DIGITALIZATION OF TRANSPORTATION MANAGEMENT AND FREIGHT AUDITING IN GLOBAL CORPORATIONS

Case study: Bosch Vietnam

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Abstract

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Abstract

From the 60s - 70s of the last century, logistics has become the backbone of supply chain activities. Amongst the components of the supply chain, transportation plays an essential role in logistics that determines the efficiency of global trade. With the outburst of technology, transportation has faced several challenges as the increases in demand, competition, and costs require proper management. One of the driving forces that tackle these hurdles is the digital transformation in transportation and freight management.

The thesis covers an insightful analysis of how digitalization in transportation management and freight auditing benefit and leverage global corporations. The study consists of theoretical and empirical research with the qualitative data collected from both primary and secondary sources.

The theoretical research covers the literature review of transportation and its role in logistics as well as the management of transportation and freight cost. The digitalization process in transportation management and freight auditing has been revealed, with the deployment of transportation management systems (TMS) and freight auditing software (FAS). Secondary data is utilized to explore this part, which is collected from books, articles, reports, and electronic sources.

The empirical research answers the research question throughout the analysis of a case study – Bosch Vietnam which belongs to the Bosch Group. The sources of primary data are collected from participant observation and in-depth interviews, providing a profound impact on the case analysis. Four participants were observed based on the participant observation setting (Appendix 1) whereas two semi-structured interviews (Appendix 2) were conducted with key experts in the field.

The results indicate that transport and freight management through TMS and FAS brings about cost reduction and savings, standardization in data consolidation and visibility and transparency in freight spend through business intelligence tools.

Keywords

Transportation, Transport Management, Freight Management, Transportation Management Systems, Freight Auditing Software

LIST OF ABBREVIATIONS

TMC – Transportation Management Center

TMS – Transportation Management System

TM – Transport Management

FM – Freight Management

FAS – Freight Auditing Software

IoT – Internet of Things

LSP – Logistics Service Provider

CONTENTS

1 INTRODUCTION

With the increasing levels of intensity in the competitive marketplace, the industries witness a number of hurdles that consistently challenge business leaders and practitioners to overcome. Together with the revolution of Industry 4.0, traditional players hardly captivate the customer base without transforming their ways of doing business. (Wilson 2021.) As a result, companies are opted to modify the operations processes by adopting advanced digitalization. With the support of technological evolution, businesses are able to incorporate strategic initiatives to respond to customer demand and dynamic competition in the global economy. (Tareq 2020.)

There is no doubt to state that logistics is the backbone of every company and a key enabler of the entire economy. It ensures the movement of goods to be in the right place at the right time. At the heart of logistics, transportation plays an indispensable role in controlling and impacting the overall logistics chain since its cost accounts for an enormous proportion. (Tseng et al 2005, 2-3.) Therefore, logistics managers and business practitioners are striving to enhance efficiency and minimizing costs, by implementing digital supply chain and transportation management into the operational process. (Shah 2020).

Empowered by the 4th Industrial Revolution, the digitalization of logistics and supply chains is one of the top priorities of business strategy. This, accordingly, requires the companies to integrate and design the process flow with electronic tools and applications. With the transformative Internet of Things, digital solutions are expected to enhance the level of responsiveness as well as visibility in logistics practices. Besides, digital systems strengthen the monitoring process of inventories and stocks in the warehousing aspect. More importantly, those technological systems are utilized to optimize fleet routes and vehicle-loading capacity in transportation management solutions. (Reis & Macario 2019, 9.)

Therefore, adopting advanced technologies in the logistics industry, especially transportation, offers benefits in increasing operational efficiency and cost-saving. In order to meet the growing demand of customers, the implementation of transportation management systems and freight auditing software should be considered as a core business strategy in multinational corporations. With the advantageous and feasible functions, these systems not only maintain the optimization of transportation operations and invoice auditing and payment but also assist in the transparency of big data analytics in today's era. (Shah 2020.)

1.1 Thesis Background

In the digital age, digitalization has become one of the prerequisites in different industries because business practitioners attempt to take advantage of digital solutions. Along with the development of the supply chain, transportation and logistics sector account for a significant scope of the productivity of an enterprise. With the growing demand from customers, transportation has encountered dramatic challenges in which timely and accurate deliveries are secured while costs are maintained at the lowest amount. Therefore, initiatives and proposals of digital transformation are sufficient to respond to the requirements. In fact, due to the lack of qualification and expertise in transportation optimization, several companies are now outsourcing external service providers which could result in a higher cost for the business. (Tareq 2020.)

It is undeniable that optimizing the transport operation is a complex process that involves a strategic network design, conventional routing optimization, and negotiation with suppliers for baseline pricing. According to Lux Research (2021), as the transportation industry constantly evolves, there are certain obstacles in agility, sustainability, and visibility that require businesses to harness digital solutions to overcome them. As Accenture (Wilson 2021) concludes:

> *If they persist with 'business as usual, traditional players can expect to lose both competitiveness and value. If, however, they harness the power of digital technologies and build new, digital business models, they could significantly enhance their competitiveness, boosting earnings before interest and taxes by approximately 13% annually."*

Thanks to the privilege of working in one of the global leading companies in technology, the author has been allowed to involve in the logistics project team and approach the new business models in transportation management. Particularly, the project team provides transportation services to different entities and branches of the multinational company. By deploying a digital system and modern software in operations, the team is able to optimize and standardize the process of transport execution and freight cost auditing, which leads to increased process efficiency and freight expense savings.

As a result, with the valuable experience and immense interest, the author is motivated to deep dive into the business case to research the initiatives, analyze the opportunities and propose the significance for process implementation.

1.2 Thesis Objectives and Research Questions

The principal objective of the thesis is to demonstrate the leverage of digitalization in transportation management of the logistics sector providing for multinational companies. Besides describing the crucial role of transportation and its cost in the supply chain, the study also outlines the significance and feasibility of digital systems which could be integrated into the transportation management process and freight controlling and auditing.

As a project-based thesis, it showcases extensive insights of a practice in which transport movements are arranged in the best routing solutions whereas freight cost is under control and verification with a high level of clarity and accuracy in an actual business case. As a result, by examining the practical operation, the current process will be analyzed in terms of productivity and efficiency, and beneficiaries will also be highlighted.

In order to fulfill the defined purposes of this study, sufficient input and quality data are required to clarify the following subjects:

- Role of transportation and its cost in the supply chain.
- The initiative of digitalization in transportation management and freight controlling.
- Advantages and challenges of transportation management systems and freight auditing software.
- Descriptive analysis based on the current process of the case company Bosch Vietnam.
- Suggestions and implications for global firms to implement digitalization in transportation management and freight controlling.

Provided that, the primary research question is: How does digitalization in transportation management and freight auditing benefit the logistics operations in global corporations?

1.3 Scope and Limitation of the Study

This thesis concentrates on the business case of Bosch Vietnam and its associated global services. As the Bosch Group is a multinational corporation including multiple subsidiaries and regional companies in different countries worldwide, the case company is a local entity located in Vietnam. Even though the business case has already gone live in different regions such as North America, Europe, and the Asia Pacific, the scope focuses on the development of digitalization in transportation management for regional Bosch's entities in Southeast Asia such as Bosch Singapore, Bosch Malaysia, Bosch Indonesia, Bosch

Thailand, Bosch Phillippines, and Bosch Vietnam. Currently, the implementation and execution are managed by the transportation team based in Bosch Vietnam.

However, due to the company compliance and confidentiality agreement between different parties, statistical figures in the display are under restrictions with only applicable processes are engaged. Moreover, the reach of specialized professionals in the fields for interviews is also limited due to the narrow network of the author. It could be translated that the interviews are conducted with experts and specialists within the internal resources of the case company.

1.4 Thesis Structure

The thesis is structured in 8 chapters, following by an introduction, research design, theoretical framework, case company analysis, empirical research, data findings, reliability and validity, and conclusion. The introductory chapter presents the priority of digitalization in transportation management and freight auditing, covered in the thesis background, study objectives, and research questions as well as its scope and limitation. In chapter 2, the thesis design will be presented by outlining the chosen research methods, research approach, and data collection methods. Chapter 3 provides a theoretical framework by conducting the literature review of transportation and its digital transformation. The next chapter, accordingly, elaborate on the advantages and downsides that digitalization in transport management and freight auditing could bring to the companies. Chapter 5 introduces the background of the case company and demonstrates the current practice of digitalization in transportation management and freight controlling in its business case. In chapter 6, empirical research and data analysis are examined intensively to provide the study implications. Chapter 7 assesses the validity and evaluates the reliability of the thesis. Lastly, chapter 8 withdraws a conclusion to summarize the analysis and present the outcome of the thesis study.

2 THESIS DESIGN

2.1 Research Methodology

When it comes to a project-based thesis, especially in business practices, pragmatic research techniques and approaches should be appropriately taken into account. The purpose is to collect quality data and generate feasible implications for the topic by providing answers to the research questions (Weathington et al 2012). Therefore, in order to construct a comprehensive thesis, the author believes that a research design is necessary to outline the academic knowledge and interpret further insights in research methodology.

In the presence of a wide range of research approaches, quantitative research and qualitative research are regarded as the most intensive and in-depth. In fact, both types of methods possess their particular features while sharing some certain similarities and differentiating from each other in specific aspects. In terms of the study process, quantitative tends to consolidate an existing theory by carrying out a collection of numerical data following by a variables' relationship measurement. (Bell, Bryman & Harley 2019, 163.) Qualitative research, in contrast, is less prone to do so. The method subject to qualifying a phenomenon, supported by a process of gathering data in words, images, and objects and empirical analysis. (Weathington et al 2012.)

Regarding the purpose, qualitative research is decided as the methodology of this thesis as it aims to interpret and understand social science by observing and examining the participants in it (Bell, Bryman & Harley 2019, 170.) As this is a project-based study, subjective qualitative research allows the writer to actively get involved in the research and explore the situated problem by conducting an applied research setting (Aliuden 2019).

It is stated earlier that, with the purpose of exploring the modern models in social science, the author decides to apply qualitative research with further interpretation through a case study. This genre does not only concentrates on the inquiry of a certain group, individual, or organization in particular but also allows project researchers to delve into the comprehension of research, data collection, and analysis. Instead of investigating different points of view of a spectrum of participants or raising a controversy towards a unique case, a case study is subjected to interpreting its own extensiveness in qualitative research. (Saldana 2011.)

Taking the aforementioned into consideration, to strengthen the validity and reliability of the thesis, the author decides to analyze a specific case study that represents the practical business case that relates to the chosen topic.

2.2 Research Approach

The main approach of qualitative research is inductive, which tends to develop a new theory or add knowledge from the collected data (Aliuden 2019).

The author decides to carry out qualitative research to dig into the understanding of the issue itself and the reasons behind it. The question of how to make decisions, not just what, when, and where, is often answered through qualitative approaches. As a consequence, small but condensed samples are often needed rather than large samples. (Jones 2017.)

2.3 Data collection

In addition to the research methodology and approach, defining the techniques for data collection is crucial in the thesis process. Lancaster (2004, 65) implied that data, as the raw material of the fundamental information, aids in the problem-solving and decision-making process during the analytical research. For that reason, data collection methods are also regarded as crucial as other research processes.

