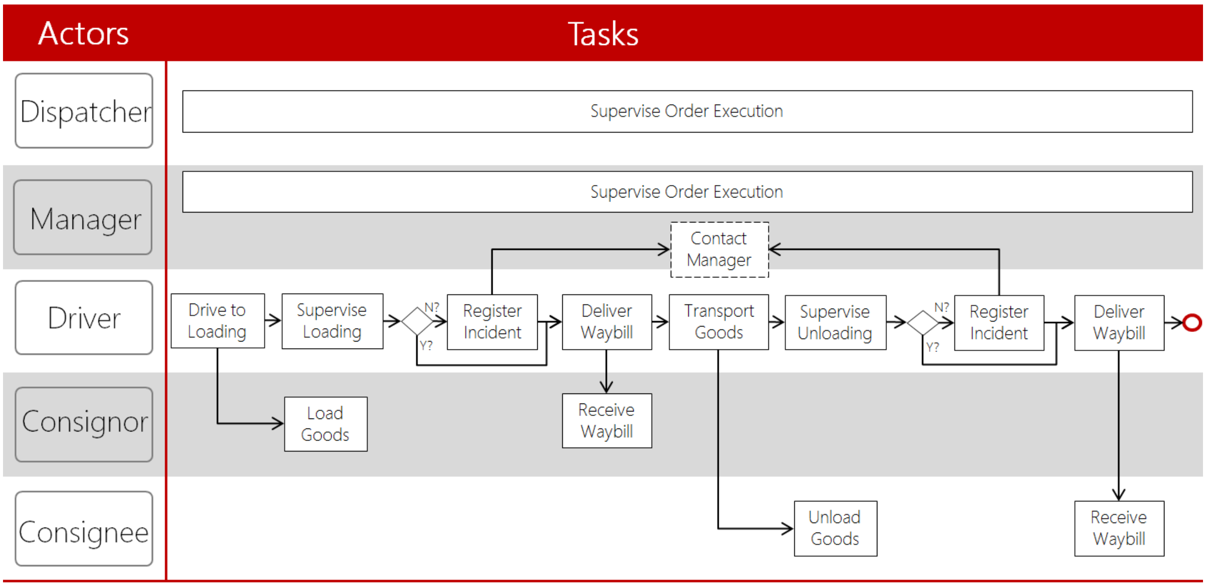

Figure 10 – Order Execution Swimlane Diagram

The flow of activities of this sub-process is represented in Figure 10:

- Drive to Loading: the process starts with the driver travelling to the loading location. In case the driver cannot be present at agreed location and time, it must be annotated

[15] The consignor is the physical sender of the goods

The consignee is the party such as mentioned in the transport document by which the goods, cargo or containers are to be received and accepted (ELA definition) appropriately the Waybill (CMR[16] - Standardized document for cross-border transport of cargo by road, based on UN recommendations for uniform international rules and in force in the European Union.

- Load Goods: the consignor organizes the required logistics for the conditioning of the goods inside the truck. Improper loading of cargo can lead to damaged goods or poor space optimization.
- Supervise Loading: the driver is responsible for supervising the loading activity. If there is any incident (such damaged or potentially damageable goods), he must inform in the Waybill (Observations section). Only in extreme situations must the driver contact the manager, since there are standard protocols to the driver follows in common incidents.
- Deliver Waybill: then, the driver delivers the 1st copy of the Waybill to the consignor.
- Transport Goods: the goods are transported to the consignee location agreed upon. The driver must follow strict rules regarding the EU Road safety policy and driving time and rest periods.
- Supervise Unloading: the consignee is responsible from the unloading activity. It occurs in the same circumstances as the Supervise Loading (above described).
- Deliver Waybill: next, the Driver delivers the 2nd copy of the Waybill to the Consignor and the macro process (*Brokerage Process*) continues as in Figure 5.

The manager supervises the *Order Execution* by contacting the driver via telephone call, SMS, email and other alternative methods. In turn, the dispatcher bridges the contact with the shipper, contacting directly with the manager (usually, there is no contact with the driver).

4.5.3 Current Problems

Obviously there are certain problems affecting carriers, such as weather conditions, thefts, strikes, holidays, accidents or mechanical issues, which are out of their control (thus can only be diminished with preventive actions).

Loading and unloading operations are part of the carriers' pains, due to the low actionable character of the driver (since they only supervise these activities). On one hand, those who handle the goods may damage valuable and fragile items, while placing them in the truck or during packing. On the other hand, there is the possibility of not completing the operations within schedule. Not being able to follow through with the planned routing may result in delivery delays affecting several customers (when a delay happens in the first loading place, all the following loading operations can be overdue). In both situations, the driver is responsible for the supervision and the manager has little control.

The use of multiple tools for internal communication within the carriers represents losses in efficiency and reliability (as illustrated in figure 11). Searching for loads in SCN or FEP's, contacting with dispatchers and drivers using telephone call, email, SMS or fax and gathering all the important information used for financial or compliance purposes is a challenge when

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[16] 'Convention relative au contrat de transport international de Marchandises par rout' (the French name for the convention that governs its definitions and application).

there is no standardized way to do so. Moreover, it can lead to the repetition of tasks and overall lack of control.

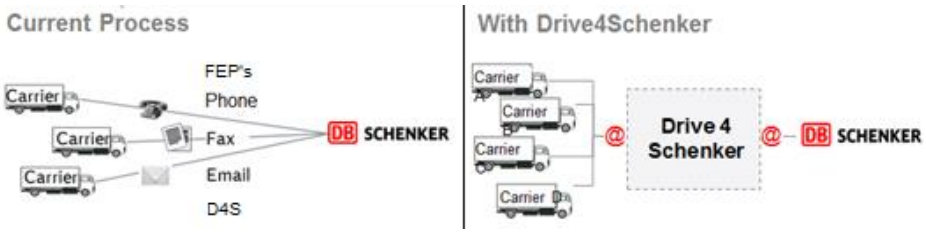

Figure 11 – D4S Communication Improvements

4.6 *Confirm Matching* and *Order Execution* – TO-BE

Regarding these sub-processes, several changes will occur. The carrier manager will be able to bid on the posted loads using D4S platform. As it is observable in Figure 12, he will be able to search for the submitted loads that may be of interest. Although the image is in Portuguese language, the main points to withdraw are the visual support of the map and the multiple ways available to browse for orders. The interface is intuitive and represents a single communication method that supports carriers' truck space optimization.

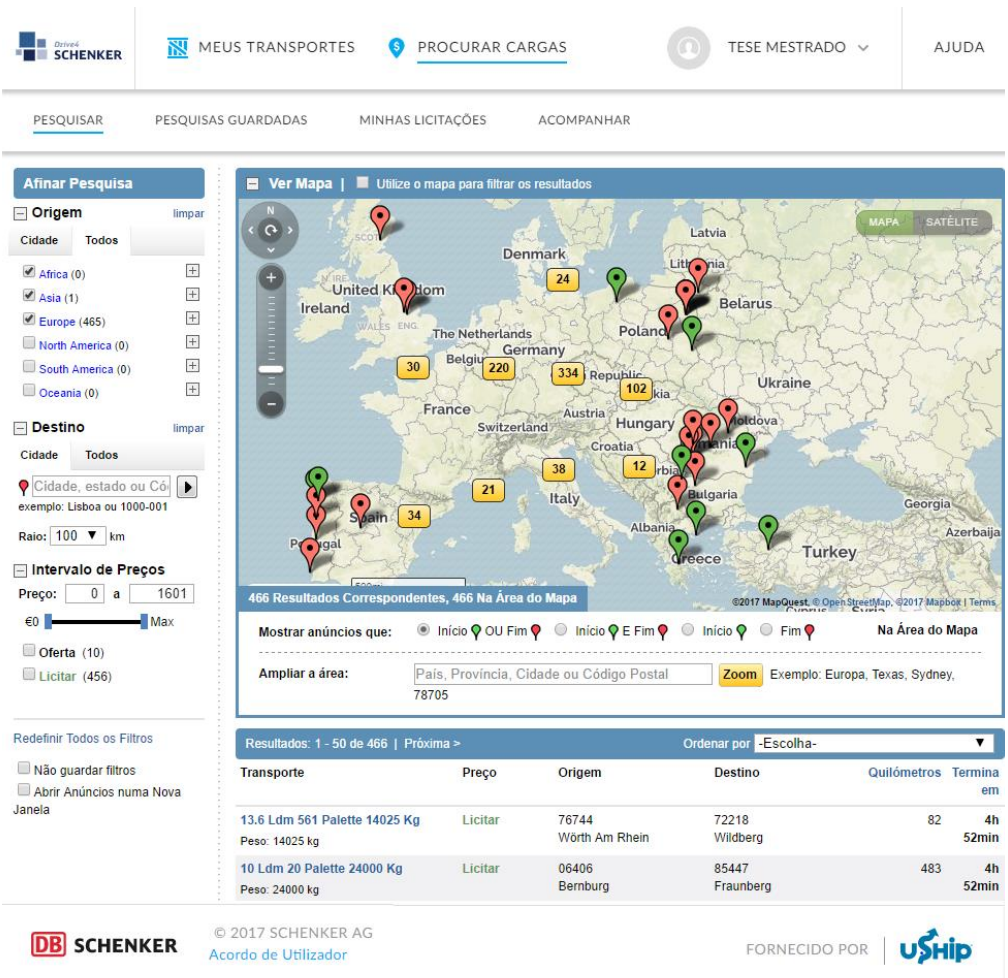

Figure 12 – Drive4Schenker Load Search (Carrier interface)

In addition, it will be possible to post available truck space (which is not possible in SCN or in FEP’s). This is a great benefit for carriers (as well as dispatchers) because both users can announce their needs, which consequently facilitates the matching process. The rating system may as well induce some changes on the dispatcher/carrier relationship. The partners will constantly be assessed by DB Schenker collaborators throughout the entire European network, which does not formally occur in the current situation.

