

Improving container consolidation process with technology in a beer company

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Abstract <p>Consolidation of cargo flows is one of the most commonly applied concepts for tackling road congestion, improving container weight capacity utilization and reducing negative environmental impacts.</p> <p>In order to answer the questions of improve container consolidation, the study reviewed the challenges that existing within the current methodology in a case company. This was done to recommend technological solutions for improving efficiency and evaluate whether the company should invest in such solutions.</p> <p>The qualitative research methodology was utilized in this study. Interviews were conducted with the case company's employees to collect proposals for the improvements needed for consolidating cargo flows. Data for the study was also collected by using relevant literature and the company's database.</p> <p>According to the interviews' results, the respondents thought that more support for certain technological solutions was needed. Based on the results, proposals were given to the case company on how the company could improve its consolidation experience by adding additional technology to its processes.</p>		
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<p><i>Appendixes 1, 2, 3 and 4 are confidential and they have been removed from the public thesis. Grounds for secrecy: Act on the Openness of Government Activities 621/1999, Section 24, 17: business or professional secret. Period of secrecy is five years and it ends 18.5.2022.</i></p>		

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ABBREVIATIONS

3PL	Third-party logistics
CO2	Carbon dioxide
EU	European Union
FCL	Full Container Loads
GDP	Gross Domestic Product
GP	General purpose
HGV	Heavy Goods Vehicles
LCL	Less than Container Loads
SAP	A Company provides Enterprise Resource Planning software
SMEs	Small and medium-sized enterprises
TMS	Transport management system
UK	United Kingdom
WMS	Warehouse management system

1 Introduction

Transport companies have undergone changes and adapted to new market conditions continually throughout the last few decades. They have integrated freight flows into the transport planning process in order to be more effective and to have more streamlined supply chains. Regarding the transport aspect, a variety of concepts have been studied, tested and applied with the aim to reduce the negative impacts caused by urban freight transport. In this context, several national and European research projects have been carried out, and overviews of the existing solutions have been published. Consolidation of shipments is often used to reduce transport costs through economies of scale.

A case company is presented in this study. The company's consolidation process is quite resource intensive at the present time, making it an appealing goal for the growth of company. This thesis concentrated on the examination and analysis of the company's consolidation process. The consolidation process was viewed from the efficiency point of view. After that, feasible technology solutions which contribute to a more efficient and sustainable logistics system were identified. Based on the outcomes of the research, conclusions were drawn from this work.

1.1 Company Background

A global brewery with a shared heritage, a passion for brewing and a commitment to quality was the target company for this thesis. Founded in 2008, this multinational company produces more than 500 kinds of beer, its product portfolio contains local and international beers that can be found in more than 150 countries. They are dedicated to building great brands and brewing the best beers using the finest natural ingredients. The business employs nearly 200,000 staff, runs operations in over 50 nations with six operational areas throughout the Americas, Europe, and Asia Pacific. Alone, this transnational enterprise holds more than 40% of the beer market in the world (Bloomberg 2019).

Company A is such a large entity that it has been divided into smaller, more manageable divisions (see Figure 1 below). The Logistics Department in the case company is divided into two divisions – Trucks operating within Europe and Containers operating overseas. Logistics involves these roles: Order Takers, Inventory Deployment, Transport Planners, and Logistics Administrators. More specifically, the organization is divided into nine zones, corresponding with certain continents that the company is active in. Accordingly, the thesis was implemented for the company's headquarters in Prague (Czech Republic), but the planning of transportation system focused on those containers across the United Kingdom (UK) in particular, for the Transport Planning Team. The team comprises 11 employees from various European countries.