Type of data

Despite its diverse shapes and forms, data is commonly categorized into two major kinds: primary and secondary data. Firstly, primary data is generated and gathered based on the answers and insights throughout the conduct of interviews, experiments, observations, and surveys. As not being in an existent document until compiled via mentioned procedures, this type of data is claimed to provide practical and reliable value from the responders' perspectives. On the contrary, secondary data is usually considered gathering at the initial point once a dissertation is conducted due to its abundant availability. That could be translated that, existing data, stemmed from the information age, could be yielded through distinguishing sources such as databases, reports, articles, and journals, which is cost-efficient and time-saving for the researchers. (Lancaster 2004, 65-66).

Thus, regarding the importance and convenience of both types of data, the thesis consists of the retrieval and collection of both primary and secondary data in textual materials of qualitative data.

Data collection

Data collection methods, as well as the qualitative methodology that employs them, must be assessed properly. Specifically, in-depth interviews and participant observations are opting to adequately investigate the issue and answer its appointed questions. Conducting in-depth interviews requires the construction of open-ended questions in a tailored and

profound procedure, expecting notable responses from the interviewee's know-how. Unstructured interviews can generate an array of data throughout an exploratory conversation between the interviewer and the informants. On the other hand, participant observation is a practice of learning by doing in which the writer involves in the research environment to study the investigated issue. By undertaking this strategy, tremendous knowledge can be attained with the validated source of data from the resulting experiences and insights. Therefore, this method of participant observation entails intuitive understanding regarding the footsteps of people to act, think and respond, leading to comprehensive value in business strategies. (Walle 2014, 19-20.)

As previously stated, qualitative approaches put less control over subjects and the contexts in which observations are conducted, allowing for more fluid and versatile data collection procedures. These methods allow for a more precise recording of reality and quality data while still allowing for distortions. Hence, the empirical part is built upon primary sources from interview outcomes and participant observation from the targeted case company. The theoretical part is reviewed and developed through secondary data in book chapters, published articles, updated news on the Internet as well as company reports. In conclusion, the thesis is designed with qualitative research, inductive approach, and data collection employing in-depth interview and participant observation (Figure 1).

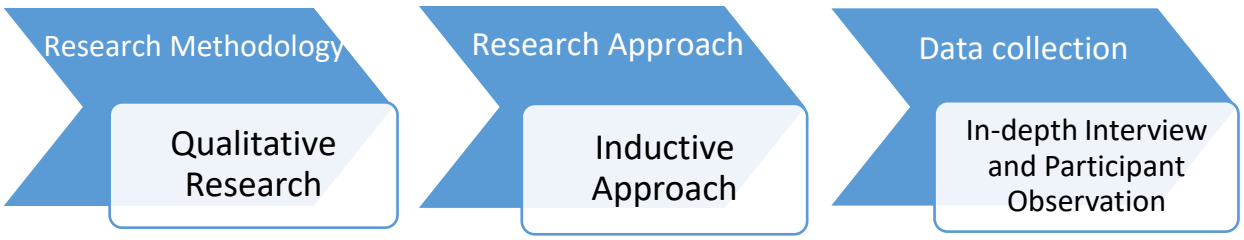

Figure 1 Thesis Design

3 DIGITALIZATION IN TRANSPORT MANAGEMENT AND FREIGHT COST AUDITING

3.1 Transportation Management

3.1.1 Transportation and Its Importance in Logistics

Transport, as one of the fundamental activities of human beings, mitigates the geographical distance across the continents. It accelerates global trade by connecting people in different locations and supporting the movement of goods worldwide. Being an indispensable component of the economy, it consists of modes, infrastructures, networks, and flows as the key elements driving the transportation force. Specifically, transport covers the mobility of people, the movement of freight, and the transmission of information. (Rodrigue 2020 a.)

There is no doubt that transportation influences the economy, the environment, and society. Regardless of its effects, the sector plays an integral role in the commercialization of the global economy. As assisting the companies to approach the markets and access the potential resources, transportation generates a competitive advantage as a service. In the setting of commercial geography, the development of logistics and supply chains evolves dramatically with the aim to increase efficiency and decrease costs for businesses. (Rodrigue 2020 b.)

Amongst the factors contributing to the supply chain system, transport occupies an important segment since enterprises are reported to spend one-third to two-thirds on transportation costs. As a result, it has an impact on both the production and sale of each business, depending on the characteristics of products such as volume, weight, and value. This could be translated that, transporting small, light, and valuable goods account for a small proportion of sales and vice versa. Therefore, business leaders and logistics strategists set the management of transportation as a priority in the sector of logistics, which brings the concentration of effective performance and gain customer satisfaction in terms of service quality. (Tseng et al 2005, 5-7.)

3.1.2 Definition of Transportation Management

In today's exponentially emerging economy, the value proposition and financial bottom line of an enterprise are defined and delineated by its performance in logistics operations (Miller & Liberatore 2020). To some extent, supply chain management, comprising logistics operations, is known as the process of managing the planning, execution, and

monitoring of the chain activities. On account of its prominence, supply chain management produces net value, reinforces logistics network and infrastructure, synchronizes supply with demand, and sharpens the competitive edge. (Eby 2018.)

Despite being an integral part of supply chain and logistics management and subordinating to them, transportation management is a discrete and peculiar discipline that signifies a far-reaching industry, as Christoph Seitz highlights (Eby 2018). However, to contend with the unprecedented challenges in fierce commerce, firms are prone to adapting to the process transformation in virtue of system digitalization. Given the phenomena of Internet of Things and Big Data, it is implied that there is paramount imperativeness that calls for logistics professionals' decision to approach digital solutions in supply chain management, also particularly in transportation management. (Miller & Liberatore 2020.)

According to Christoph Seitz, transportation management constitutes a set of processes facilitated to handle the transportation of goods and cargo specifications with the aids of technological systems. In reality, transportation management encompasses strategic planning and tactical optimization to maintain the efficiency of cargo movements. As William Salter emphasized, in order to inflate the utility of resources and minimize costs at the same time, this business modeling requires daily execution and resource allocation as well as cost controlling. (Eby 2018.)

3.1.3 The Digitalization of Transportation

The world of industries has seen inevitable changes in technological advancements, particularly digitalization is steadily integrated into each of the market segmentation. On top of that, logistics and supply chains have been shifting from traditional and manual processes to modern and digital solutions in daily operations. For instance, factories are continuously implemented with automation followed by Industry 4.0, or systems are technically upgraded with modern technologies to enhance smoother workflows. This revolution, as escalating in the complexity of logistics network, is prone to alter the flows of products from production to customers respectively. (Sharma 2021 a.)

With the advent of the digital age, technological applications and systems have been the driving force in transforming the way businesses operate and function. It is undeniable that logistics and transportation sector benefits a great deal from the transformation regardless of its scope and size. Even though rapid developments are usually accompanied by regulations and restrictions, thanks to the adoption of digitalization, it is promising for the transportation and logistics industry to access real-time data in the management of personnel, facilities, and transactions. By utilizing this, not only abrupt changes in

operations are more easily resolved but also the level of performance and efficiency is increased significantly. (Sharma 2021 b.)

The transportation industry has undergone an expansion in scope and horizon due to the digital wave of information technology. Besides boosting the degree of accuracy, deploying these technologies enables corporations to fulfill customer's demands by designing and customizing the services based on their requirements and expectations. Thanks to connectivity, digitalization strengthens cross-functional cooperation and engages better adaptability in the operations of transportation. Last but not least, enterprises are seemingly updated with the latest ongoing trends and insights from digital sources and are capable of continuously improving processes based on business analysis. (Avee 2021.)

3.1.4 Transportation Management System and Its Functions

The effect of the exponential growth of technology on customer behavior calls for the business's adaptation and development to meet the growing demand. Along with the best quality and lowest price, delivery time is also taken into consideration in commercial trading, which exhibits the importance of the transportation sector in the supply chain. However, the increasing standards and expectations from customers challenge the businesses to face the rise of freight cost, shortage of capacity and simultaneously resolve the constraints in transportation management. (Radchenko 2021.)

To overcome these intimidating challenges, corporations are opting to harness digital solutions by approaching the updated applications and systems. By utilizing the potential of technological advancements early on, business leaders are able to gain a competitive advantage in logistics capabilities and cost efficiency in transportation. Therefore, one of the most effective systems relating to transportation that draws significant intention from logistics practitioners is the Transportation Management System. (Radchenko 2021.)

Manners-Bell (2017, 225-226) indicated that transportation management systems (TMS) "manage the movement of trucks, facilitating loading, routing, pricing and costing" and now "integrate the management of a shipper's or logistics operator's vehicles with carrier and bid optimization, facilitate collaboration cross departments, fleet management and a range of other functions". This type of system aids in the bridging of technological gaps, which facilitates optimal planning, crucial optimization, and effective execution in the operations of transportation (Radchenko 2021). As a subset in the supply chain, this streamlining platform supports monitoring the goods movement and tackling any issues arising in that process starting the initial point of shipment arranged until final delivery to customers (iThink Logistics 2019).

Optimizing the transportation of goods is a complicated, yet essential process to implement because it directly impacts a company's bottom line. Therefore, the feasibility of a TMS can leverage the operations of transportation, hence keeping the freight costs in check and service quality in control. In essence, there is a wide range of TMS software and applications, which varies from traditional on-premise to network design solutions. Depending on the customers' inquiries, TMS is customized and designed based on the particular network in businesses' transport process. Despite the variety and complexity, a TMS is designed to transform business operations by three main functions: planning, execution, and optimization. (Oswal 2018.)

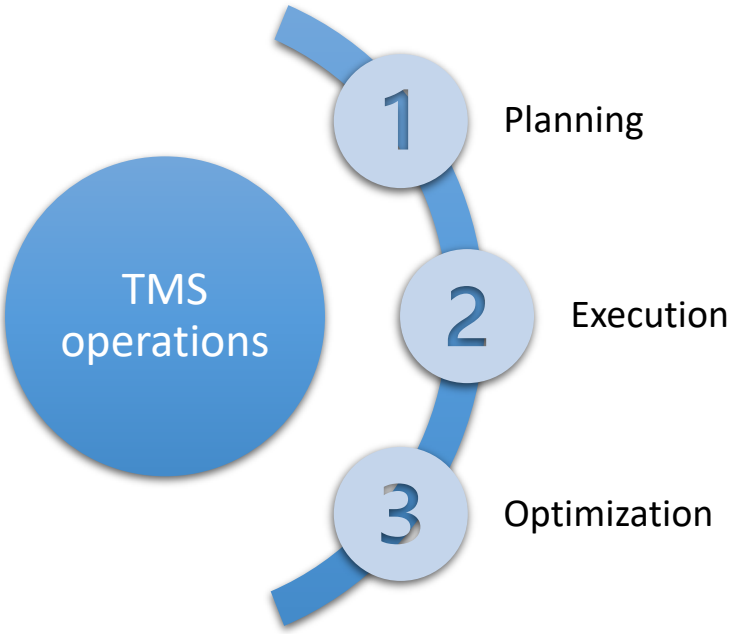

Figure 2 The functions of TMS (Radchenko 2021)

As Oracle indicates "TMS as a logistics platform that uses technology to help businesses plan, execute, and optimize the physical movement of goods, both incoming and outgoing and making sure the shipment is compliant, proper documentation is available". Regardless of the various features that a customized TMS might obtain, there are three main functions which are planning, execution, and optimization that this system could offer to transform the transportation operations, shown in Figure 2. (Radchenko 2021.)