In relation to drivers, alterations will also occur. After the matching is confirmed, the manager assigns the load to the driver, who receives the info in the App (without D4S the load assignment is phone call, SMS or email). From here on, the driver register the key moments using the mobile app, providing transparency and visibility to the dispatchers.

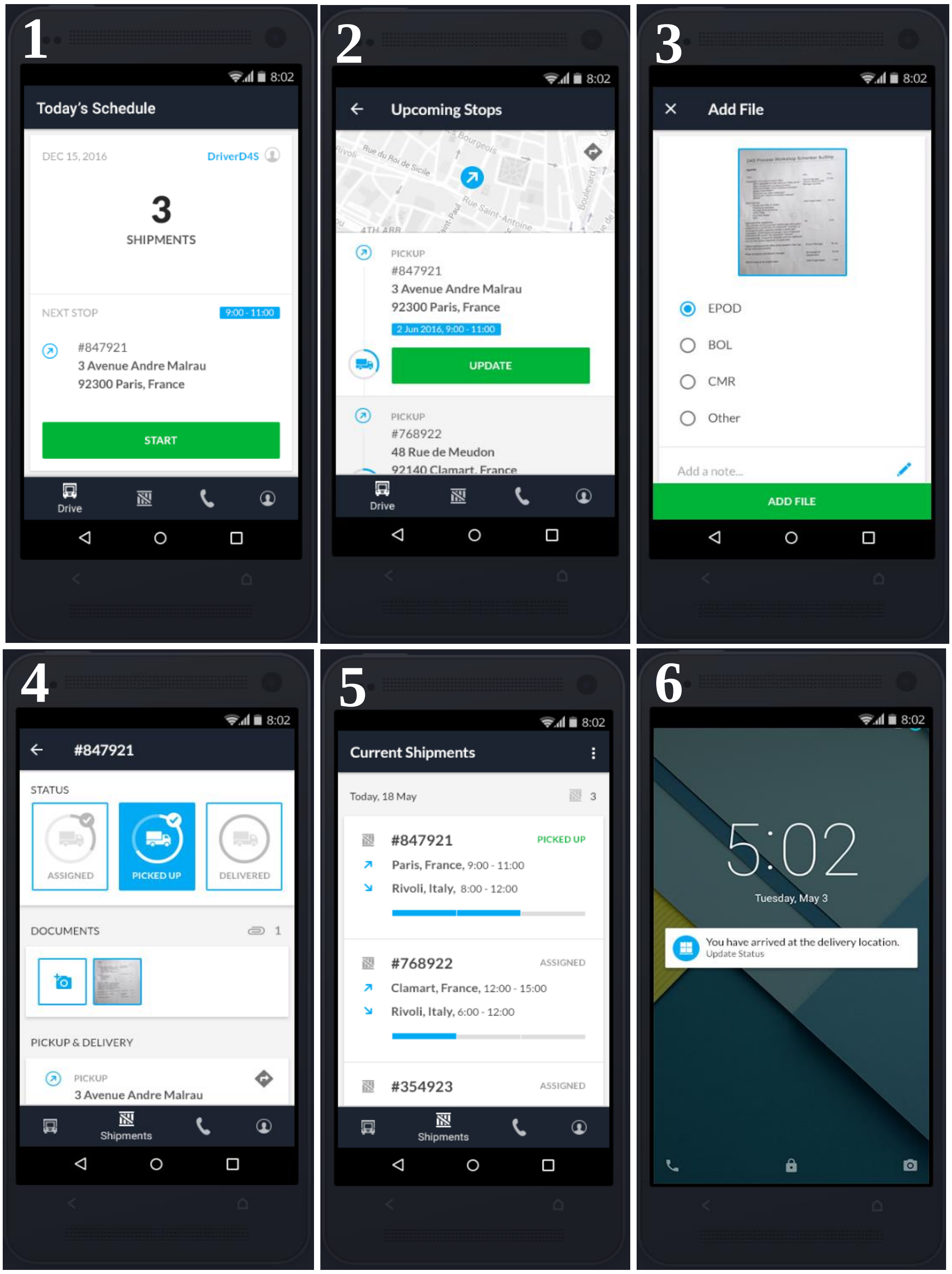

Figure 13 – Drive4Schenker Order Execution (Driver Interface)

Figure 13 shows several steps through which the driver goes in the *Order Execution*, supported by the App (numbered from 1 to 6). In the image 1, the driver can start his 3 shipment route. The interface in image 2 provides him with some relevant information (such as his current position and pick up address) and with the possibility to update the order status. He also has the chance to upload important documents, choose their type and write a note, if necessary (image 3). Then, as represented in image 4 and 5, the driver can update the status again and proceed with his planned route. Upon arrival, he is notified as in image 6.

The Driver App uses the smartphones' geolocation technology to automatically collect and avail data regarding the truck location. The notification features are also a crucial advantage of the App, as well as of the web platform, that ensure that the key stakeholders are instantaneously notified when a given event occurs. Subsequently, the communication between the two parties will be leaner, easing the delivery follow-up process.

5 Organizational Concerns

On the TO BE section of the studied processes, some upcoming changes resulting from the successful use of D4S were mentioned. Regardless of the benefits that the service will bring to the Direct Freight *Brokerage Process*, sociological and cultural concerns must be taking into consideration when undertaking the implementation within the Portuguese branch. One important aspect to note was the fact that none of the participants was aware of the specificities of the future platform. It was observed a strictly broad knowledge regarding D4S from key stakeholders (namely, the Head of Land Transport and the Leader of Direct Freight).

In one hand, this facilitated the observation of the current activities diminishing the possibility of biased results from the participants. But on the other hand, it increased the difficulty in obtaining complete information regarding the platform and in interviewing the key stakeholders (most of which do not work within the Iberian Cluster). This lack of awareness demonstrated as regards to the service may result in a lengthier implementation process and increased necessity for intense training. It may also have related consequences concerning errors and operational losses.

The fact that most of the personnel have been working in DB Schenker for an extended period of time also raises some issues that should be considered. Despite the benefits of their long years of experience and notable industry know-how, some vices related to their *modus operandi* (e.g. contacting a certain carrier by mobile phone or using the SCN system in a different way than the standardized) must be reflected upon.

Additionally, during the observation and interviews, the lack of technological proneness was eminent among most dispatchers and drivers. This deficit in tech skills was also present in the carrier manager. Bearing in mind that the D4S is a technology-based project, difficulties must be carefully identified in order to apply preventive measures. The lack of academic education among the several actors (especially drivers) is also something to take into account.

In the course of the data collection, several employees showed lack of willingness/ aversion to change in relation to D4S. Reasons for such can be the great amount of work load they are subject to in a daily basis, being reluctant towards their ability to prosper in the transition or attributing low value to the service, undermining the positive change potential in relation to the current reality. This may also represent a challenge for the implementation.

Portugal's geographical position was also a pointed out characteristic that goes against D4S implementation. Being a periphery country within Europe, the benefits in terms of truck space optimization will not be as demarked as in other more central branches. More orders go through more centrally located countries and, therefore, carriers have more offers in their radius. As an example, a truck departing from Portugal will have fewer orders available to fill in its empty space than one departing from France (because Portugal is a small country and only borders with Spain; and France is far larger and borders with Spain, Italy, Switzerland, Belgium, Luxembourg and Germany). This may undermine the Portuguese collaborators' benefit perception.

Given the fact that one of the most important aspects of the implementation is the adaptability of the users to the platform, an ongoing assessment and support is necessary to ensure that the transition is as seamless as possible. In this sense, it is intended that the previously referred cues alert the project responsible for potential obstacles that may arise.

6 Multi-level Service Design

After a reflection on the state of the art research and on the data collection and analysis process, potential improvements to the platform were conceived. The two main suggestions will be made in the following section: the inclusion of a shipper interface that works as an online sales platform; and the integration of the several modes of transport in that same interface (land, sea and air).

Air and sea transport are key pillars of international business, as well as an important source of revenue to DB Schenker. A holistic view of the constellation of services available to the customer clarifies the need for improved communication between all the departments, each responsible for a given transportation mode. As an example, a customer shipping cargo from China to Austria may require the use of two different means of transport (combination of sea and road transport). In order to answer to this need without undermining the customer experience, the backend business processes must be integrated efficiently.

A unified tool that provides interdepartmental linkage between dispatchers is necessary to assure a satisfactory customer journey. During an interview with D4S Owner Iberia, he affirmed that “the project is fully dedicated to land transport and will not be extended to the sea and air departments, as they are totally different and separate businesses”. He added that “a shipper interface was already considered but it is a different project and still pending of the green light from all the countries, since there is a high risk of losing business” (carriers may contact directly with the shipper, eliminating the intermediary).

Still, competitors (such as Kuehne + Nagel) and successful newcomers are working towards that direction at a fast pace. As it was previously explained, shippers expect a more agile supply chain to meet an “on demand economy” with shorter contracts and spot rate requests. They need solutions to optimise their freight spend in a more dynamic way and a shipment execution dashboard or control tower. While Drive4Schenker is a large step towards a better linkage between dispatchers and carriers, customer service still has potential to be faster and more efficient.

In this sense, the Multilevel Service Design (MSD) approach supported the development of a solution that allows shippers to cocreate value within a complex service system. MSD combines contributions from different disciplines, allowing integrated design of the service offering at three hierarchical levels: the firm’s service concept, the firm’s service system, and the service encounter. At each of these levels, a understanding of the customer experience is needed prior to the design of the service offering, providing new insights that are not offered by existing service design methods (Patrício, Fisk, Falcão e Cunha, & Constantine, 2011).

The envisioning of the customer constellation of service offerings and the customer journey throughout multiple interfaces in a holistic way, led to the redesign of the customer experience. Fostering customer collaboration in co-creating value is hereby seen as crucial to optimize the entire process. The ideation, reflection and prototypes are presented in this section.