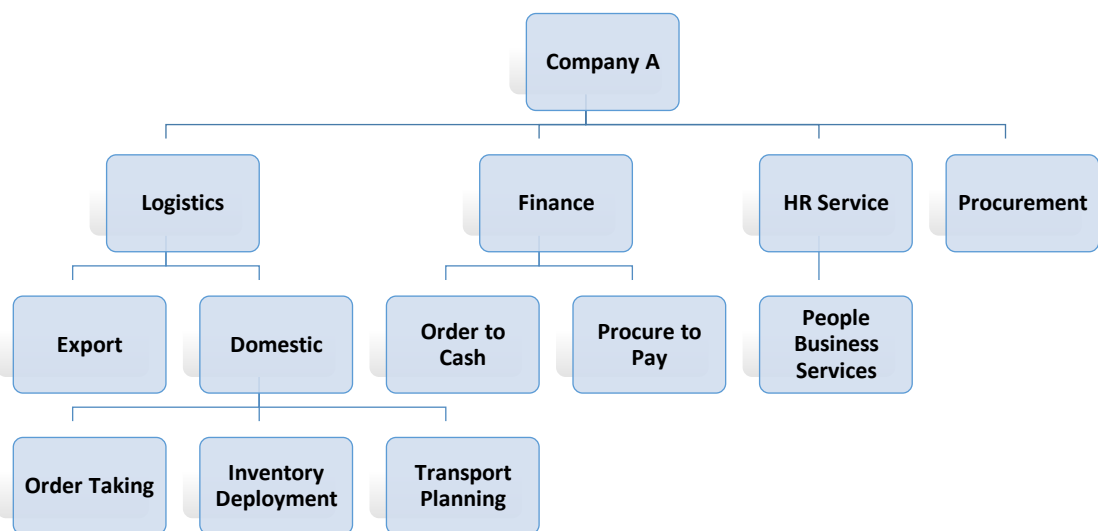


Figure 1. Company A in UK Organization Structure

Table 1. Summary of beer volume (hectolitre) transported in 2018 (Appendix 1)

Month	Total
1	48 099,77
2	63 112,44
3	62 706,53

4	75 863,06
5	83 456,39
6	74 534,03
7	84 322,91
8	81 548,95
9	67 069,91
10	81 584,74
11	78 457,71
12	76 441,21
Grand Total	877 197,64

Table 1 outlines the beer volume transported every month in 2018. The volumes include not only brands that are owned by or licensed by the case company, but also third-party brands that the case company brews as a subcontractor and third-party products sold via the distribution network of the case company, particularly in the UK. The monthly volume rose to over 81,000 hectolitres in May, July, August, and October on account of the peak season, while for the remaining months the volume was just under 79,000 hectolitres per month. The UK head quarter's volume led the way compares to other headquarters' volumes with overall volumes transported grew with strong execution aligned for marketing engagement during the 2018 FIFA World Cup Russia.

The Transport Planning Team's mission is to build resilient supply chains while achieving a healthier environment. They have deliberately concentrated on contributing toward the United Nations Sustainable Development Goals where they can make meaningful positive changes through scale and partnerships. They are using their resources and energy to make a positive impact on society and reduce their impact on the environment. In practice, this means that the team needs solutions that would reduce transportation costs, enhance accessibility, comply with international shipment practices and support the company's sustainability goals through its consolidation process. While the transport planning team's service level is good, it also takes time. It is not only uneconomical in terms of later development but also difficult to manage assets since the interface and platform are not always stable.

1.2 Objectives

The situation above called for finding solutions that could save time and be more sustainable. The research questions of this study tried to find technology solutions which are capable of enhancing the consolidation process, and they are as follows:

- i. What are the challenges existing in the current method?
- ii. Which technology solutions can improve the team's consolidation efficiency?
- iii. Should the team invest in the solutions mentioned in Question ii?

1.3 Scope and limitation

As company A is large and has facilities in several countries, and due to limitations in time and resources, this study only analyzed the transport planning department of the company. The data was collected concerning only the consolidation process of container transport within the UK. This study focused on finding technology solutions for the container consolidation process for the case company. The study concentrated on the operative level, but outcomes may also impact on the tactical or even strategical levels. Therefore, it could be a good foundation for other studies in a similar industry.

The target of the thesis was to provide a comprehensive review of the current process with the aim to generate a practical and implementable outcome rather than just to write a study for research purposes. The idea of the thesis was to provide more guidelines and suggestions on how the process could be more efficient with the help of technology. However, there were also some difficulties in collecting the data because of the high information security policy of the company.

2 Methodology

2.1 Study approach

A study can be evaluated based on how well the research problem can be answered. Identifying the research problem from the point of view of validity is, therefore, important. If the study has a clear objective, the research data can be collected accordingly. (Mäntyneva, Heinonen, & Kim 2008.)