First of all, adopting the TMS functionality enables logistics specialists to plan the most efficient transportation. With the help of better visibility through displays and dashboards, it supports the process of decision-making in different aspects of transportation management. (iThink Logistics 2019.) It is easier for the business to select a suitable mode of transportation and a competent carrier in terms of cost, performance, and distance

(Oracle 2021). Apart from the transport mode and carrier selections, TMS allows the practitioners to deploy more optimal planning features such as order management, tendering, shipment rate management, and load planning. As better visibility is given by TMS, when it comes to orders management, all associated information of orders such as weight, volume, number of pallets, pick-up location, destination place, or specifications are all displayed and then automatically assigned to suitable routes, vehicles, and transporters. Besides, as the system is accessible for all stakeholders involved such as consignors, consignees, and forwarders. It, accordingly, allows them to track the status of shipments and take prompt actions in case unexpected resolutions, such as scheduling changes, lost or delayed cargo, might arise during the transporting process. Meanwhile, tendering is the feature where logisticians are able to select carriers as well as vendors based on specifications. Another tool in the planning aspect helps the executives to manage the rate of shipments through a rate engine. Last but not least, load planning is one of the most important functions because it supports the utilization of the loading space of shipments and closely relates to other crucial capabilities of TMS which are execution and optimization. (Altexsoft 2020 a.) Back then when the integration of technology starts to evolve, the planning function of TMS is basic and manual. However, in today's emerging digitalization, TMS now can perform geocoding, time estimations, and distance calculations. Planning is often a neglected yet important phase, which not only strengthens strategic tactics but also enhances efficient performance based on the comparison of planned capacity with actual operation. (Kant 2014.)

Secondly, execution follows after the planning process, driving efficiencies in addressing major functions of the TMS. Due to the company's specific demand in transportation, the features of TMS may vary widely as it is usually designed to serve the business's supply chain network. Regardless of this differentiation, a TMS at least enables the transportation managers to communicate with LSPs and oversee the status of goods movement. (Oracle 2021.) As the system is technologically equipped with digitalization, it now can automate some of the key functions, for example, load assignment and shipment, which require less human intervention. (iThink Logistics 2019.) The TMS allows the logistics team to tap into the execution process from shipment assignment until its final delivery. During the shipping progress, a shipment is tracked and monitored by logistics executives through TMS and ensured that specifications upon pickup and delivery are fulfilled by carriers and forwarders. (InTekFreight & Logistics 2021 a.) The executing solution also offers a better tool to exchange information amongst shippers, consignees, and LSPs. Other advanced features are related to the access to necessary documentation for both inbound and outbound shipments, which aids in the insurance of trade compliance. In terms of financial

aspects, TMS also assists the process to accept the carrier rate and settle payments of freight invoices with more effectiveness and accuracy. (Oracle 2021.)

Last but not least, optimization is considered as one of the core functions that are included in TMS capabilities. In fact, in order to anticipate the logistics trends, the business leader in the transportation industry must contend with various challenges such as volume changes, increasing freight costs and surcharges, carrier restrictions and performances as well as the environmental effect caused by carbon footprint. It becomes apparent that transportation calls for efficient optimization to enhance the operating systems and adapt to customer requests. Through TMS optimization capacities, it is objected to optimizing efficient routes and fleet utilization. Referring to route optimization, it becomes more effective when optimal routes are altered based on grouping orders rather than the manual solution of traditional scheduling and routing for each day's deliveries. Nevertheless, the fast pacing transport sector requires companies to adapt to daily abrupt changes and respond proactively. In line with this, advanced TMS equipped with real-time routing aids in the real-time communication between different stakeholders, leading to the accommodation of specifications during the delivery process. (Kant 2014.) Fleet utilization, which comes after routes have been efficiently optimized for given orders, refers to the feature of assigning drivers and vehicles most appropriately and efficiently (Atlexsoft 2021). Through a single platform, TMS enables the company to allocate its resources and utilize its assets simultaneously to boost the efficiency level of transportation planning, execution process as well as optimization functionality (Kant 2014).

3.2 Freight Management and Freight Cost Auditing

3.2.1 Definition of Freight Transportation and Types of Freight

Transportation, in general, is considered a broad term because it comprises the physical movements of human beings and the shipments of materials. In fact, there are different methods and techniques used in transportation such as public transport, private vehicles, or ride-sharing. Hence, when it comes to the overview, transportation refers to the moving process of both objects: people and goods. (The Junction LLC 2019.)

Freight transportation is one of the most popular modes in the transport industry in global commerce. This freight mode is of great importance in business concepts because it describes the transporting process of commodities and cargo via air, sea, rail, and land means of transport. (Freightquote 2021 a.) As goods and products are moved from origin point to destination place with large quantities, freight shipping benefits different

stakeholders ranging from generating cost-efficiency to the customers to gaining competitive advantage for companies that utilize the services effectively (Freightallkinds 2021).

The market of freight transport is becoming increasingly competitive due to the diversity and complexity of each business's nature. In this sector, logistics service providers, working under a transport company, render the transporting and forwarding business by ensuring the delivery of goods from place to place. (Reis & Macario 2019, 32.) Due to the intensity of market segmentation nowadays, LSPs have optimized and tailored their services in order to fulfill customer's growing demands and compete in the marketplace. As a result of diversification, it is imperative that freight services are provided with high levels of quality while transit times are shortened. In this case, more and more LSPs are starting to provide added-value services to the traditional transport services and strengthen their portfolios of modes of transport. Despite the variance of technological capacities and performance, air, road, rail, and sea transport mode obtain different benefits and downsides in terms of cost and quality. (Reis & Macario 2019, 33 - 34.)

Amongst the four means of transportation, air freight is considered the fastest and most reliable compared to other modes. This could be explained that the high levels of security and safety that are ensured during the flight because it is inaccessible within the aircraft. On the contrary, due to the fast and convenient services that it brings about, the air mode costs are highest measured by unit volume. Besides, the flexibility is comparatively low since only fixed infrastructure – airports must be in use. (Reis & Macario 2019, 34.)

Unlike air freight, road transport provides a highly flexible and reliable service to its customers with the transit times remain relatively low. However, when it refers to the safety status, security during transport is not safeguarded and assured because there is a possibility and likelihood for other users sharing the roads to invade the goods while drivers are resting. Opposingly, rail transport is regarded as more secure in dedicated railways, let alone the cheap rate of transport. On the other hand, the transit times take longer and the reliability and flexibility degree remains lower compared to other modes. (Reis & Macario 2019, 34.)

Lastly, sea transport is known as the cheapest of all the abovementioned modes. Nonetheless, because of its slow speed, it causes the transit times to be the longest. Moreover, similarly to air transport whose services are executed in airports, ocean mode requires terminals as a place of loading and unloading its freight. Since freight on vessels should remain out of reach during delivery, some externalities such as weather catastrophe or congestion could affect the freight to cause its loss, damage, or possibly delay in service. (Reis & Macario 2019, 34.)

3.2.2 Definition of Freight Management

According to Amstan Logistics, the efficiency of logistics processes could be highly increased as long as freight management is implemented and accomplished in the operations. Nonetheless, multiple corporations are on the verge of gradually integrating the management into the strategies instead of outsourcing the services from other specializing logistics companies. With the management in place, the company is able to embrace the short-term impact on operational efficiency and enhance the business's logistics performance in the long term. (AmstanOH 2017.)

To be more defined, it refers to an end-to-end process in which inbound and outbound goods are arranged to arrive at the right locations at the right time. It accomplishes this by ensuring a smooth flow of operations, starting from shipment booking, goods preparing, cargo transporting to freight receipt. This process requires the participation and involvement of all parties such as forwarders, vendors, custom brokers, and carriers. Thanks to the coordination in place, the management generates cost efficiency in a way that price is considered and controlled at the initial stage. On top of that, the purpose is straightforward: assuring the cargo delivery safely, timely, and efficiently in the most feasible course. (Redwood Logistics 2021 a.)

Technically, transportation management covers the stages of moving goods from the shipper's warehouse till their reaching the consignee's doorsteps. When referring to the transport execution, the scope varies from a wide range of processes that the management encompasses. (Redwood Logistics 2021 a).

- Route optimization points out the shortest distance between two locations of departure and destination to ensure the most feasible route for transport in terms of timely and cost-effective aspects (Redwood Logistics 2021 a). Especially for road transportation, route optimization allows the executives to pick the best routing in the network of transport and add multiple drop points due to customer's delivery requests (Das 2019).
- Rate negotiation relates to the terms of deciding and choosing the correct price of freight cost associated with the services provided by the carriers and vendors (Redwood Logistics 2021 a).
- Claim management deals with handling insurance in case of lost or damaged goods, late pickups, or cargo mishandlings (Redwood Logistics 2021 a).
- Tariff and regulation management affirms the assurance of goods transportation that not only commits with the compliance of government protocols but also company policy (Redwood Logistics 2021 a). In addition, it also ensures that the

service level agreements (SLAs) are adhered to by various parties in the operations (Das 2019).

- Network design is implemented through data collection of visualized routes and processes. Thanks to the insights and data analytics, operations are managed in a more effective way. (Redwood Logistics 2021 a.)
- Carrier and vendor management is of prime importance since the transportation specialist maintains the relationships with stakeholders involved in the transport chain. With adequate communication and considerable dialogue, the coordination becomes more adept, leading to a better level of transportation performance. (Redwood Logistics 2021 a.)
- Integrations involve the practitioners' cooperation with other relating departments to maintain operational systems such as transportation management systems (TMS), and enterprise resource planning systems (ERP), as well as to centralize and streamline the flow of processes within the corporation. (Redwood Logistics 2021 a.)

3.2.3 Forms of Digitalization in Freight Transportation

Regardless of disruptive changes in digitalization, deploying digital systems and taking advantage of their benefits have become the ultimate goal for companies to seize the competitive edge in the marketplace. Logistics enterprises, including carriers, forwarders, and other LSPs are embracing the digital transformation in order to boost business growth in terms of improving efficiency and increasing the reliability and transparency in their services. (Shah 2020.)

Referring to the scope of freight transportation, it is simultaneously optimal and beneficial when utilizing digital mobility paradigms. Even though there are different patterns of digital freight shipping due to its market size, it is composed of four main elements which are goods, conveyances, infrastructure, and business process (Figure 3).