6.1.1 Service Concept

This methodology is designed to enable innovation in the processes of value integration and in the role of the customer as a co-creator. Normann and Ramirez (1992) define value constellation "as the network of actors and their relationships that jointly create an offering" and provide an insightful approach for positioning the firm's service concept in the value-creating system. Therefore, the value constellation can be viewed as a system of service systems. The understanding of DB Schenker's input into creating customer value while also considering other companies' input was helpful in widening the service design space. In this sense, up framing the perspective enabled "out of the box" thinking which, in turn, lead to the design of transformations on the value-creating system.

As shown in Figure 14, a wide range of offerings are available for shippers within a complex multi-organizational network. Several companies are directly or indirectly responsible for the customer satisfaction and frequently, for each interaction, a different platform is used.

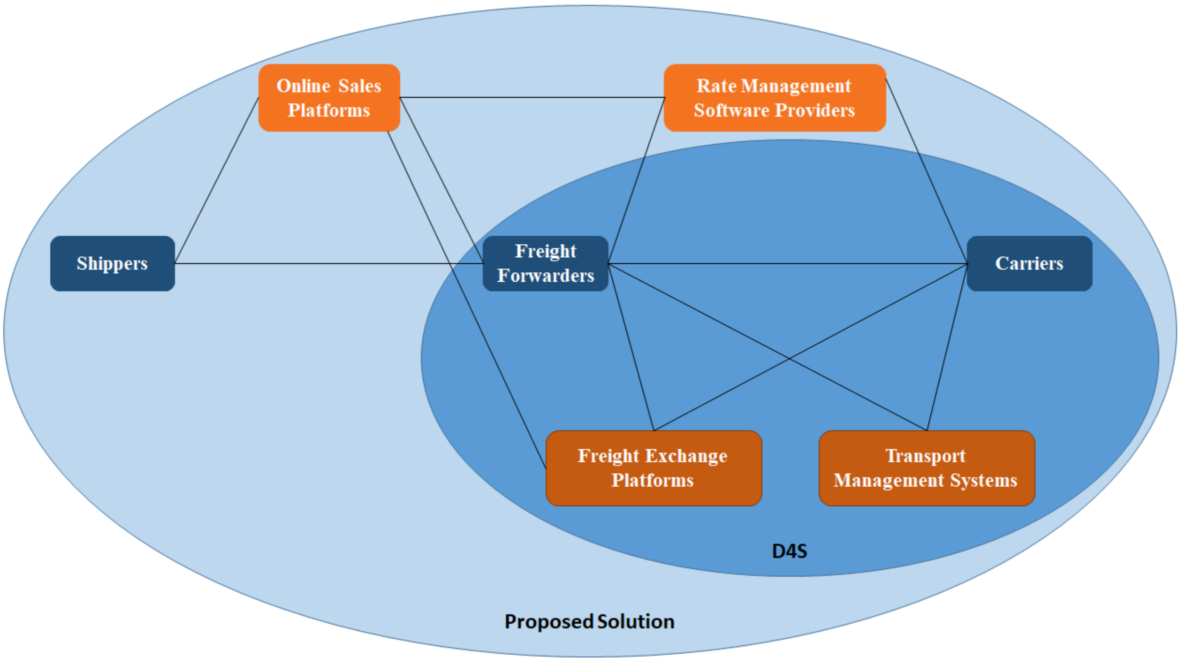

Figure 14 – Customer Value Constellation (Shippers)

D4S will ease the contact between DB Schenker (freight forwarder) and carriers, as well as integrate FEP's and TMS's in one interface. Still, there are other systems that add value to the customer and through which the customer can co-create value that are not being tackled (as observable in the dark blue and light blue circles in Figure 15).

The Customer Value Constellation analysis exercise resulted in the proposal of a solution that incorporates the final customer in the D4S environment. If shippers have the possibility to request transport prices and submit orders in an autonomous, intuitive and fast manner, their experience with DB Schenker will be more satisfactory. The Track & Trace and Payment process may also be subject to improvements with the integration of processes in the same unified system. On top of that, the Pricing and Booking department, as well as Dispatchers, will have less work load and fewer duplicated tasks. Hereof, it can also lead to the reallocation of staff to other important activities related with increasing sales volume, improving customer relationships or controlling carrier quality and compliance.

The service concept design was the initial phase of envisioning features that target an effective linkage between the projected capabilities of D4S and the customer expectations. Bearing in mind that shippers expect a reliable, affordable and fast service, with maximum control and transparency, the system must be design accordingly. Taking advantage of D4S process automation, carrier consolidation and cost reduction, an additional set of features should be developed to satisfy those needs.

Carrier connectivity assures speed and transparency connecting shippers directly with the carriers (increasing reliability while guaranteeing the necessary privacy settings). It also makes the quoting process faster and more transparent (with the possibility to choose among several offerings). In turn, a rate automation and management system will also provide reliability to the instant quotes and improve the service response time. An intuitive dashboard with API integration and real-time information updates will offer control and visibility. Ideally, the customer experience will be improved while also streamlining the entire process and diminishing costs.

In order to avail these features to the customers, DB Schenker must consider including offerings that represent the core business of online sales platforms and rate management software providers (explained in section 2.4.3). This can either be done through Mergers, Acquisitions or by internal development (in-house).

6.1.2 Service System

The service system can be viewed as an integrated whole that enables customers to co-create their service experiences according to the positioning of the service concept in the value constellation. The Service System Architecture (SSA) and Navigation (SSN) can be very helpful when designing the overall structure of technology-enabled multi-interface services. It specifies how the overall user interface breaks down into interaction contexts, how they are grouped, how they are presented to the users, and how users navigate them (Patrício et al., 2011).

The use of SSA and SSN in the design of the shipper interface was very useful in envisioning how the multiple interfaces and actors can support the different stages of the process. Additionally, the fact that the customer journey (instead of the internal flow of the order, as in the BPM approach) was at the core of the rationale opened up new perspectives.

Figure 16 (next page) shows all the service interfaces through which the customer and the company can interact with each other. Touchpoints occur whenever a customer interacts with the service provider across multiple channels and, therefore, are similar to service encounters (Bitner, Ostrom, & Morgan, 2008). The customer journey refers to a series of touchpoints, involving all activities and events related to the delivery of the service from the customer's perspective.

The efficiency of these support technologies has the power to influence the success of the customer journey, hence the customer satisfaction and perception of quality regarding the company. Their management must be carefully thought through in order to simultaneously provide control, actionability and transparency to the customer and simplifying internal processes (making them less error prone). This also means to have a unified communication tool as a replacement for the current interface "zapping". The customer journey is designed so that Email and Telephone interactions are exceptions and, when necessary, undergo the smoothest way possible.

This schematization of the designed interface architecture contains two disruptive stages: Visualization & Control and Quote Request (see Figure 16).

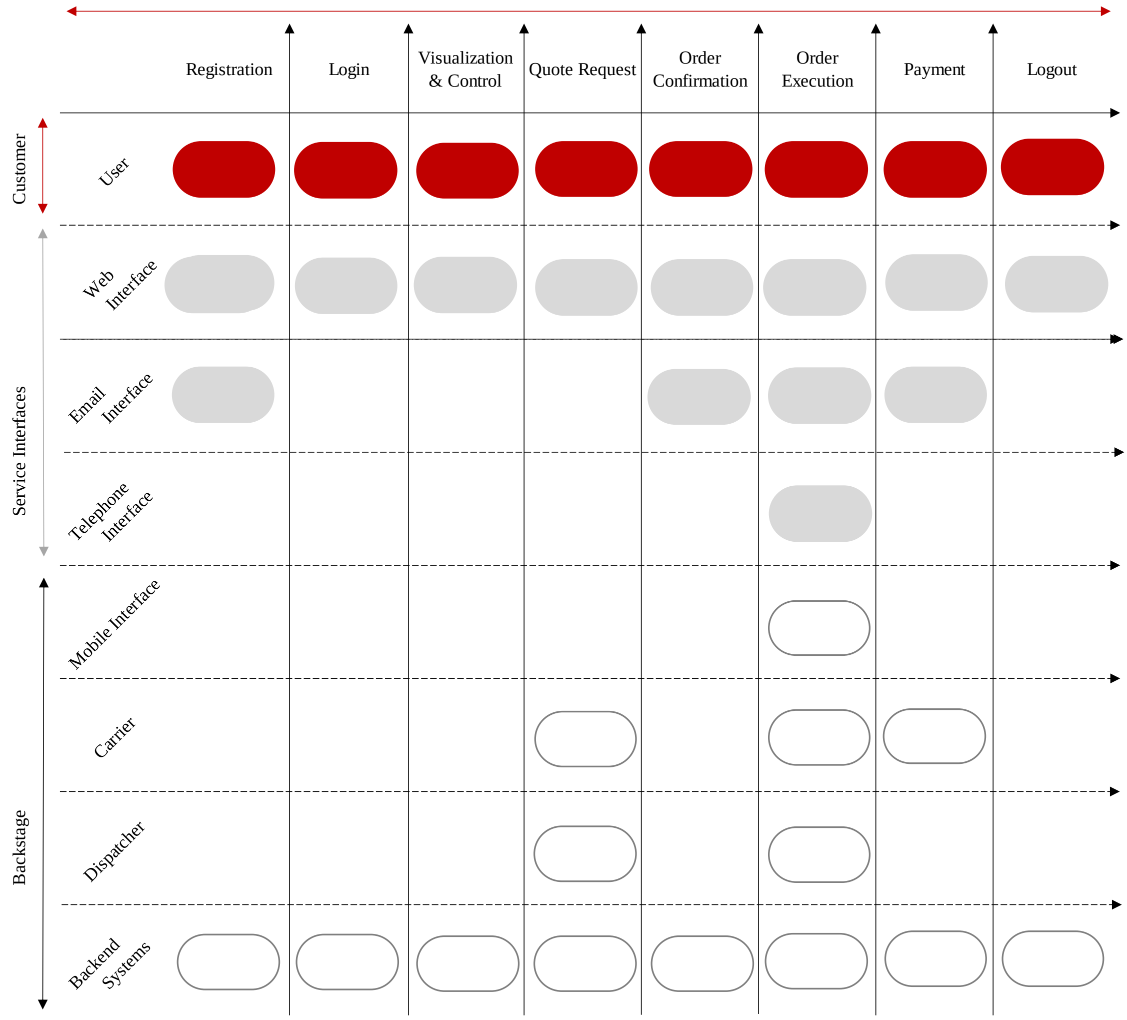

Figure 15 – Service System Architecture

Visualization & Control consists in the part of the customer journey where he can browse available truck space in real time, within the DB Schenker network. This gives him the possibility to take advantage of non-full trucks (LTL) with competitive prices. The shipper can have his loads transported at inferior costs and the carrier can optimize his capacity. At the present and bearing in mind the current pricing/booking process, this flexibility is not possible. The current situation attributes to the dispatcher a vital function of bridging this task, which is not ideal in terms of providing an optimized service response time.