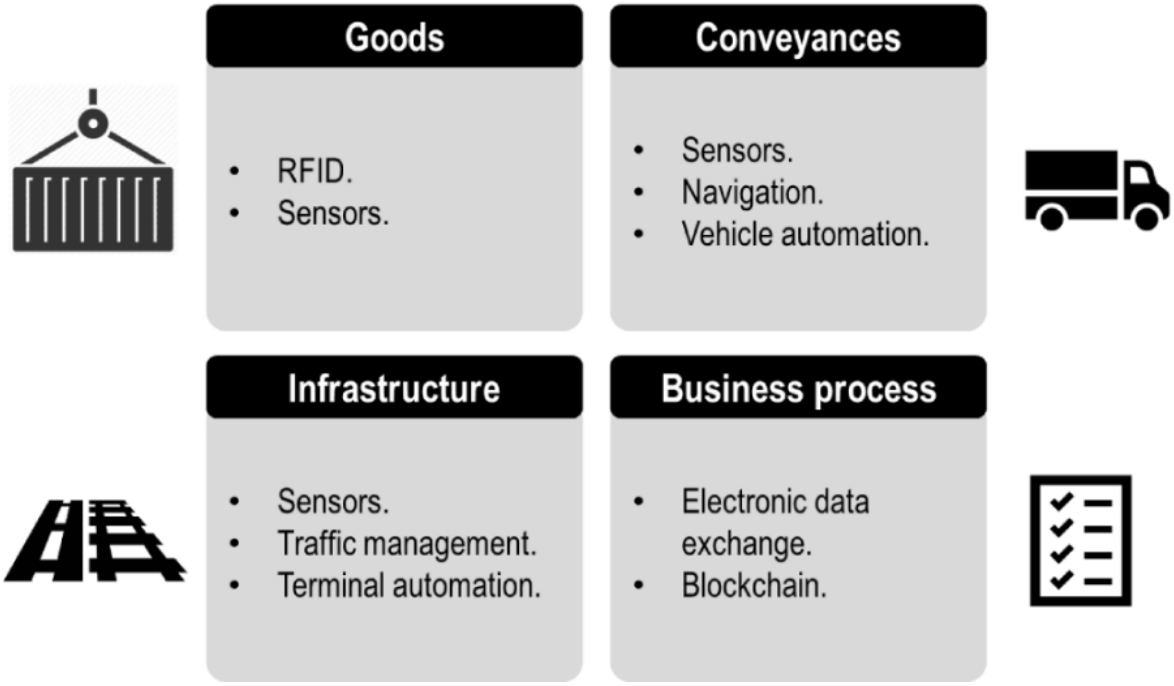

Figure 3 Forms of Digitalization in Freight Transportation (

Firstly, with the highly advanced technologies, the goods in freight shipping are now monitored in an easier and more effective way. Through a variety of modernized systems, the movement of goods is tracked and traced with a simple bar attached or a QR code scanner. RFID, known as radio-frequency identification, enables the process of identifying and tracking tags attached to objects. Thanks to this array of sensors, the availability of real-time data such as location or conditions allows the logistics specialists to oversee the status of shipments and handle more complicated transport chains of intermodal mode. (Rodrigue 2020 c.)

Secondly, conveyances refer to the feasible means of transportation. In addition to goods, the vehicles carrying goods such as trucks, trains, and ships are also attributed to advanced sensors. On top of that, digitalization leverages the practical operations of freight transportation by optimizing the route and adopting navigation to contend with such constraints as terminal congestion or the shortage of containers. Also, vehicle automation is the next goal that the business leaders are aiming to focus on and progress to reduce human intervention. (Rodrigue 2020 c.)

Thirdly, Infrastructure, such as roadways, railways, ports, airports, and distribution centers, has a huge impact on transportation activities. There is a likelihood for those to be controlled of use and supervised of conditions through the implementation of sensors. Moreover, the capacity of the infrastructure is better managed via traffic management

systems, while the concept of automizing its units such as terminals is being taken into consideration. (Rodrigue 2020 c.)

Lastly, the business process covers the transactional settlements for the freight services that have been completed. As there have been significant segments in internal business shifting from traditional to digital processes, productivity improvement and operational performance can be boosted in the entire supply chain. It, correspondingly, provides access to data exchange within the branches of corporate entities. Last but not least, through the main portals of the digital systems, blockchain allows customers to view the entire journey of a shipment before its actual arrival. Regarded as an evolution in the technological era, blockchain is in ongoing projects for developments to reduce processing time and increase the effectiveness of logistics processes. (Rodrigue 2020 c.)

3.2.4 Freight Cost Auditing and Its Digital Transformation

Ensuring the delivery of cargo arriving upon exact destination timely, safely, and cost-efficiently with damage-free and sufficient quantities has been prioritized since it drives the business success forward. The increasingly challenging and competitive marketplace has urged corporations to employ the most optimal tactics in transportation management by deploying digital tools and systems. The objective is to not only fulfill customer expectations but also to maintain the transport costs at the lowest amount. (InTekFreight & Logistics 2021 b.)

Considering the costs of mobility, it has now become a growing concern of how passengers and freight are determined in the most optimal routes via the transportation system. The nature of products that are light and high-value affects the located production and distribution for freight transportation. This, accordingly, leads to the variation in selecting the suitable transportation mode depending on different factors such as infrastructure, locations and distance, technological systems, and the nature of goods. Abovementioned, these considerations add up to transportation costs. (Rodrigue 2020 d.)

Since transport cost attributes to the cost of goods and greatly affects international trade on a large scale, it is influenced by the price of transportation services, which is known as rates. This portion of transport costs is defined by the negotiation between customers and service providers, including the monetary cost of carrying people or freight from origin to destination. Due to the competitive pressure of the freight marketplace, rates are reviewed and adjusted from time to time based on the business scenario or the interrelation between supply and demand. (Rodrigue 2020 d.)

From a business perspective, when it refers to logistics costs with transportation costs, in particular, freight charge accounts for the largest proportion. Freight charge is defined as the amount charged to customers for using the transportation services of goods from the origin pickup place to an appointed destination. This rate is usually calculated based on the distance between origin and destination places and varies from different variables depending on the type of transportation mode, which is air, sea, road, or rail. The cost of freight is shown in the freight bill and determined on the basis of incoterm rules. (Saloodo 2021.) In addition, Glad (2019) elaborates the terms that the freight invoice consists of details of shipments information such as the description of goods, weight, volume, name of consignor and consignee as well as the due date of invoice payments.

When it refers to the transport and forwarding industry, incoterm plays indispensable guidance for the participants in the global trade on a daily basis. Incoterms stands for International Commerce Terms. This is a set of international trade rules that stipulate the responsibilities of the parties in foreign trade contracts. These standardized international trade terms are widely recognized and used by many countries and territories around the world. These terms define the division of responsibilities and duties between buyers and sellers in the areas of risk, cost and shipping arrangements, and customs documents, thus reducing the risk of legal complexity. As a result, incoterms impact the shipping cost whether it is borne by the seller or buyer. (International Chamber of Commerce 2021.)

Regarding the significance of freight cost affecting operating costs, especially sales, it entails accuracy and precision in the freight invoice. Therefore, freight controlling is worth taking into consideration for all sizes of enterprises. The process of auditing these invoices aims to improve the billing accuracy and revise the amount of freight that is wrongly charged, leading to the ultimate goal of recouping costs. Since the tax and regulatory system differentiates in each country, the tax-related cost as value-added tax (VAT) or goods and services tax (GST) is charged in an incorrect method whereas other costs such as tariff or exchange rate conversion are overcharged to the business. Without proper freight cost management, the discrepancies are prone to affect the bottom line of companies as it is reported that approximately 2 percent to 5 percent of average savings are required through freight auditing. (CTSI Global 2021 a.)

A recorded percentage rounding from 5 to 6 percent of the number of freight invoices is affected by incorrect billing payments. This stems from a variety of distinct errors, mostly coming from three main mistakes: human error, accessorial charges, and detention. Firstly, human errors result from the manual process of entering data input or miscommunication between stakeholders. In the circumstance that the system or process is not

automated in such digitalization, any revisions in rates or pricing agreements are likely to cause deviations during interpreting and transferring information. Furthermore, incorrect freight billing occurs in case of accessorial charges. These kinds of charges such as additional delivery, cargo inspection, or alternative pickup, arise as the added services during the shipping progress. Without aligning in the rate agreements before, these additional charges are usually noted on the invoice or shipping documents, which requires attentive verification with associated parties to make sure the service is actually performed before payments. Moreover, detention, known as the penalties, occurs when the shipment is picked up later than scheduled. Especially, the detention rate might be wrongly charged due to the miscalculation of detention hours or the overcharged amount without informing the customer priorly. (SCM3 2021.)

Taking the aforementioned errors and downsides in freight billing disputed and invoice overcharged, it is suggested that implementing freight auditing is essential to business operations in logistics. According to a recent study, it is potential to recover 5 percent of freight charges by adopting a freight cost controlling process. (SCM3 2021.) In order to minimize human errors and maximize efficiency and accuracy, this process should be integrated and performed through a proficient auditing system. With the system and procedure in place, the logistics practitioners are able to perform invoice verification and data reconciliation to reduce the inaccuracies in freight invoices. (Glad 2019.)

To streamline the freight cost controlling process, there is a variety of solutions for the businesses to select to align with company operations. Nowadays, outsourcing is a preferable option amongst corporations since it helps to reduce the workload for the internal personnel. Thus, it is feasible for companies to outsource the payment and freight audit due to its cost-saving benefit. This feature is secured by the centralization of the invoice processing system and optimization from advanced technologies like business intelligence tools. Besides, invoice automation is favored as considerably optimal since it provides shorter processing invoice time and fewer errors caused by human intervention. Therefore, issues such as duplication are avoided and resolved prior to payments, hence costs are reduced significantly. Meanwhile in the marketplace, businesses are seeking to implement and utilize freight software such as Magaya Cargo System, A1 Tracker, Freightos, Excalibur WMS, or Cargowise One. (Glad 2019.)

Without a freight audit process in place, the errors stemming from unnoticed and incorrect verification of freight billing could have a huge impact on the company’s bottom line. Otherwise, manual freight verification and invoice payment cost time and effort in the company investing in internal employees. (Redwood Logistics 2021 b.) These challenges

could be tackled by implementing audit systems, utilizing automation processes, or outsourcing to external services. In consequence, proper freight management is feasibly performed by streamlining the verification process at large, aiming to save time and expenses while thoroughly exhibiting the beneficial data visibility in large corporations. (Glad 2019.)

4 BENEFITS AND CHALLENGES OF DIGITALIZATION IN TRANSPORTATION MANAGEMENT AND FREIGHT AUDITING

4.1 Benefits and Challenges of Digitalization in Transportation Management

4.1.1 Benefits

Digitalization in transportation management escalates in importance as it brings about a competitive advantage for those implementing and utilizing it. With its effectiveness and convenience, the technological systems in transportation reduce multiple manual processes leading to significantly increased efficiency. (Eby 2018.) Though there might be a variety of positive effects that a TMS drives the company growth, the writer takes into account three considerable benefits as the leading factors which are improving operational efficiency, reducing transportation costs, and enhancing shipment data visibility.

The first and noticeable capability of the TMS is to improve operational efficiency. By utilizing the functionality of TMS, logistics executives are able to optimize resource allocation. Besides, it is feasible for the planners to facilitate better planning by cutting down daily steps in the planning stage as well as decreasing the number of times from hours to minutes. With the support of TMS, the transportation operation is supervised entirely, not only resulting in greater productivity in route planning but also developing the competence of all service providers. (Eby 2018.) Improving efficiency in transportation operations entails good business analysis and well-organized processes. Whenever a business decides to deploy an integrated transport management software, the biggest goal is to increase the overall efficiency and productivity of its logistics operations. As integrated with three core functions which are planning, execution, and optimization, an excellent TMS is capable of storing and retrieving data and then analyzing the key performance indicators in the operating process. It supports logistics management by presenting comprehensively analyzed data. The ability to track deliveries, monitor shipments, and detect issues supports the users to resolve them promptly to avoid unexpected delays or rising costs. (Oracle 2014.)

One of the most important goals, when a business leader integrates and utilizes a TMS, is the overall reduction in the freight cost. This reduction, which derives from a variety of functions within the TMS. (InTek Logistics 2021.) There is no doubt that the leading reason businesses opt to implement TMS is to reduce costs in transportation services. This could be achieved by the execution of load and route optimization. With the same amount of goods transported, TMS allows businesses to require fewer facilities and employ fewer human resources. By carrying out a well-planned transportation roadmap, vehicles are

instructed will follow an optimized route plan, which supports reducing fuel consumption and minimizing transport time at a noticeable rate. (Oracle 2014.) One of the advanced functions of TMS is the ability to consolidate multiple individual shipments into full loads, thereby optimizing the flows of goods to individual customers. Along with the route optimization, the logisticians are able to map out the modal choice with efficient routes, leading to lower-cost options being used. (Manners-Bell 2017, 227.)

Thanks to the connectivity portals in which TMS enables access, the visibility feature and business intelligence have become the dominance of its advantages. In the era of IoT revolution, business intelligence has gained certain attraction from business practitioners because of its advancement in analytics. Through significant capabilities such as data extraction and transformation, TMS boosts the improvement of transportation data analysis based on real-time reporting through business intelligence. For example, it is possible for the logistics executives to retrieve data from TMS and display an analysis about the carrier performance, the volume of goods, the utilization of routes as well as rate negotiation. Consequently, the business is able to visualize transport modes' data to make better decisions and improve the operational workflow. (Altexsoft 2020 a.)

4.1.2 Challenges

In the environment of fierce competition and rapid acceleration in global logistics, digitalization in transportation management has become a competitive necessity. With the ability to provide optimized functionality and data analytic tools, the digital instruments allow business leaders to harness the immensely untapped power of data. (Kuznetsova 2017.) However, implementing TMS could be costly depending on business size and some specific systems may not function smoothly after integrating with the current workflow. Hence, the constraints associated with internal alignment and management, and implementing costs are such challenging issues for businesses to tackle. (Teleroute 2018.)

The biggest barrier to deploy a TMS software into business operations comes from the internal alignment and process management. When it comes to implementing the TMS project, the values of the software must be proven and showcased not only for operations aspects but also to different departments. Apart from the transportation management team, it is imperative to convince crucial functions such as purchasing and procurement team, financial and accounting team, or even the higher management team about the upsides of the system. As involving various stakeholders, organizational alignment becomes critical to obtain complete support for the software to be integrated successfully. (Gonzalez 2021.) Moreover, process management is also considered an issue with a TMS embedded. Large corporations, after going through different pilots and tests, have built up the

standard operating procedure (SOP) and structural processes for the entire company network to follow. As a result, system implementation acquires enormous interpretation and evaluation to turn the transition from a challenge to an opportunity afterward. (Sholes 2021.)

Cost is the factor that most companies take into consideration before deciding to implement a modern system. Based on the demand of utilization and the size of business models, investing in TMS could affect the bottom line of the business in terms of the financial segment. The operating costs of a TMS vary from software licenses, system setup, and maintenance to implementation expenses from the experts. (Teleroute 2018.) More importantly, due to the advanced and complex functionality of the TMS, the implementation process has a broad impact on the entire company. Thus, the costs of implementation account for the largest ratio out of the operating costs of a TMS. Consequently, initial investment should be measured economically and effectively to facilitate operational excellence with the lowest implementing costs. (InTekFreight & Logistics 2021 b.)

4.2 Benefits and Challenges of Digitalization in Freight Cost Auditing

4.2.1 Benefits

As mentioned earlier, freight cost controlling is a process that streamlines the auditing and ensures the accuracy of freight invoices in transportation. With the careful review and verification of the content of invoices, the process enables companies of all sizes to gain significant savings from the number of payment discrepancies. (Ascent Global Logistics 2021.) Thanks to the digitalization integrated into freight cost management, there is an enormous number of advantages that those software and applications bringing about for the company's freight audit and payment, which include cost savings and payment control, data insights and analytics, and tailored reporting feature (Bax 2019).

Considering the positive sides of implementing these freight audit systems in operations, the ultimate benefit contributing to freight management is cost savings and control. As the system are able to verify invoices based on the contractual rate or separate quotation, its functions can identify the errors in billing as well as the disputes in the method of freight charging. Moreover, some advanced programs can detect the duplication of payments and overcharges in shipment rates. Last but not least, these systems allow the logistics operators to combine multiple shipments into one billing and issue one consolidated invoice, hence avoiding the possibility of missing single invoices and settling payments on time. (Ascent Global Logistics 2021.)

Digital freight audit tools are identified as a powerful asset in which the leading companies are data-driven and taking advantage of data insights and analytics. Due to the severe competition in the logistics marketplace, firms deploying technology and digitalization are able to access and proceed with data, particularly in logistics and transportation costs. Through the install and functions of these programs, it reduces the processing time to revert to previous shipments, respond to immediate issues, or optimize the payment process in freight invoices. There is no doubt that these digital assets enable the corporation to leverage its position in the marketplace against other competitors. (Bax 2019.)

One of the most advantageous features of freight controlling systems is the ability of reporting. As the system is capable of storing and capturing the shipment data and its cost, companies manage to extract the information needed in detail and regularities. On account of the importance of reporting, utilizing this function from the software allows logistics practitioners to plan, optimize and execute future shipping decisions based on the data of transport modes, frequent routes, or freight costs. In addition, procedures and processes can be improved and optimized in which best practices are applied during operations, ranging from the transport route to the rate offered by different carriers. On top of that, by analyzing the expenses of freight shipping through reports, it is beneficial for logistics leaders to make strategic decisions when it comes to contract tendering, rate negotiation, or carrier selection in the future. (Ascent Global Logistics 2021.)

4.2.2 Challenges

Regardless of the significance of robust technological systems, managing freight invoices is still faces some challenges due to the unstable shipping rates and the interrelation between supply and demand (CTSI Global 2021 b). Since manual verification is time-consuming, embracing the digital trends and employing freight auditing systems generate particular prosperity for the business, however also imposes certain difficulties on the operational workflow. The challenges, which oblige the companies to deal with, include the complexity of system setup, the over workload of internal employees, and standardized procedure for carrier’s documents. (Globaltranz 2019.)

Even though systems are becoming increasingly modern, the complicated procedures in freight auditing result in the complexity of system setup. Regarding distinct references and requirements from each carrier’s invoice, systems are set up appropriately to adapt to these conditions to perform the best results in freight data verification and chargeback requests. Due to the wide range of carriers and their contact rates, it is a difficult task to maintain the setup effectively, otherwise, a minor mistake could lead to failures in freight verification. (Globaltranz 2019.)

Since most companies refer to freight auditing programs in-house, managing the verification and auditing tasks places a burden on internal employees. Even though those applications and programs have gone digital and automated, it is compulsory to involve specialists to control the systems and optimize the complicated process. Regarding the importance of these tasks, the qualifications needed in staff in charge are increasing while the talent pool in the supply chain workforces is decreasing. Integrating the freight cost controlling into the transportation department does not only cause the overloaded scope of work to the personnel but also results in higher labor costs. Notwithstanding the high level of accuracies in freight invoices, errors still occur in some circumstances due to the internal freight cost handling team. Therefore, companies are expected to hire more operators and executives to manage the efficiency of the auditing tasks, leading to an increase in labor cost subsequently. (Globaltranz 2019.)

Adding to the complexity of system setup and the burden upon internal personnel, the different formats of documents and invoices are also a confrontation that the transportation team may encounter (CTSI Global 2021 b). Some vital supporting documents in the forwarding industry, for example, bill of lading, lack the standardization between multiple carriers. Each LSP has a different template of documents such as bill of lading, commercial invoice as well as freight invoice. This non-standardization is a challenge for the logisticians to invest more effort in setting up the auditing rules based on contracted rates and factual information in the system. (iTech 2021.)

5 CASE COMPANY BOSCH VIETNAM

5.1 Background

Background

The Bosch Group is known as the world's leading provider of technology and services. It comprises more than 440 subsidiaries and branches of offices in around 60 countries. With the vision "Invented for Life", Bosch focuses on innovative solutions in four main business units: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The multinational corporation aims to improve the quality of life through connecting the products with advanced technology and offering those solutions to customers. (Bosch 2021 a.)

Bosch first entered Vietnam with a representative office in 1994 and the company is presented by Robert Bosch Co., Ltd. (Bosch Vietnam) since 2007. Over 27 years of business activities, Bosch Vietnam, with its headquarter in Ho Chi Minh city, has expanded into 6 major locations with different manufacturing plants and business branch offices. Bosch Vietnam's product portfolio diversifies from automotive to technology business, such as Automotive Aftermarket, Automotive Electronics, Drive and Control Technology, Power Tools, and Building Technologies. (Bosch 2021 b.)

Strategic drivers

To achieve its position on the global business map, Bosch follows determined principles to drive success forward. Three core drivers consist of focusing on customers, shaping change, and striving for excellence. By placing customers at its center, Bosch tailors the products and provides the best services to fulfill customers' requirements. Even though existing and trading in different units in different areas around the world, Bosch shares an explicit culture that each associate has a customer-centric mindset. Besides, shaping change is another direction that forms the company's focal goal. As Bosch concentrates on continuous improvement and innovation, it seeks valuable opportunities and takes advantage of them, especially in mobility and connectivity. The company proudly takes lead in automated, connected, and electrified solutions, aiming to bring about efficiency and convenience for the community. Lastly, striving for excellence is the realm of Bosch's strength in outstanding quality. In order to provide the best quality and reliability to meet customers' demand and expectations, the corporation strengthens the expertise and reinforce the network to facilitate the excellence of work. The international firm actively engages to develop initiatives that determine corporate success. (Bosch 2021 c.)

Supply Chain Management

Bosch defines its supply chain by the performance of purchasing and logistics field. To adapt to the emerging markets, the business's value stream is secured by an agile and robust workflow of the supply chain operations. In the long term, quality serves as the key competence, contributing to the driven success of both internal and external performance. On the one hand, purchasing takes responsibility in binding agreements of competitive prices to gain potential advantages against its competitors. On the other hand, with the goal to respond to individual requests from customers, logistics maintain an outstanding service to deliver substantial results. Utilizing the cross-functional cooperation of two divisions, Bosch creates synergy in operations and benefit from cost-saving. (Bosch 2021 d & e.)

Digitalization in Logistics and Transporation

The world has been witnessing a digital revolution in all aspects of industries in the past few decades. The initiatives, such as business intelligence, automation in warehousing, smart distribution equipped with highly advanced technologies, innovative optimization in transportation, as well as sustainable business models, are considered critical components in worldwide logistics. Positioning is one of the leading global technology companies, Bosch has embraced the transition of Industry 4.0 and integrated IoT into the operations of the business. (Bosch 2021 e.)

This, accordingly, explains that Bosch focuses on expanding the concepts of digitalization in the supply chain and investing in systems and software to optimize and centralize the processes. The objective is to enhance the standardization level, reinforce the crisis management system, as well as to adapt the trending practices on an ongoing basis. (Bosch 2021 e.)

> *"In a connected world, digitalized supply chains are crucial if we are to meet the personalized, highly specific requirements of our customers more quickly. Those who fail to digitalize will lose out." - Stefan Asenkerschbaumer, deputy chairman of the board of management, Robert Bosch GmbH (Bosch 2021 e.)*

Interconnected activities of logistics within Bosch have been on the edge of centralization for more than 235 plants both on the global and regional scale. At Bosch, transparency and efficiency are centered on the core values in logistics operations. The corporation does not only facilitates continuous improvement in ensuring cost efficiency, time-saving as well as quality in transportation performance with suppliers but also engages customers in their operations and fulfills their requests. In addition, sustainability is also an

integral indicator that business leaders also take into account. During the operational management, each activity is designed to create minimal impact on the environment, such as the emissions of carbon dioxide are reduced at the lowest level. All the components aiding transportation account for a significant and influential segment within the entire chain. (Bosch 2021 e.)