The Quote Request stage was also designed in a completely different way as of today. As previously mentioned, this shipper interface encompasses instantaneous quotation in a self-service basis. In fact, with this interface the customer can request pricing at any time (very useful for benchmarking purposes) without having to wait indefinitely for the answer. The prices are presented to him using rate automation solutions (developed in-house or sourced).

In both processes, the Schenker personnel (namely dispatchers, booking employees and pricing employees) will be alleviated of a process that is known to be long, toilsome and with low conversion rates (many quotations are not converted into an order).

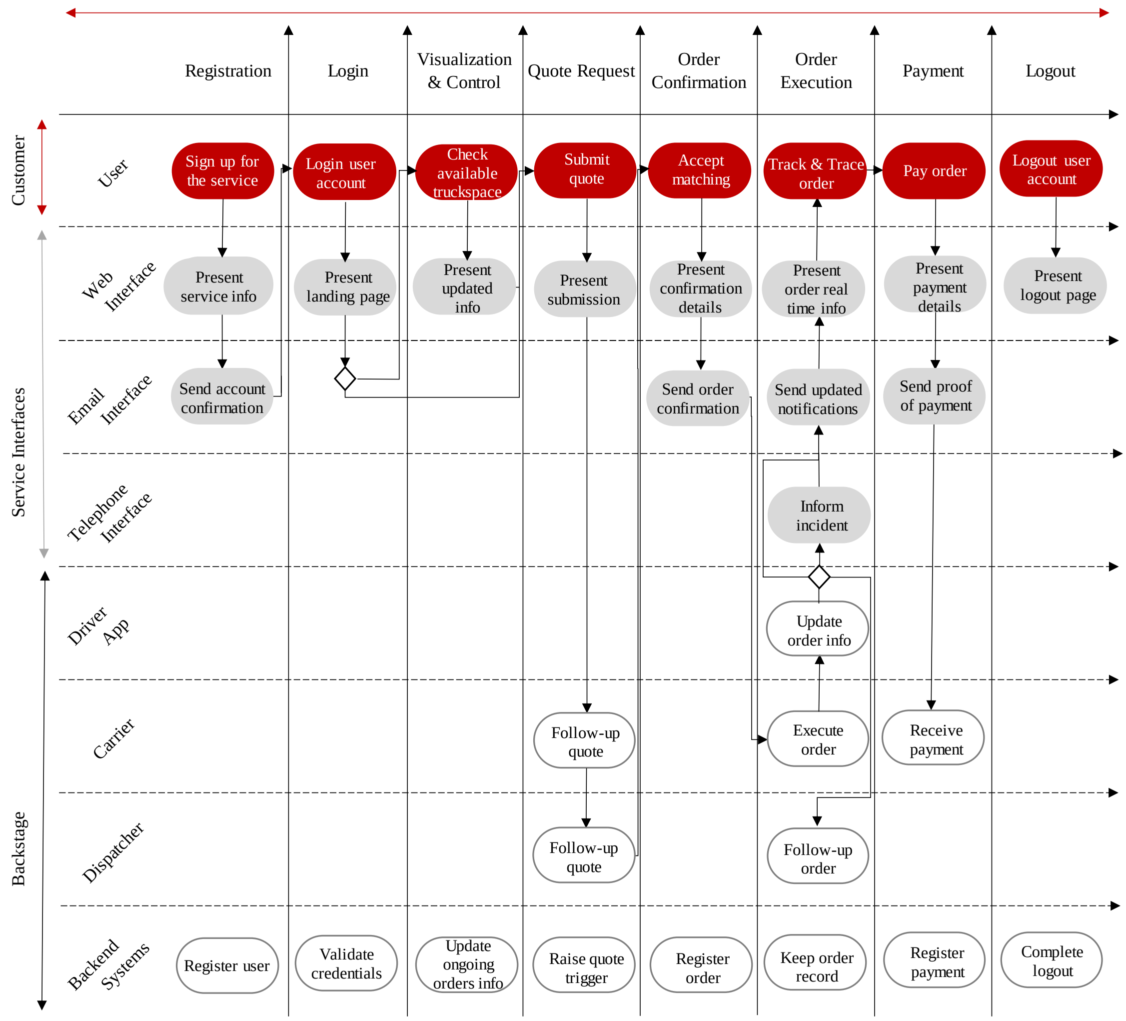

Figure 16 – Service System Navigation

In Figure 16, it is possible to observe the flow of the customer journey throughout the steps of the process (horizontal) and across the several interfaces and stakeholders (vertical). The next section provides an insightful analysis on the Visualization & Control and Quote Request phases and potential fail and waiting points. Also, the expected customer journey is presented in section 6.1.4, along with visual support.

6.1.3 Service Encounter

Understanding the Service Encounter involves studying customer service tasks and customer experience requirements independently of the used service interface. The Service Experience Blueprint (SEB) integrates the design logics of Service Blueprinting and Activity Diagrams, allowing a more detailed design of each service encounter (Patrício et al., 2011). MSD uses the SEB diagram to design service encounters in a way that enhances multi-interface service experiences.

This method helps to analyse which interface is best suited to provide the desired experience for each task and to enable designing service interface links that guide the customer across interfaces whenever such flexibility enhances the service experience. Its customer focus and visual representation of the service delivery are considered strong aids for service innovation (Bitner et al., 2008).

Appendix D covers the previously mentioned most innovative stages (Visualization & Control and Quote Request) all the way to the Order Confirmation. The outlined service encounter highlights the use of web interface to include the final customer in the D4S environment, taking into account the latent privacy issues. Its ultimate goal is to automate the process of browsing for solutions, analysing the available prices and choosing the most suitable matching. Simultaneously, it is also intended the centralization of these activities in one single interface, minimizing the use of other communication tools (mainly email).

Several fail points emphasised in Appendix D and must be taking into account as they can undermine the customer experience:

- Check available truck space: it may fail to go as planned if, for example, the shipper has trouble analysing the presented information or if the carrier accepts cargo outside the platform (resulting in a gap between the virtual and the real trucks pace).
- Update orders: the status update of the orders can be a failure point due to either technical issues or driver error/mistake. In both situations it may cause problems in the Visualization & Control.
- Update orders info: the backend system may also experience technical issues when transmitting the order information from the driver app to the platform.
- Calculate price: the rate automation is the most critical failure point. A quote error may lead to conflicts between DB Schenker and the shipper, when the real costs of transport are not in line with the quoted price. In this sense, the importance of having quality technology backed up by well-engineered processes is tremendous.
- Follow-up quote: the dispatcher has an essential role in assuring that the quote request from the customer is handled with quality service. This includes applying corrective measures to previous errors and preventing subsequent flaws.

Regarding waiting points, where the customer journey may be halted, only one was identified:

- Accept Matching: the fact that the service encounter is designed to be fully automated will result in a fast response to the shipper. The waiting time therefore depends on his purchase decision.

Figure 17 (next page) intends to illustrate the disruptive changes in these two stages, by comparing them to the SCN/D4S reality. As it is possible to note, it is not possible for the shipper to check the available truck space of the entire network of carriers with either SCN or the upcoming implementation of D4S (left side of Figure 17). Aforementioned, this new Visualization & Control stage (that fully depends on the efficient backend functioning of the Driver App) provides additional flexibility and autonomy to the customer. He can be responsible for actively sourcing the best solutions for his needs.

Furthermore, with the proposed shipper interface, the Quote Request will also become more of a self-service type of activity. The Submit quote and Provide quote price tasks (waiting points) will no longer be accountable to the dispatcher and the carrier. These will be made carried out by the shipper itself and by the Backend System, respectively. The main goal is to drastically reduce the quote lead time from several hours (sometimes days) to an instantaneous action.