5.2 Situation Analysis of Transportation Management Center

In order to achieve the above-mentioned goals, Bosch establishes a specialized division to manage the global transportation strategy, which is the Transport Management Center (TMC). The management of TMC ensures the transparency and efficiency in the operation of all modes of transport such as land, air, sea, and rail in different regions where Bosch businesses are located. Furthermore, the solutions are designed to be cost-efficient, time-saving, and environmental-friendly which brings significant improvement in the performance of transportation activities. (Bosch 2021 e.)

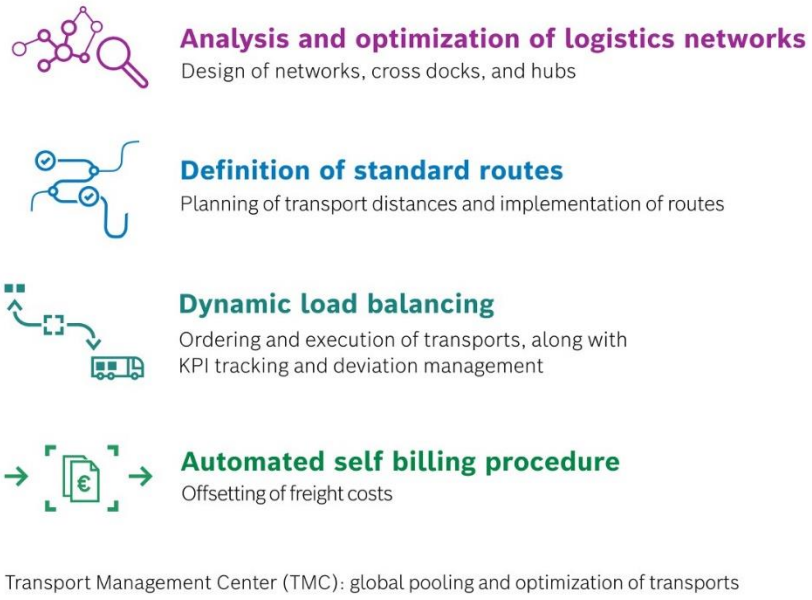

Figure 4 The Operations of Transport Management Center (Bosch 2021 e)

TMC is a division of the Bosch Group taking full responsibility for coordinating transport activities and connecting all the shipping parties. Bosch TMC organizes the transport if the route is registered via TMC's system and process. (Bosch 2021 e.) Figure 4 illustrates the core operations and functions of TMC's tasks as following:

- TMC utilizes data analytics retrieved from systems to optimize the logistics networks. In addition, this division opts to design the network, cross docks, and hubs to produce a smooth flow of movements as well as goods handling.
- Through the assistance of transport systems, TMC executes the planning for transportation and implements route optimization. By doing that, the team is able to generate standard routes and define the most beneficial and cost-efficient routing.
- TMC is in charge of the dynamic amounts of load assignments and the process to balance them. After handling the bookings on the system, TMC proceeds with the execution of transport orders. Besides, the team is also responsible for the management of KPI tracking as well as deviation issue.
- Along with the operations-related tasks, TMC's scope of work also includes duties related to finance assignments. With the support of the transport system generating automated billing, TMC can offset the freight cost based on this procedure.

5.2.1 Transport Management System – Bosch TMS

As representing a cross-divisional unit that is in charge of transport activities, TMC is the contact point both internally and externally. In order to fulfill the tasks of planning, optimization, and execution of transport orders, there is a system in place called TMS – Transport Management System. This is a digital tool equipped with a web-based user interface that manages the transport orders created. TMS is the domain used for Bosch plants, suppliers, and carriers that are involved in the transport process. TMC handles and manages air freight, sea freight, and road freight via the TMS. According to the supplier logistic manual version 5.0, Bosch divides transport orders into two sections: transports processed by Bosch TMC are referred to as TMC shipments, whereas transports not processed by Bosch TMC are considered non-TMC shipments. (Bosch 2021 f & g.)

TMC shipments

Concerning the processed shipments by Bosch TMC, all the transport orders are handled and controlled completely via Bosch TMS. In this case, the supplier is obliged to notify TMC about the information on shipment information promptly to prepare for pickup and further steps. A notification about basic requirements such as number of packages, dimensions, weight, volume, number of pallets will be sent out to Bosch TMC as a compulsory request. Upon this, TMC operates and proceeds internally to ensure that the applicable regulations are met and decide for the order acceptance, processing times, and cut-off

times respectively. After that, the supplier fulfills a transport order (TO) on Bosch TMS, with a form including shipment data as mentioned earlier. Along with this, relevant shipping documents such as delivery note, invoice as well as documents related to customs clearance are requested to be uploaded into TMS. In some circumstances, exceptional cases of deviations between the transport notification and the actual shipment's status in terms of weight, dimensions, quantities are promptly informed to TMC without any delay. It could be translated that, suppliers and LSPs strictly follow the requirements of freight transportation and let TMC know if changes occur. In this way, TMC is the management function that oversees and monitors the process of goods movements through the visibility and flexibility of real-time data displayed on TMS. Thanks to this convenience, TMC is able to communicate effectively with multiple parties and implement a transparent and comprehensive communication channel between suppliers, LSPs, and Bosch plants. (Bosch 2021 g.)

Non-TMC shipments

For the shipments that are not handled by TMC, suppliers will work directly with the assigned logistics team of the Bosch plants or offices. Then, suppliers notify about the shipment data directly to the specified LSP after Bosch unit has already been appointed. Thus, the procedure of monitoring the status of shipments requires manual processes and human involvement, ranging from receiving the shipping notices to storing the supporting documents. Since the shipments are not controlled via TMS, it involves more intervention from the Bosch logistics team, which causes the processing times to be longer. Moreover, as data inputting and shipment tracking are manually processed through some office tools such as word, excel, and outlook, it frequently results in back and forth conversion for data exchange. With the operations of TMS, some transport documents are automatically created in the system with information based on the transport order number such as bill of lading. Unlike transport processed by Bosch TMC and TMS, suppliers work directly with LSPs to notify about the transport requirement and relevant shipping documents, hence leading to possible mistakes created during the data exchange process. (Bosch 2021 g.)

6 EMPIRICAL RESEARCH AND DATA ANALYSIS

The empirical research is generated based on observation and measured phenomena to derive knowledge from real-life experiences. This type of research embodies a research question, a research methodology, data collection and analysis methods as well as the validity and reliability of the findings. (Emerald Publishing 2021.)

In the empirical research of this thesis, qualitative research and inductive approach were chosen as the methodology. Primary data were collected through in-depth interviews and participant observation and then analyzed in a specified case study. The outcome of the empirical research addresses valuable findings and insightful implications by answering the research question comprehensively.

The thesis was carefully designed based on real-life experiences of the author with the chosen topic, the research question, and the research objectives of the study.

- Research question: How does digitalization in transportation management and freight auditing benefit the logistics operations in global corporations?
- Research objectives:
    - Role of transportation and its cost in the supply chain.
    - The initiative of digitalization in transportation management and freight controlling.
    - Advantages and challenges of transportation management systems and freight auditing software.
    - Descriptive analysis based on the current process of the case company Bosch Vietnam
    - Suggestions and implications for global firms to implement digitalization in transportation management and freight controlling.

6.1 Data collection

Practical experiences and insightful knowledge from experts are of great importance to reveal answers to the research question. Hence, the author decides to conduct participant observation and in-depth interviews to gather the primary data. Taking advantage of the privilege of working in the case company and directly involving in the topic-related project, the author seizes the opportunity to observe the daily operations of the transportation management at Bosch Vietnam. Moreover, in order to provide intensive insights into the study, the writer also conducts semi-structured interviews with senior executives and specialists who have expertise in the field to understand their perspectives towards the topic.

6.1.1 Participant observation

Observation is a beneficial method that aids in generating primary data through a systematic process to produce trustworthy results. Participant observation is considered a highly subjective data-gathering technique, which is conducted to assess the emerging findings. Conducting observations is advocated in a way that some knowledge of a context is expanded, which could serve as a reliable reference for subsequent interviews. Its most efficiently applicable function is related to the event of firsthand observed activity and freshly desired perspective. (Merriam & Tisdell 2015, 137-139.)

Regarding the context of the case study, the author defines participant as observer as the stance amongst a spectrum of categories. This stance is similar to the author's situation in the project because it is explained that the investigator is involved as a member of a group being observed. Schensul and LeCompte (2013) as cited in Merriam & Tisdell (2015, 144) stated that this is "a data-collection technique that requires the researcher to be present at, involved in, and actually recording the routine daily activities with people in the field setting" while maintaining an active participant role. Last but not least, in order to form a systematic observing process, a well-structured setting is outlined to gain sufficient data and validate informative observations (Appendix 1).

Referring to the physical setting, the environment, context as well as surrounding space should be described. In addition, the technologies, resources, and other relevant objects are suggested to be mentioned and specified. Regarding the participants, since these are the most important elements in the setting, information such as the number of participants and their responsibilities is required to be collected in a detailed and extensive method. Besides, the similarities in the shared characteristics as well as the frequency of interactions are also of great importance to recognize changes in the social environment. Furthermore, the activities occurring in the setting remain as the concentration of the context, along with the way participants respond to them. The content of the conversations exchanged in the environment provides an extensive analysis of the participant's thoughts or problem-solving and decision-making process. Lastly, as participant as observer is chosen as the main stance, the behavior and comments of the observer are also taken into consideration when assessing the field notes and impact on the setting environment. (Merriam & Tisdell 2015, 141.)

6.1.2 In-depth interview

Interviewing occurs to obtain a certain source of information from the way people interpret the surrounding world, in the event their behaviors or feelings are not observed. For most business research for a thesis, the interviewing process involving qualitative investigation assumes individual respondents interpret the question genuinely. Therefore, semi-structured interviews are chosen to facilitate more open-ended and less predetermined formats of questions and answers. In this case, each semi-structured interview includes a list of more and less structured questions, which allows both the interviewer and interviewees to comfortably explore the issue. This type of interview enables the author to respond to the current situation and improvise at times, whereas respondents are welcomed to share about the emerging worldview as well as exposed to new ideas. (Merriam & Tisdell 2015, 109-111.)

Even though the interviews are semi-structured, a certain list of questions is explicitly covered by the involved attendants (Appendix 2). The author carries out two face-to-face in-depth interviews with one project leader in digitalization of transport management and migration of freight cost and one team leader in freight cost controlling. The interviewees were invited to interviews based on their solid background in logistics and supply chain management, particularly the competence and expertise with years of experience in the field. Due to the company compliance and confidential information requested, the interviewees are described as Respondent A and Respondent B respectively. Depending on the role and tasks of each respondent, the interview might last from 30 to 45 minutes and the questions may vary flexibly based on the situation. All of the interviews were conducted in English and the actual and interview questions are found in Appendix 2.