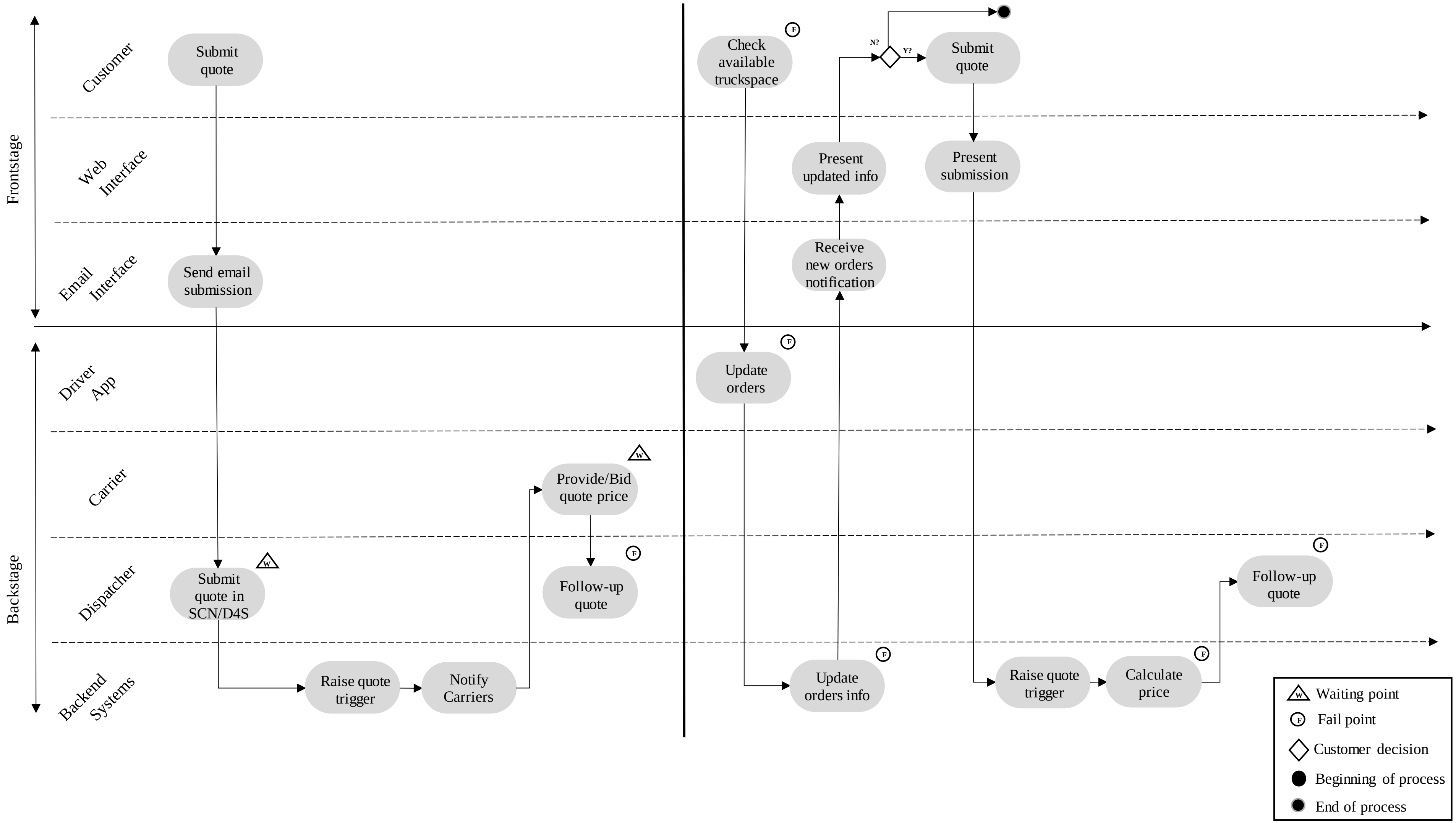

Figure 17 – Visualization & Control and Quote Request Changes

6.1.4 Interface Prototypes

In order to provide a visual support and showcase the innovative features of the envisioned shipper interface, some low fidelity prototypes were developed. To facilitate the understanding of the proposal, it was intended that the interface was similar to passenger flight ticket booking services (such as Skyscanner and eDreams). The following figures (18; 19; 20; 21 and 22) illustrate the expected customer journey along the new service interface up until the order confirmation:

The customer signs up (see Figure 18) into the service by creating an account and filling in all the required information.

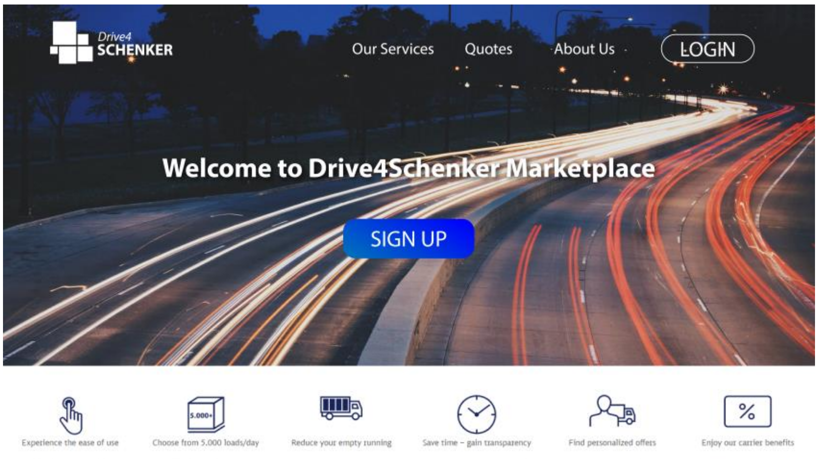

Figure 18 – Sign up Page Prototype (Shipper Interface)

As seen in Figure 19, he can check the available truckspace supported by the ongoing orders map and the browsing tool.

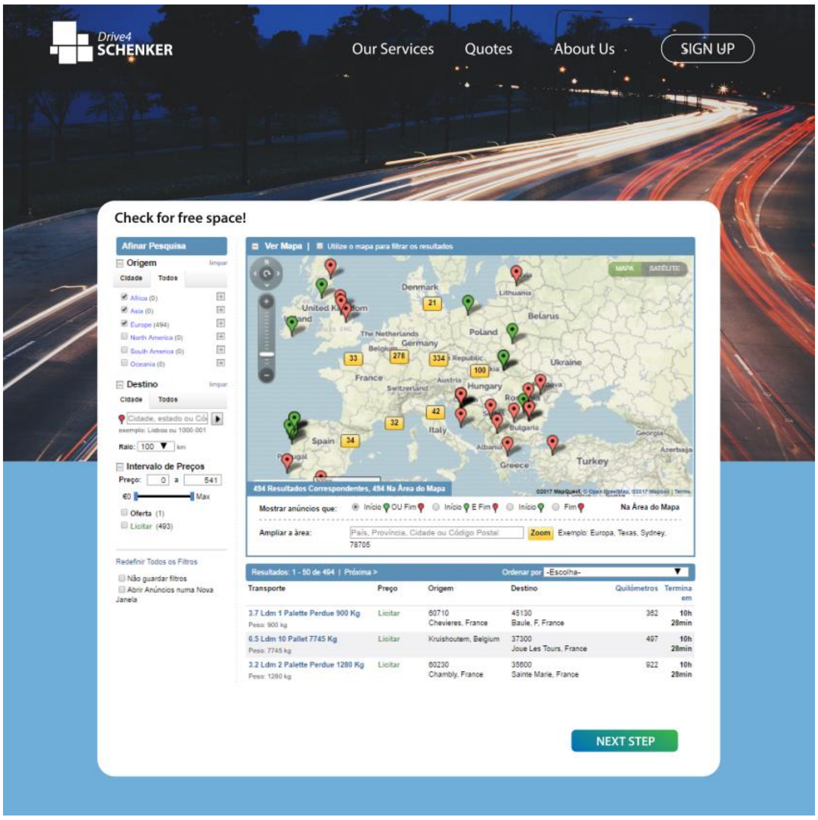

Figure 19 – Visualization & Control Prototype (Shipper Interface)

The customer can also submit the quote by providing the necessary information and clicking the “Search” button. As shown in Figure 20, he can intuitively fill in the required fields and request for optional services (for example, in case the shipment requires dangerous or perishable goods handling).

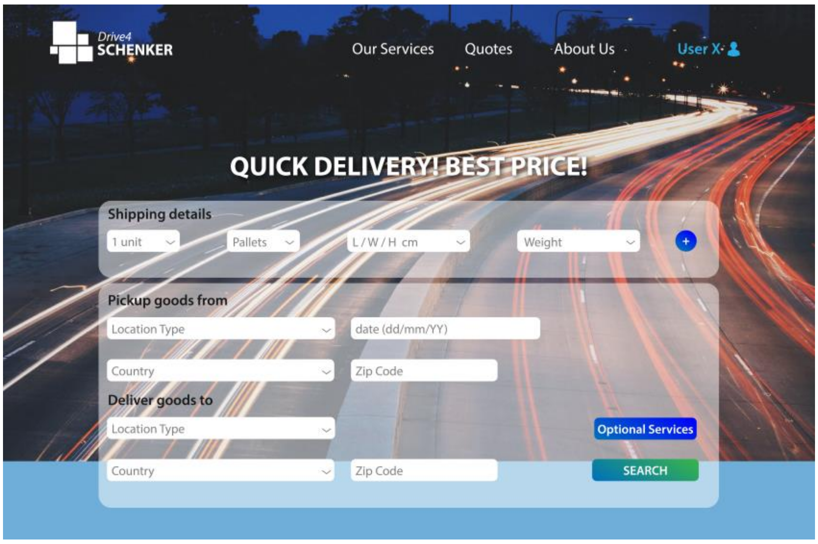

Figure 20 – Quote Request Prototype (Shipper Interface)

The available quotes are presented to him with the underlying details, including price, transport time estimate and mode of transport (Figure 21). The customer can also assess the quality of the carrier through the reviewing system, as presented bellow. He will continue into the next step by clicking the “Book” button.