Referring to Appendix 2, the interview structure consists of five key questions. Question 1 explores the task of the respondents based on the description of their roles, along with their thoughts about the involvement of their work with the digitalization process in transport management and freight auditing. Question 2 seeks to understand the advantages of digital systems through the benefits contributing to the respondents' work. In contrast, question 3 examines the drawbacks and downsides of system operations during the process of transport management and freight auditing. Moreover, question 4 examines the respondents' evaluation and assessment towards the current practice of the digitalization process. The last question discovers the recommendations to enhance and implement the digitalization approach from the respondents' experiences and suggestions.

6.2 Data analysis

In order to find the answers to the research question, field notes and interview transcripts are two major sources of primary data that the author collected from participant observation and in-depth interviewing. Thus, the qualitative data is yielded in the two methods and then analyzed through charts, tables, and other infographics.

The writer started the observing process as a participant during the first three months when she joined the digitalization project in transportation management at Bosch Vietnam. As soon as she took part in the project, the author started collecting information and gain knowledge through multiple field notes. The participant observation setting is illustrated in Table 1:

Physical setting	The environment was observed in the headquarter of Bosch Vietnam. The context is that during her internship, the author was involved in the transportation team which provides transportation services for different units of Bosch in the Southeast Asia region. The team was in the middle of the digitalization phase of transportation management through employing transportation management systems (TMS) and freight auditing software (FAS). The scope of the project includes two principal operations which are Transportation Management (TM) and Freight Management (FM) for both TMC and non-TMC shipments. The project aims to manage transportation execution and freight cost controlling through digital systems for different Bosch plants in the Southeast Asia region which are Bosch Singapore, Bosch Malaysia, Bosch Thailand, Bosch Philippines, Bosch Indonesia, and Bosch Vietnam. TM function is responsible for transport management including transport order processing, load assignment, network design as well as supplier and vendor management through TMS. Meanwhile, FM manages the freight cost controlling which is the process of verifying the invoice and consolidate the data of the freight expenses. The technology applied for this process is deployed through FAS.

Participants	There were four participants in total during the observation process. All of them are the operators who handle the daily tasks for the project. Two participants are responsible for TM tasks that are receiving and processing shipments, optimizing and assigning the goods capacity, selecting carriers, and picking up the best rate, communicating and managing resolutions with LSPs. Two participants are in charge of verifying and controlling the freight cost. In addition, maintenance and system setup for the freight auditing software is also included as one of the key duties for the FM operations.
Activities and interactions	Even though TM and FM work individually, there are significant connections between the two functions. On the one hand, as FM's responsibilities ensure the accuracy of the freight payment, it requires the correct information from TM to clarify the shipment data and then calculate the exact freight amount. On the other hand, TM seeks support from FM to comprehend the freight rate to pick the most efficient and cost-saving routes from the suitable LSP.
Conversation	The conversion exchange is mainly about the problems that occurred during the operations and the solutions to resolved them. Besides, TM and FM functions also share the situation of the freight marketplace as well as exchange information to plan freight volumes and control its costs. However, separate conversations between 2 participants in TM and FM functions also occurred to acknowledge the issues and improve the efficiency in the operations.
Observer behavior	The observer's comments and notes are recorded and marked in her field notes. The observer, as a participant, actively attends the meetings as well as conversations with the other participants in TM and FM in order to gain significant knowledge in the transportation field as well as develop the competency in utilizing different digital systems and managing communication with LSPs.

Table 1 Participant observation setting

As compiling the results of the activities from the TM function, the author learned about the process flow of TM operations which encompass two integrated transportation management through TMS: strategic planning and tactical optimization.

On a strategic level, transportation planning involves network volatility and shipment volatility. The network volatility consists of the long-term and mid-term volume changes or market trends as well as changes of sources, nodes, drains in the network. Whereas, shipment volatility includes changes on daily shipments about their volume, weight, or demand on a daily level. All reasonable degrees of shipment data are used to design the optimal network structure. Moreover, strategic planning allows TM operators to define the overall transportation strategy in project scope and derive transportation concepts and transportation network structure. In addition, this planning process supports significantly defining the purchasing strategy for logistics and transportation services as well as respective tariff structures. Overall, by optimizing the entire transportation network, strategic cornerstones are defined and the transportation spend is dramatically decreased.

Another important scope of the TM process contains tactical optimization. Results of regular tactical planning runs are discussed in order to agree on feasible solutions and implementation to outline a tactical optimization for the transportation network. Analysis of existing transport routes is conducted through data provision and cleanup. Potential determination is the identification of potential optimized areas by choosing the right level to increase truck utilization such as to change transport mode, packaging, or equipment. Route is described as the complete transportation of articles from supplier to plant or plant to the customer. Those optimization measures are calculated and documented on the levels of processes and results. There is a request template to fill in the quoted optimization either in route or truck. Therefore, the status of an optimization measure and its monetary impact is tracked easily by the TM operators and executives. By defining a detailed timeline and calculation for an optimization measure, regular tactical optimization runs are recorded per year to focus on transport cost reduction. As a consequence, the ultimate target is achieved yearly by the significantly decreased amount of transportation expenses for the logistics operations.

On the opposite, while observing the activities and interactions of FM functions, the main data yield was from the process flow and the difficulties from the implementation of freight auditing and the system setup.

In order to perform the auditing process for freight invoices, every freight invoice and financial documents received sent to FM function must be verified for factual and price correctness. Invoices are only released for payment only after all the described verification

steps have been completed. The factual verification process aims to verify whether the invoiced delivery or service has already been performed and ensure the content of invoices matches the relevant shipment data. This step is executed based on the utilization of the TMS feature by extracted reports of listed shipments from the TM function. Meanwhile, the purpose of price verification identifies the ultimate goal of avoiding deviations in the freight payment. Based on the contractual rates and all relevant basic data, a FM operator calculates the total amount of freight of a shipment to make sure all surcharges are accurate. This stage is integrated and verified by a FAS. After the FM participant imports the invoices into the system, the FAS starts to capture the data and automatically verifies the freight amount based on the contractual rates that have already been set up. The global rate contract between Bosch and LSPs includes standard charges of multiple lanes depending on transport mode. After uploading these contractual rates into the FAS, the FM operator programs the rules to sum up the amount of freight based on the indicated incoterms. Finally, the FM participant clarifies if the amount verified by the FAS equates to the number on the freight invoices. If there are no discrepancies or gaps, the FM operators confirm the correct freight amount for the LSPs to issue invoices and settle payments. By employing the functionality of the FAS, the FM participants are able to verify a larger number of invoices due to the automation feature of the system. Moreover, the freight spend is remarkably reduced thanks to the detected deviations on freight invoices, whereas freight consolidation is fostered which constructs an effective and agile reporting tool.

During the participant observation, the author identifies a certain range of problems and difficulties caused to freight auditing and system implementation.

As the system is connected and integrated through a global server, a minor error in one region could lead to the disruption of the functional operations. While waiting for the FAS to be fixed, the FM participants start a manual process in freight invoice verification. This takes more time and effort in clarifying the disputes between invoices as well as consolidating the freight data. As for the FAS to generate the correct amount of freight, the shipment data, and relevant shipping documents are required to be accurate and detailed. However, the lack of logistics knowledge especially incoterms from some LSPs results in back and forth conversations to communicate and revise the shipment data and its freight cost, which causes a longer processing time of invoice confirmation.

Respondent A

Role: *Process delegate in transportation digitalization*

Role and responsibilities

- Responsible for implemetation and optimization process solutions for regional transport network
- Specification and test management of IT adaptions
- Collaborate and coordinate different stakeholders such as LSPs, purchasing department, Bosch plant, suppliers

Benefits in digitalization

- Standardization process of transport management and freight controlling
- Optimization in transportation network
- Planning and implementing new routes to daily execution and transportation coordination
- Adjustments to fluctuations are flexible and use of transportation consolidation is enabled

Constraints in digitalization

- Pursuade management team and other departments to get internal alignment to implement digitalization
- Carrier variety and different formats of invoices and documents, leading to inflexbile adaptation to changes

Evaluation

- Crucial and beneficial

Suggestions

- Involve the daily operations of cross-functional teams to identify problems and needs
- Obtain cultural alignment with internal resources and external stakeholders

Respondent B

Role: *Team leader for freight auditing and cost controlling*

Role and Responsibilities

- Manage freight auditing process and control freight cost by KPI report
- Use different systems which support freight auditing processes to indicate process improvement opportunities
- Responsible for operative issue resolution and correspondence with stakeholders and logistics service providers

Benefits in digitalization

- Freight savings can be measured by using key performance indicators
- Data analytics and business intelligence
- Cost dashboards by Power BI
- Transparency provided by a globally integrated freight auditing software

Constraints in digitalization

- Complexity in freight rate requires investment in efforts to set up system to produce standardization
- Different tax regulations and legislation in each country

Evaluation

- Benefits outweigh downsides

Suggestions

- Map out the critical business drivers that require freight auditing
- Script the expected process work-flows and objectives

Figure 5 In-depth interview transcripts

6.3 Outcome

To draw the outcome of the key findings, it is imperative to emphasize the initial research question defined at the beginning of this thesis: How does digitalization in transportation management and freight auditing benefit the logistics operations in global corporations?

In order to provide thorough answers to the broad question, the author divides it into sub-questions that reflect the research objectives:

- Role of transportation and its cost in the supply chain.
- The initiative of digitalization in transportation management and freight controlling.
- Advantages and challenges of transportation management systems and freight auditing software.
- Descriptive analysis based on the current process of the case company Bosch Vietnam
- Suggestions and implications for global firms to implement digitalization in transportation management and freight controlling.

Firstly, transportation presents a central role in the supply chain since its freight cost has a big impact on logistics operations. Hence, adopting the transportation management systems to improve efficiency in transport execution and employing the freight auditing software to control the freight spend are of the priorities at Bosch Vietnam. As a result, a TMC is set up in each region enabling supply chain experts at Bosch to continuously optimize the transportation network. TMC at Bosch Vietnam manages two functions of transportation which are TM and FM for different entities of Bosch in the Southeast Asia region. TM activities are performed through the TMS, including processing transport orders, optimizing routes, and designing transportation networks. Whereas, FM deploys a FAS to execute the process of two-step invoice verification which are factual and price correctness.

Secondly, the techniques and practices in TM and FM both bring about advantages and disadvantages to transportation management. Thanks to the functionality of TMS, TM is able to accomplish the ultimate goal of significant cost savings based on strategic planning and tactical optimization. It is now flexible to adjust the fluctuations and respond to the real-time data changes in terms of visibility and accessibility. Nonetheless, FM also achieves a noticeable amount of freight savings due to detected discrepancies in freight invoices and then visualizes the transparency through the business intelligence tool. As the cost savings are measured by key performance indicators, it allows the logistics practitioners to perform data analytics by utilizing the cost dashboards. Nevertheless, even though the FAS enables the FM operators to improve the capacity and enhance the

productivity in freight invoice verification, the system is affected by other regions' disruption due to the globally connected server. In addition, the complexity in contractual rates and complicated tax regulations in a different country requires an enormous investment in time and effort to set up and maintain the system to run smoothly and efficiently. However, setting up a TMS calls for internal discussion for a persuasive process to get internal alignment and approval for process change.

Overall, when it comes to implementing the digitalization process in transportation management and freight auditing, the firsthand scheme acquires the comprehension of current problems and practices of daily operations in associated departments. It is advised that critical business drivers are outlined in a detailed proposal to indicate the necessities and requirements for freight controlling. Aligning with LSP to attain external stakeholder's acknowledgment about process change is essential to drafting the expected workflows and transformation objectives.