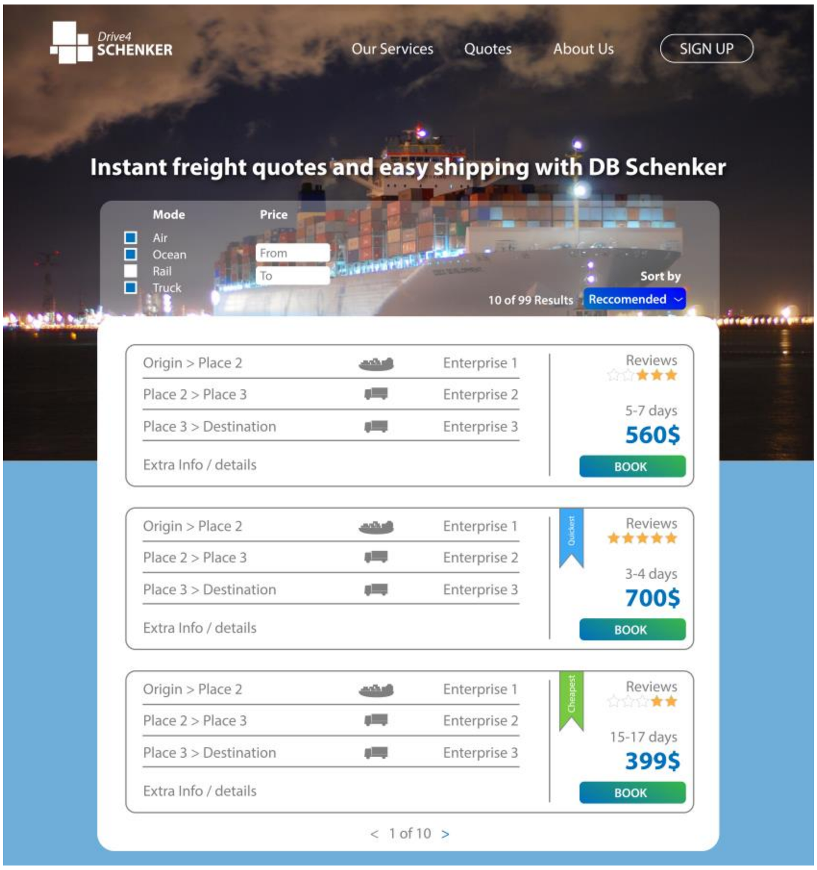

Figure 21 – Available Quotes Prototype (Shipper Interface)

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After, as illustrated in Figure 22, the customer checks and validates the transport details and clicks “Finish order” to complete the order confirmation process.

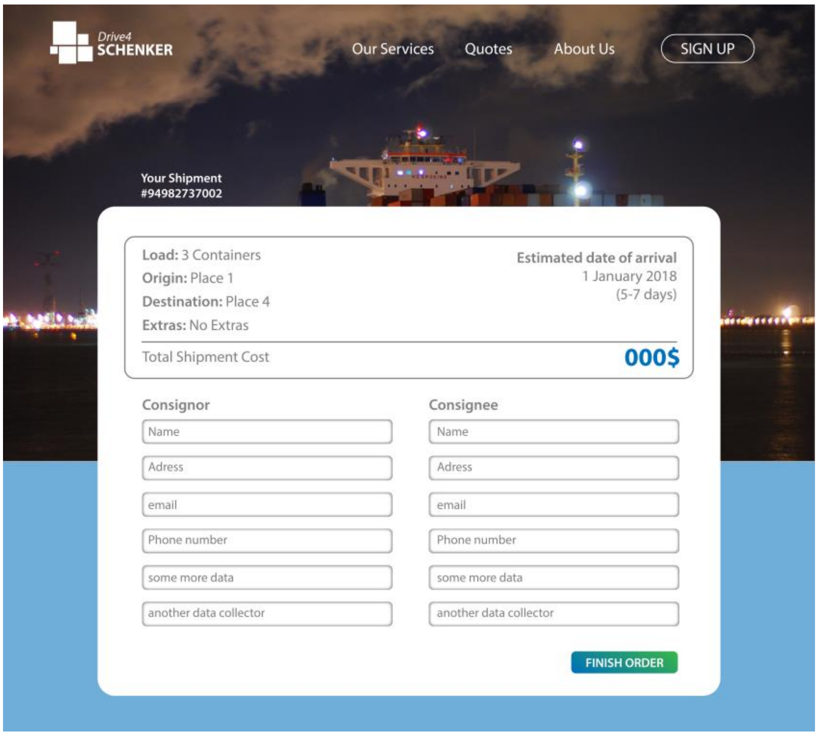

Figure 22 – Order Confirmation Prototype (Shipper Interface)

7 Conclusion and future research

The starting point of this study was the request of the Head of Land Department (DB Schenker Portugal) for an industry research regarding the modern-day business transformations among the key players. An analysis on the company's in-development solution was also intended, in order to in assess its quality and pertinence.

During the state of the art review, several topics were addressed and literature gaps were found, one of which related to the limited empirical research on closed ELM's. The analysed case study is not able to effectively fill the gap, since it does not address the design and implementation of a closed ELM. D4S represents a hybrid of open and closed model as presented by Marasco (2004), allowing participants to maintain existing long-term, collaborative relationships with trading partners along with spot relations. The authors' preliminary findings suggest that the coexistence these two dimensions is likely to significantly encourage participation. Wang et al. (2007) added up that although this had not happened yet in practice at the time, it was highly possible for such a hybrid model to emerge. To this point, more investigation and empirical evidence on closed and hybrid ELM's is required.

Another identified gap in the literature was in regard to the logistics facet of Electronic Marketplaces. In comparison to other areas, the amount of research on such marketplaces in the transportation and logistics sector is little. At an early stage of the present research, it was established that a deep understanding of both external and internal realities had to be settled so that the best methodology would be chosen, yielding findings of considerable corporate and academic influence.

The research objectives were translated into understanding how different approaches to the design and implementation impact Electronic Logistics Marketplaces and how global freight forwarders are appropriating the new digital business models. The in-depth analysis of the DB Schenker case study ensued some considerations that can complement previously made research and contribute to future ELM-related studies:

- <u>Impact of different approaches in ELM design and implementation</u>

Transport and logistics sector is highly fragmented and competitive, with an historical slowness to adopt technologies. Electronic Logistics Marketplaces were first developed in the late 1990's. Historically, the success of such services was not as expected, bearing in mind the announced benefits. Actually, most of those attempts to gain market traction at that time were quick to fail and many reasons were attributed to this unanticipated failure. Those reasons can be summed up into technological issues and reluctance of both shippers and carriers to embrace ELM's.

The discussion regarding a logistics digital business transformation has recently intensified, as other "averse to change" industries experienced major disruptions (e.g. Hotel and Taxi). In this sense, ELM's are increasingly more attractive to freight industry players because of their potential to reduce costs, increase efficiency and automatize processes. Technology has innovated up to a point that it is considered a core aspect of service provision. Still, this rapid evolution and growing complexity of service systems raises new challenges to ELM's design.

The present case study analyzed the development of Drive4Schenker. As previously mentioned, this solution is a Freight Exchange Platform, a type of ELM that connects the freight forwarders to the carriers. The utilized framework for the D4S development project is Scrum, which represents the most frequently used process of the Agile software development processes (Hussain, Slany, & Holzinger, 2009). One of the claimed benefits of using agile development is that users' needs are taken more into account than when developing software based on more traditional processes (Singh, 2008).

This research made use of the Multilevel Service Design, an approach that provides a more holistic view of the service. It enabled to envision the customers in a more collaborative, rather than participative, perspective where they are incited to co-create value (Patrício et al., 2011). It enriched the perception of the service as a whole, which is more difficult when using more programming-oriented methodologies, such as Scrum/Agile. In the development of a technology-based service, experiences must be analysed taking into account the entire constellations of related offerings and people must be seen as more than just users of a platform.

The final result entails a proposal of improvements to be made to D4S. The co-creation can be grasped in the Visualization & Control stage, where customers are encouraged to collaborate with each other and with carriers, aiming the optimization of the truck space and consequent cost reduction for all parties. Furthermore, this value co-creation is extended to the automated Quote Request stage, where self-service is availed to the shippers to induce a fast and efficient quoting process. The integration of the proposed interface within the D4S scope will provide full shipment processes visibility (order matching, tracking, documentation and payment processes) within a single platform.

Additionally, as previously suggested, the linkage between multiple departments responsible for the different modes of transport is mandatory. This is something that must be stressed due to its tremendous importance. In order to remain competitive, the company must be able to seamlessly provide solutions for intermodal shipments (alike some competitors already do). Failing to do so will most definitely undermine the customer journey.

Although a relatively small contribution to ELM's literature is made with the present study, it lays out important foundations for the application of Service Design logics in the logistics sector. Further research is needed to compare different alternative approaches the design and implementation of ELM's and evaluate its success. Moreover, there is also a gap for empirical evidence of other case studies using the MSD in transport and logistics companies. It is highly suggested that shippers are actively included in future research designs.

- <u>Appropriation of new business models</u>

The shifting in customers' expectations towards more reliability, transparency and speed indicates an obvious need to improve the customer service level. Major players as well as new entrants are making large investments in business digitalization. Companies like Hellmann, Kuehne+Nagel, DHL and CEVA logistics are some of the freight forwarders leading this transformation, with high value partnerships with emerging technology-based services providers. These include transport management systems, freight exchange platforms, rate automation solutions, cloud-based freight forwarders and online sales platforms, among others. Their role within the customer value constellation was previously explained.

These new business models aim at automating aspects of freight pricing, routing and sales to streamline internal operations, optimize freight movements and improve customer connectivity. Supported by Big Data solutions and marketplaces, they provide transparency of rates, carriers' service schedules and shipment execution, visibility and performance. On top of online sales, customer profiling and market segmentation are also at the core of their digitalization strategy.

Still, a clear gap has been identified between the few forwarders fully embracing digitization and the others who show even slower service response time. Freightos (2017) mystery shopping survey showed that most processes are still manual. Freight forwarders took on average 101 hours (4 days) to provide a simple manual spot quote and an average of 15 hours to personally follow up a quote request.

In order to leverage technology, large or profitable freight forwarders must revisit their business models and make investments to operate quality services at the lowest possible cost and least environmental impact. DB Schenker's investments in the digitalization of its business model, namely in restructuring its corporate structure and partnering with Uship for the development of Drive4Schenker, are large steps towards securing competitive advantage. However, some competitors are doing so at a faster pace. The entry of a large tech one-stop multi-vendor logistics network operator, linking data, technology and people with integrated seller-buyer financial services and improved customer experience is a scenario being watched.