6.4 Implications

Aforementioned, transportation is one of the most principal sectors that define a paramount effect on logistics functions. However, transportation management is neglected at some points, while maintaining the proper management of transport and freight facilitates not only operations excellence but also enormous cost savings. In that event, adopting functional transportation and freight management through digital systems should be taken into consideration as one of the top priorities for business transitions.

However, the implications are indicated for the global or regional enterprises whose size is similar to the case company. The Bosch Group operates as the worldwide network focusing on research, manufacturing, development, and sales with 270 plants, as well as offices and regional subsidiaries in more than 50 countries. The equally sophisticated transportation network includes inbound transportation from suppliers to locations as well as outbound transportation to supply customers and its own subsidiaries. Thus, the project of TMC is planned to optimize globally, with the aim to coordinate shipment transports from hub to hub, from warehouse to customer. Besides, in order to win a competitive advantage in the freight marketplace, the corporation also its purchasing and procurement in place to negotiate and tender the contractual rates with a selection of qualified LSPs. Therefore, these suggestions are recommended for the large corporations which acquire a refined transportation network and obtain rate contracts and tenders with specific LSPs.

Based on the key findings as well as the primary source of data analysis from the case company, the authors acknowledge and consider three key sections to address the implications for the topic.

Identification of needs must be completed first

Initially, it is important for the business leaders to review the current shipping processes to identify problems and areas that can be improved through the implementation of transportation and freight management. After understanding the root causes in the operations and recognizing the potential capacity for improvements, it worths considering to shift from tactical to digital transportation management to gain a competitive advantage. Implementing new processes or systems requires tremendous time and willingness to change and adapt. However, as embracing changes and anticipating global trends are one of the necessities in the business world, without prompt actions could lead to failure inefficiency.

The logistics leaders are supposed to review the current processes and outline a framework to fulfill the needs of innovations. Not only the leaders are the ones making decisions but also the practitioners, operators, executives, and specialists in logistics operations are allowed to raise areas that need improvements. It is an utmost objective that every employee in the logistics department perceives and advocates integrating transportation management systems and freight auditing software to accommodate potential success for the company process. Attaining sufficient information about the necessities of change as well as perceptions of logistics practitioners are critical and essential to initiate the digitalization process in transportation management and freight auditing.

Weighing the benefits over the setbacks is the driving force

The essence of placing technological systems in-house can accelerate and transform the transportation execution and strategy into a competitive advantage with higher service levels, more capacity, and a lower all-in-cost. The outcome of the case study analysis calls for an evolution of transport management programs and freight verification systems.

The utmost benefit when the business leaders think of when implementing those systems is to cut down on the transportation costs, which could be generated from the lower shipping costs and potential savings from deviations from freight invoices. Each year, Bosch incurs transportation costs of roughly one billion euros, with road transportation making up 60%. This enormous sum promises a significant amount of potential savings. By putting these technological appliances into practice, Bosch TMC has successfully met the cost-savings objectives the company sets out to achieve. In terms of transportation management, the TM team utilizes one of the key features of TMS including strategic planning

and tactical optimization. On top of that, standardization is the cornerstone in the entire process, which settles down numbers of transport orders and transactions into one type of data that users can automate to learn and predict demand and supply through intensified reporting and analysis. Besides, the FM function enables operators to verify, control, and save a tremendous amount of the shipping freight rates of the disputed invoices. The advent of freight auditing software brings about advantages in standardizing the freight data since LSP have a variety of documents and invoice formats, which allows the logistics to consolidate data by extracting reports from the program. More importantly, as the world is embracing the big data revolution, visibility and transparency in data have become an integral factor in operational performance. The team leader of freight auditing and controlling of TMC indicated that with the involvement of the FAS, it has advanced the reporting process and integrated cost dashboards and data analytics through the PowerBI tool. Even though the digitalization process acquires cultural and organizational alignment and efforts in maintaining the systems, the advantages that companies could benefit from are worth taking into consideration.

Detailed project planning is fundamental to a successful implementation

There is no doubt that every project requires thorough and exhaustive planning from the strategic level to a tactical standard. After aligning successfully on the feasibility and practicality of these digital tools, business practitioners are opted to define the goals and targets for the implementation of transportation management and freight auditing equipped with technological systems. Visibility and transparency drive efficiency in establishing a project successfully, especially related to digitalization. Details in project planning should be disclosed to showcase the steps and changes in the new process. The author suggests the following sections to be facilitated in the digitalization transition in transport and freight management.

- Engage all stakeholders: It is necessary to inform the organizational stakeholders and ensure that they are prepared for change. Conducting information sessions about the upcoming projects boosts the awareness levels of the stakeholders, which supports the adoption process more conveniently and effectively. Moreover, it is crucial to maintain informative, consistent, and transparent communication flow throughout the entire corporation. Preparing the drafted scheme of the project and its well-defined goals assists the business leaders in explaining and presenting the major advancements that digital systems in transportation management and freight auditing could benefit the business performance. Failure in attaining stakeholders' concentration in the initial stage could lead to an unsuccessful

implementation later due to a lack of understanding or acceptance from the associated employees who directly perform tasks on software on a regular basis.

- Design general timetable plan: A project is not likely to be successfully executed and implemented without a well-defined general timetable. The planning schedule is sketched out by the logistics leaders to track the progress of the project. On account of any changes that occurred during the project, it is easier to adjust the implementation stages to fit the timeline. Creating a reasonable timeline with appropriate engagement and action points does not only keeps the project on track but also shapes the stakeholders' intention and concentration on point.
- Assign the project leader: Along with the timeline, the responsible leader places a dominant role in leading the project and moving it forward. The leader is assigned to oversee, monitor the progress as well as tackle resolution issues arising during the implementation process. assemble required documents. A resistant, determined and accountable leader can create synergy in communication flows when establishing good cooperation with different stakeholders. It is also advised that the project leader assemble the required documents with input from relevant departments in order to make objective decisions during the project.
- Research the potential solutions: The project team maps the current processes and starts the evaluation with plenty of education to determine the TMS and FAS software vendors. After that, it proceeds to determine the design and best fit against the TMS and FAS software providers' responses to the requirements document and pricing proposals. When starting the selection process, it is implied that narrowing the best-selected vendors based on the evaluation allows the project team to focus on onsite visits and comparing the advantages as well as the downsides of software. Next, mapping the new process and comparing it with the old one is a decisive step to identify possible shortcomings that need to be addressed with recommended TMS and FAS software. Subsequently, the project leader presents the suggested software to the stakeholders' committee for approval. In the event that the selection is approved, it requires negotiation in the final pricing details in case it differentiates from the previous proposal.
- Execute the implementation phase: When the actual implementation process begins, it is necessary to assemble a detailed project plan to adhere to and assign the responsibilities to the team members. After that, the project team works with the details of the project with regular meetings with internal and external stakeholders. Final testing, software training, and user acceptance testing are the last testing phase that walks each shipment process and scenario from end to end operations before putting the systems into effect. After the systems are fully

implemented, the project team proceeds to review final TMS and FAS performance against goals to make adjustments. Continuous evaluation of the new functionalities is essential to adjust and adapt to the company's expectations and changes.

7 VALIDITY AND RELIABILITY OF THE THESIS

Regardless of the type of research, validity, and reliability represent the authenticity and trustworthiness of a study (Merriam & Tisdell 2015, 238). Based on the data collection and analysis, the author considers the thesis outcome as valid and reliable.

Validity deals with the concern that how research outcomes match reality. In other words, validity examines how true the results of the research are. In qualitative research, human beings are the primary instrument of data collection and analysis through observations and interviews. The validity is considered higher in case the interpretation of data is conducted based on the interaction and interjection between researchers and participants. (Merriam & Tisdell 2015, 242-243.) As a result, the validity of the thesis is concrete based on the dedicated observation and involvement of the author as an observer. Moreover, the data gained from the interviews was of high quality as it enlarged the analysis compared to data that was not observed. The frameworks of conceptualizing the data collection setting in an actual business environment of the case company intensify and enhance the validity of this thesis.

Reliability demonstrates the extent to which a particular data collection method can generate the same research findings on different occasions (Lancaster 2004, 71.) Nonetheless, the more important question triggers the consistency between the results with the data collected in qualitative research. Essentially, the process that the study was conducted and the approach used for data analysis are undertaken to evaluate the reliability. (Merriam & Tisdell 2015, 251-253.) Babbie (2010) indicated that when a single observer is the source of data, reliability becomes a challenge because there is no guarantee as to the effect of that observer's subjectivity. As the participant observation was conducted with four participants, the source of data yielded is diversified and strengthened. Moreover, two more informants were interviewed in business concepts, which increases the trust and reliability for the outcome. The interviewees with professional backgrounds and competent expertise had provided extensive insights and knowledge for the thesis topic. The data collected and the study conducted were carried out in actual project implementation at the case company, which facilitates a high level of reliability for this thesis.

8 CONCLUSION

The thesis aims to investigate the leverage of digitalization in transportation management and freight auditing in global corporations. The objectives are outlined to understand the role of transportation and freight cost in the logistics chain and explore the management of transportation and freight cost through digital systems as well as its advantages and disadvantages. Lastly, a case company is analyzed to comprehend the current practices and then suggestions are presented to implement the process for global companies.

Qualitative methodology with an inductive approach was chosen and applied in the thesis. Data collection methods were employed through participant observation and in-depth interviews. The author combines primary data yielded from observation and interviews of the case company and secondary sources of data from books, articles, reports, and the Internet to conduct the thesis analysis.

The introductory part opens the thesis background in which the emerging trends in transportation management call for the shift in a digital transition.

The theoretical framework in Chapter 3 reviews the knowledge and literature of transportation in logistics, freight costs, digitalization in transport and freight management, and its concepts. Chapter 4 explores the benefits as well as drawbacks in transportation and freight management through digital tools which are transportation management systems and freight auditing software.

Chapter 5 covers the introduction of the case company background as well as the demonstration of its current practices in transportation management and freight auditing process.

The empirical research in Chapter 6 showcases the process of collecting and analyzing data through participant observation and in-depth interviews. Subsequently, the authors give answers to the research question through the key findings:

- Cost reduction by strategic planning and tactical optimization by transportation management systems.
- Standardization in the transportation management process for transport data consolidation.
- Cost savings through detected discrepancies in freight invoices by freight auditing software.
- Visibility and transparency in data analytics by business intelligence tool and cost dashboards.

Implications are also outlined for an implementation project in global corporations including three sections: identification of needs, evaluation advantages over disadvantages, and detailed project planning.

Chapter 7 provides an overall assessment of the validity and reliability of the entire study of which both degrees are high and concrete.

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APPENDICES

Appendix 1 Participant observation setting

1. The physical setting
2. The participants
3. Activities and interactions
4. Conversation
5. Observer behavior

Appendix 2 Interview questions

1. Please describe your roles in the transportation team and how your work is associated with the digitalization process in transport management and freight auditing.
2. How do you benefit from utilizing digital tools in the management of transport execution and freight cost?
3. What are the constraints that resulted from the operations of transportation management systems and freight auditing software?
4. How would you evaluate the digitalization process in transportation management and freight auditing in the current practice?
5. What do you suggest to improve the current process and implement it for global corporations?