In this sense, DB Schenker needs to establish strategic priorities, aligned with the new business model transformation. This approach requires the redesigning of value added functions into a digital environment, structuring customer and product segmentation, centrally optimizing carriers and suppliers' contracts and streamlining internal processes. Strategic partnerships (mergers or acquisitions) may be the key to the successful transformation. The proposed improvements to D4S envision features that can effectively support the company in icreasing its overall efficiency and revamp the company in relation to its competition.

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APPENDIX A: Uberization of Freight

Since mid-2016, a great deal of discussion on the potential disruption of the traditional transportation industry is generating a noticeable buzz around executives and business experts, clearly observed in the American media. The so-called "Uberization of Freight" (also known as "Uberization of Trucking", "Uber for Freight" or "Uberization of Logistics) has been addressed by several articles, describing the money flowing into startup firms that are looking to change current paradigm in the same way Uber disrupted the taxi industry.

Uber is the tech company that developed a location-based, easy to use app that can be downloaded to smartphones to order a ride and is designed to leverage "the sharing economy." In logistics this is often referred to as a "non-asset based model", similar to what is used by several 3PL. Both of these terms are to say that Uber does not own any vehicles. Instead, the drivers use their own vehicles to taxi passengers to their destination.[17]

The latest logistics disruption argument implies that just as Uber has revolutionized the traditional ride-hailing industry dominated by taxi cab companies by allowing individuals to arrange for a passenger vehicle through a smartphone app, so too, companies will be able to contract with freight-hauling trucking firms through the same type of app. Hence, the right technology will be able to replace the role of the intermediary, much as taxi dispatchers have been sidelined by Uber. This would be most felt by brokers, whose sole purpose is matching shipments with trucks. Some of them charge high markup fees for their services, so an automated platform potentially could have a significant impact on the overall cost of shipping.[18]

Jack Nicas and Laura Stevens affirm that " a series of startups are vying to become an Uber of trucking,' leveraging truck drivers' smartphones to quickly connect them with nearby companies looking to ship goods[19]. The upstarts aim to reinvent a fragmented U.S. trucking industry that has long relied on third-party brokers, essentially travel agents for trucking who connect truckers with customers." According to the Wall Street Journal experts, "investors are pouring millions of dollars into startups hoping to disrupt the $700 billion (US) trucking industry, the latest example of Silicon Valley's efforts to upend the traditional economy". "The hypothesis is that they're so efficient, they're going to put established brokers out of business", said Noël Perry, FTR Associates senior consultant, that believes in the elimination of the middleman and the cost the middle person imposes on the marketplace (Dills, 2017)

CrunchBase, an online database for investors and companies seeking funding, shows that over $170 million invested since the beginning of 2015 in U.S. tech startups focused on longer haul freight moves and well over half a billion dollars invested in last mile type solutions. Some of the biggest include Otto, Cargomatic, OMVS, ShipX, Convoy, Transfix, Cargo Chief, and Trucker Path. Furthermore, giants are also tackling this opportunity.

In August 2016, Uber announced the acquisition of Otto, a technology startup whose mission is to rethink transportation, starting with self-driving trucks. Although the initially stated goal was linked to autonomous trucks, Uber has already started pitching services to shippers, truck

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[17] https://www.forbes.com/sites/stevebanker/2016/04/08/the-uberization-of-last-mile-freight/#61cbb48b3ad4

[18] http://www.lek.com/sites/default/files/1908_Uberization_for_Freight.pdf

[19] https://www.wsj.com/articles/startups-accelerate-efforts-to-reinvent-trucking-industry-1445918403

fleets and independent drivers that are set to compete with the brokers who connect carriers and shippers[20].

The CEO Travis Kalanick has long described Uber as a logistics company, and the Otto partnership comes with additional navigation, mapping and tracking technology that will provide Uber with the foundations, as it looks to build out a freight network connecting shippers and carriers. The company's Uber Eats food delivery and Uber Rush shipping service have already done the same thing on the city-level and, according to Otto's co-founder Lior Ron, the new goal is about "building that long-haul piece."[21]. Still, little is known about the Uber Freight, which website was already launched. Right now, it's about data acquisition and processing: it will give Uber access to enormous quantities of real-life data that can help prepare for and improve the eventual autonomous hauling service it plans to implement using Otto's self-driving trucks.

Moreover, in the end of the past year, Business Insider reported that Amazon was developing an app that would match truck drivers with shippers, schedule to launch in 2017. The company has purchased thousands of trailer trucks and dozens of cargo planes while launching new "last mile" services, like Amazon Flex that take packages straight to the end customer.

But the broader goal is to improve the "middle mile" logistics space, which is largely controlled by 3PL's that charge a hefty fee for handling the paperwork and phone calls to arrange deliveries between shipping docks or warehouses. It would make shipping more efficient and cheaper not just for its customers but also for Amazon, which has been dealing with rising shipping costs lately[22].

The more shipping process steps Amazon controls, the lower costs are for the company overall. Not only would Amazon's app be a convenient tool for drivers, but if it works, Amazon may look to offer the service to non-Amazon shippers for a fee as a business-to-business freight shipping service. This would provide another revenue stream for Amazon and would also help cut costs of its shipping operations.[23]

Unlike its competitors, Amazon already has a giant shipping network and a rapidly growing package volume, so theoretically it shouldn't be hard to find a load match for the drivers on its platform[24]. Another example of the application of the popular Uber cab-ordering model to the freight and logistics industry across the United States is Doft. The California-based startup takes a fixed $4.99 commission on each job. The CEO Dmitri Fedorchenko boldly commented that: "we are going to become a huge, 21st century transportation company that will disrupt the whole logistics industry to make it more efficient, and we won't be staying on the ground, either. We want to save people and companies money and time, as well as helping the environment[25]."

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[20] http://www.reuters.com/article/us-uber-trucking-idUSKCN11Y0DI?feedType=RSS&feedName=technologyNews

[21] https://www.engadget.com/2016/09/28/uber-wants-to-do-for-truckers-what-it-did-for-cab-drivers/

[22] http://www.businessinsider.com/amazon-building-uber-for-trucking-app-2016-12

[23] https://arstechnica.com/business/2016/12/amazon-reportedly-making-an-app-to-connect-truck-drivers-and-shippers/

[24] http://www.businessinsider.com/amazon-building-uber-for-trucking-app-2016-12

[25] http://www.handyshippingguide.com/shipping-news/uber-for-us-freight-trucking-new-app-service-goes-country-wide_7822)

Other reported big name investors are Salesforce founder Marc Benioff and eBay founder Pierre Omidyar. While this phenomenon is currently happening in a more intense way in the United States, the global transportation and logistics sector will most certainly feel its effects.

Even though the media is effectively insisting in such comparison, several industry players argue that these marketplaces are far from being equivalent to Uber. The differences between taxis and trucking are far greater than they seem and make the freight-hauling industry a poor candidate for Uberization, at least in the form that has transformed the taxi industry. ARC recently published a market study on the transportation execution market and largely discounted the impact the startups will have on this market for the next few years. In short, there are those that believe the opportunity is not nearly as big as the venture capital community thinks it is.

Certainly, the trucking industry certainly has some conditions that make Uberization attractive:

<u>The high value of the underlying assets translates into a need for optimal utilization</u>. One of Uber's initial value propositions was to allow a better exploitation of underutilized valuable assets, namely the "black cars" (limousines and town cars). Another good example of such optimization of a costly asset is Airbnb, which increases the usage rate of people's houses. The same happens in the logistics industry as well, carriers want to maximize the capacity utilization of their vehicles. Furthermore, since in the less-than-truckload (LTL) market carriers transport goods from multiple shippers, the role of the broker is crucial on doing so.

<u>The potential technology has to make industry processes more efficient is also one of those conditions.</u> Uber's platform revolutionized the taxi industry, availing an intuitive smartphone app instead of the inefficient and old fashioned phone-based dispatch system. It managed to improve the whole customer journey, from the very first contact with the platform all the way to the seamless and accurate payment processing. In an industry that is historically averse to adopting new technology, only the right innovation managed to disrupt its *modus operandi*. Looking at the transportation industry, one can grasp the same potential for a technology-based transformation. The fact that the current matching between shippers and carriers is characterized by being people-intensive, made via phone and generating a great deal of paperwork makes streamlining the entire process a valuable opportunity.

However, several conditions go against the Uberization of the transportation industry as it happened in the taxi case:

<u>In the first place, the market does not consist in "one-off" transactions</u>. Contrary to the taxi industry, intermediaries in the logistics industry are tremendously important. When catching a ride, the customer has no relationship with the cab company and is not concerned with which provider is offering the service. These one-off transactions facilitate the takeover of a technology based solution. Since companies have no way to track customer relationships, the Uber model had a relatively easy time capitalizing on the fact that no benefits were handed out to repeat business. On the other hand, shippers develop long-term relationships with brokers. Handling freight transportation and logistics is far more complex than arranging a taxi ride and requires the know-how of expert brokers. Networking capabilities, knowledge of different industries, providing short-term credit, understanding of the subtle differences between carriers and ability to arrange good deals for important clients are some of the advantages of hiring a 3PL. Such key factors are hard to replace with an automated platform and attempting to do so can seriously damage these long-term shipper-broker relationships.

In addition, the shippers' customer experience is far better than what taxi users experienced. Going back to the pre-Uber cab experience, customers had to wait in the street to catch a ride or phone the cab company and then wait during an undetermined time. This process was time-consuming and uncertain and often lead to dissatisfaction. Additionally, when in the taxi, the clients frequently came across situations where they would pay more than the actual fare, the vehicles were dirty and the driver was unwelcoming. Uber was able to eliminate all of these problems in an efficient, transparent and generally cheaper way. When it comes to shippers, they don't have similar complaints. Although the desire to pay less is inherent to any business, brokers take accountability for the majority of the work. It's their responsibility to arrange the best transportation solution for the shippers, who know the cost and what will they get for it in advance. While their customer experience can be improved, it is not nearly as dissatisfying as the prior taxi situation.

Finally, a number of Uberization-friendly conditions don't really exist for the trucking industry at all:

Other non Uberization-friendly condition is the fact that the taxi offers a service relatively homogeneous whereas the freight transport is usually not. Normally, the cab ride comes down to driving someone from point A to point B. There is a degree of similarity from customer to customer that enables a good functioning of the Uber platform. When the customer's needs are unique, the model does not work so well – someone carrying a surfboard might be more a more complex problem for Uber to solve. In logistics, most of the times the service is nonstandard and complexities arise in the form of specialized equipment types (such as flatbed, refrigerated, or hazmat), shipments transported via multiple modes (such as from ocean carrier to railcar to truck) and necessary exception handling for service issues (such as equipment breakdowns or weather-related incidents). When it comes to LTL situations, things become even more complicated. Needless to say that the risk and complications are far greater dealing with high value and time sensitive shipments.

A remarkable difference between the two industries is related with the capacity constraints. Supply and demand are not balanced and demand peaks often occur. Cities have a tight control on the number of taxis that can operate within its boundaries, being so drivers have reduced ability to move to areas where there is demand. But whenever an event results in crowds of people looking for a ride, Uber is able to source additional supply due to its "shared economy" facet (every car stopped in a garage can be a "taxi" and serve as idle alternative capacity). On the other hand, the shortage of licensed trucks and drivers in the industry results in a fixed capacity and the lack of idle vehicles to satisfy demand surpluses, which are tackled through dynamic spot prices (similar to Uber's surge pricing).

Regulatory barriers also hinder the disruptive potential of this type of technology. Uber has had to overcome several legal and ethical issues regarding uncertified drivers and vehicles, posed by the industry players and regulatory entities. This is also a big obstacle to the "Uberization of freight", especially in an industry where barriers are challenge and exist up to the level of the individual driver. Training and certification requirements, compliance requirements related to driving time and resting period and upcoming enforcement of the digital tachograph regulations are impediments to the implementation of a Uber-like platform.

Uber model works best in cities, where there is a high concentration of supply and demand in the same location and it can establish a sufficient customer base to ensure its success. Also because of this, Uber tackles each market gradually. In the long-haul transportation industry, for a technology platform to take hold companies would need to become part of the ecosystem simultaneously, since it does not operate at a city-level. The difficulty in launching such marketplace at a global scale is one of the main challenges.

There are obvious process inefficiencies in the freight industry that could be solved with the implementation of the right technology. However, many startups have not been able to succeed in the freight industry due to the lack of many important conditions that embrace Uberization.

From matching shippers and carriers to routing and optimization, a platform would be of great importance for transport and logistics but, in several experts point of view, disintermediation as the wrong way to go, especially in the more complex LTL space. They add that as these tech companies work towards achieving the necessary scale and marketplace acceptance, they are more likely to benefit from partnering with traditional brokers, at least in the mid-term. In other cases, a viable exit strategy would be settling for an acquisition by a large 3PL. Layering a platform solution on top of an existing business model could enable existing brokers to become more efficient and less labor intensive, thereby lowering shipping prices.

Large shippers frequently have long-term relationships with 3PL, and the degree of integration together with the two-sided gains makes them reluctant to change. Small and medium size shippers can also limit the effectiveness of Uberization for LTL since they currently experience gains in lower prices, access to a broad range of offers, good customer service and trust when using a broker. In this sense, some say that the Uberization of trucking will probably not achieve the same level of penetration and will take considerably longer than it did for the taxi industry. In the long run, larger brokers who can afford to implement the technology will be the likely winners in the race to Uberize the industry. Like Uber, they will essentially become software companies.[26]

[26] http://www.lek.com/sites/default/files/1908_Uberization_for_Freight.pdf

APPENDIX B: New Business Models

According to Drewry (2016), a leading international provider of research and consulting services to the maritime and shipping industry, the following new digital business models are emerging:

Online sales platforms

Platforms aimed at midsize shippers where they can request instant spot quotations, book and pay such as Freightos, Fleet, Searates, Transporteca (comparable to Expedia or Booking for freight). They provide easy dashboard tools are seen as neutral and transparent, without going too deep into shipment execution.

These marketplaces are a cost effective through which forwarders are able to reach more customers and provide dynamic public and customer-specific rates. They target paricular markets, such as LTL, customer segments and specific trades (e.g. Asia/USA) and are being increasingly used by larger shippers. To be scalable, they have to automate processes such as tendering, procurement and payment through an Application Programming Interface[27] (API).

Cloud based freight forwarders

Companies like Flexport, IContainers, Kontainers that address the small/medium shipper door-door market, focusing on specific trades and segments where they can pursue automation. However, their shipper size target has been increasing and now reaches the low end of the large forwarders' core business.

These freight forwarders provide advanced customer experience through online intuitive solutions (including instant quote/booking and execution dashboards), extended customer service and cost efficiency through automation, while operating with technology developed from scratch.

E-commerce and tech giants

Technology companies with sprawling infrastructure, large captive audiences, and accessible capital such as Uber, Amazon and Cainiao (Alibaba Group-related logistics company) have been relentlessly exploring new opportunities. Although their strategy has yet to be announched, their drive is likely to be serving their own transport service needs, controlling the end-to-end seller-to-buyer process.

Given the market opportunity, logistics represents a lucrative target for corporate expansion, a potential scenario commonly debated would be to operate innovative and cost effective integrator services as a one-stop multi-vendor logistics network with integrated financial solutions. Their impact may also be on their capacity to raise the service level and use of data, predictive analytics.

Mid-size forwarders technology-driven networks

[27] An Application Programming Interface is a set of clearly defined methods of communication between various software components. A good API makes it easier to develop a computer program by providing all the building blocks, which are then put together by the programmer. An API may be for a web-based system, operating system, database system, computer hardware or software library (Clarke, 2004).

The developlment of technology-driven “forwarder networks” (e.g. BuyCo, Centrolene, WIN/WCA) is based on powerfull technology and strong trust and liability obligations among the members. They aim to provide their mid-size forwarder members with technology, network capacity or rates to compete with market leaders, combining their expertise and agility.

Although large forwarders have other capabilities such as buying power and organizational know-how, these marketplaces intend to minimize some of their competitive advantages (namely, network and IT).

Rate and service information technology providers

Rate automation, freight insights sources and yield management are critical to power online sales. The use of freight business intelligence available lead to a better informed market and provide rate transparency. CargoSphere, Catapult, Freightos, Okargo are examples of these rate automation solutions that offer information and services supporting the integration of carriers’ tariffs and production of forwarders quote to shippers. They present differences in their geography or approach to full or semi-automation.

Transport Management System providers

Logistics providers have been incrementally investing in end-to-end integrated Transport Management Systems (TMS) and connectivity. Business partner networks and collaborative solutions are also gaining traction, for example to handle local suppliers. Mid-size forwarders are migrating to cloud-based solutions with pre-set connectors to marketplaces, port community systems, rate management tools and dashboards. The TMS applications used by large exporters and importers for shipment planning and optimisation, spend management, system integration and control tower will become more accessible to smaller size shippers.

Carriers

Shippers may change to purchasing online directly from carriers to save time, effort and costs. This trend has been reflected in other industries as well, such as airlines directly providing flight bookings to passengers. In fact, airline companies such as China Southern, Qatar Airways and Delta already began online cargo freight quoting and booking.

Senior freight decision makers anticipate that direct online carrier sales to shippers will continue further eating into large 3PL’s market share and expand from air to ocean carriers as well.

APPENDIX C: Qualitative Study Participants

The following table contains the DB Schenker employees that participated in the study:

DB Schenker	Department	Country	Interview (=13); Observation (=14)	Contact Method
Participant 1	Land Transport	Portugal	Interview	In person
Participant 2	Direct Freight	Portugal	Observation + Interview	In person + Phone
Participant 3	Direct Freight	Portugal	Observation	In person
Participant 4	Direct Freight	Portugal	Observation	In person
Participant 5	Direct Freight	Portugal	Observation	In person
Participant 6	Direct Freight	Portugal	Observation	In person
Participant 7	Direct Freight	Portugal	Observation	In person
Participant 8	Direct Freight	Portugal	Observation	In person
Participant 9	Direct Freight	Portugal	Observation	In person
Participant 10	Groupage	Portugal	Observation + Interview	In person
Participant 11	Sea Transport	Portugal	Observation + Interview	In person
Participant 12	Sea Transport	Portugal	Interview	In person
Participant 13	Air Transport	Portugal	Interview	In person
Participant 14	IT	Portugal	Interview	In person + Email
Participant 15	Finance	Portugal	Interview	In person
Participant 16	Fairs, Removals & SE	Portugal	Observation + Interview	In person + Phone
Participant 17	Fairs, Removals & SE	Portugal	Observation + Interview	In person
Participant 18	Direct Freight	Spain	Observation + Interview	In person + Skype
Participant 19	D4S Owner	Spain	Observation + Interview	In person + Email
Participant 20	Shared Service Center	Poland	Interview	Email

The following table contains the Carrier employees that participated in the study:

Carrier	Department	Country	Interview (=8); Observation (=3)	Contact Method
Participant 21	Manager + Driver	Portugal	Observation + Interview	In person
Participant 22	Driver	Portugal	Observation + Interview	In person + Phone
Participant 23	Driver	Portugal	Observation + Interview	In person
Participant 24	Driver	Portugal	Interview	In person
Participant 25	Driver	Portugal	Interview	Skype
Participant 26	Driver	Portugal	Interview	In person
Participant 27	Driver	Portugal	Interview	In person
Participant 28	Driver	Portugal	Interview	Phone

APPENDIX D: Service Experience Blueprint (Visualization & Control, Quote Request and Order Confirmation)