The qualitative research method is a method that is focused on collecting information from ideas, points of view, and theories. In addition, in order to understand verbal responses, the researcher also needs to be focused on non-verbal communication during the interview. For qualitative research, there are various methods of collecting information, such as focus group discussions, observation or interviews. (Bradley 2013, 260.)

Quantitative research is focused on facts, numbers and provided statistics. This approach is considered to be more objective, as it is possible to measure actual results. This method is considered to be more objective because the actual results can be measured. Numerical data collected by a survey, experiment or content analysis is typically used to explain an occurrence and address questions from the study. (SkillsYouNeed 2016.)

The two research methods can also be combined. Qualitative data can be obtained, and the results can be converted into a numerical form. It allows quantitative analysis of outcomes. (Muijs 2004.)

Quantitative methods or a mix of methods were not used in this thesis. The research was conducted utilizing techniques of the qualitative research analysis. The theoretical section of this study was written based on an analysis of literature, and the empirical section was implemented through a case study. The literature review typically sets the basis for the topic of research, since a certain understanding of the study's context principles has to be established prior to the empirical part of the

study. (Salminen 2001.). A variety of written documents sources, such as Elsevier, ABI Research, EBSCO, Google Scholar, which were retrieved from online-databases, search engines and academic literature found in the library were reviewed in the literature review process.

As mentioned earlier, the real information for the empirical part of the study was obtained from observing the daily operations of the case company. An unstructured interview may look similar to daily conversations when the gap is not so distinct between the interviewee and the interviewer. (Eriksson & Kovalainen 2015.). The goal is to make the participant re-create their experiences in the field of the research topic. In general, there are open questions in an unstructured interview, which can be altered during the interview. There are different definitions for a semi-structured interview, but the fundamental part of all definitions is that some sections or viewpoints, but not all, are fixed in the interview. It means that each interviewee is asked the same questions but in a different order or that the phrases of the sent-out questions would vary between the interviews. (Herbert & Irene 2005.)

In semi-structured and unstructured interviews, the questions are used to facilitate and lead the discussion into different directions if necessary (Eriksson, & Kovalainen 2008). Because of the scope of the research topic, the study concentrated on direct feedback from the participants and observations based on several months of experience with the case company. Comprehensive viewpoints of the current status of the consolidation process were established, and proposals for improvement were given based the selected research method – observations, interviews, and analyses of the case business' consolidation flow.

2.2 Study Process

The main aim of the study was to determine if there was anything that could be used to improve the company's container consolidation process used by the transport planning team. For a better understanding of the consolidation profile of the case company, the process of the study is showed in Figure 2 below.

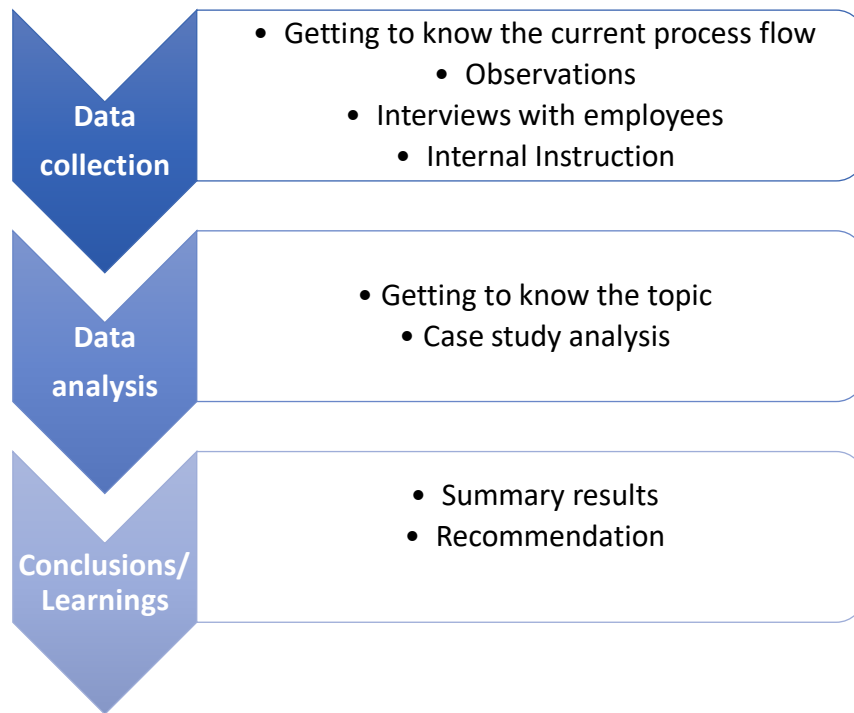


Figure 2. Study Process

The following steps were taken in the study process:

Qualitative research regards participative observation to be a valuable and necessary way to gain a deep understanding and to develop a realistic picture of the internal existing situation when collecting primary data. The author of the study also conducted interviews with the employees of the case company in order to identify challenges and areas for improvement.

Secondly, when data was obtained, the main challenges were to evaluate the obtained data and to collect more information for identifying the ways to face these challenges. Moreover, the study also focused on the ability to implement practices in real life. Therefore, in order to re-examine and discuss all the challenges facing the employees, How and Why-questions was established.

Thirdly, in these discussions, possible solutions were found for providing answers to the research questions in a prompt way within the context of the findings. Based on these findings, a review of information was carried out to identify potential solutions for enhancing the present case operation. E-mail exchange and phone calls were

used to more reliable viewpoints from other transportation carriers operating in the same business field and provide ideas for future researchers of the topic.

3 Literature review

3.1 Road freight transportation in the UK

Following the last major revision of the European Union (EU) transport policy with the 2011 White paper, new socio-economic and technological developments, such as collaborative economy, digitalization and big data, have increased business structures and supply chain complexity, as well as have caused a shift towards a circular economy. European transportation is growing rapidly and will continue to grow in the near future, consistent with the EU Statistics, which show an increase of 60% in freight transport by 2050. This is good news for the trade business, but it puts pressure on both the transport network and the ecosystem. (European Commission 2014.)

Most urban freight transportation is done by road. Road freight transport presents a significant trend in the 27 countries of the EU. According to Marinov (2013), there are no statistics on the modal split for European's urban freight transport, but road transport is projected to become even more prevalent, as rail, inland waterways, and pipelines are predominantly suitable for long-distance transport. Its distribution has increased in terms of ton-kilometers (tkm) by 4.5 million between 2016 and 2017. Local transport in the EU, which accounted for 63.5% of the total transport, grew by 9.9% from 2013 to 2017, with a 38.5% growth in cross-trade and cabotage transportation over this period. The movement of goods packed and unloaded nationally and internationally through EU-27 rose by 3.5% to 4.6% from 2016 to 2017 respectively. Heavy goods vehicles (HGVs), which are classified as vehicles with a gross weight over 3.5 tons, are used in the majority of freight transports.

The EU trucking industry, however, is very fragmented. There are currently more than 2000 carriers and independent owner-operators (European Commission

Transport 2017). This fragmentation hinders the efficiency of cargo transportation as well as brings many negative impacts mentioned earlier: emission of noise, road conflicts with other users during delivery operations, traffic congestion, contamination of the environment, road users' intimidation and damage to the road surface and infrastructure (Sara 2015). In the transport planning process, the environmental impact of road freight transport starts to receive significant attention. Key references have been verified as about 30% of the EU's overall CO₂ emissions are accounted for transport, of which 72% comes from road traffic. In the case of the UK road freight, transportation contributes 20% to the total amount of UK greenhouse gasses (GHGs) according to Annual TRL Academy Symposium (2018), which means that it is the single largest emitter. It also contributes significantly to poor air quality, which is the fourth major public health problem in the UK after cancer, heart disease, and obesity. Furthermore, the total transport amount was more than 147,000 million tonnes.km, 76% of which was transported by road and only 9% by rail in 2017. The goods transported by road have created 18,599 million kilometres driven by vehicles, of which 30% were empty, and all this will increase. (Transport Statistics Great Britain 2018.)

In February 2019, the EU reached a tentative agreement concerning CO₂ emission limits for heavy-duty commercial vehicles. The rules require that new lorries must emit an average of 15% less CO₂, compared to this year's emission levels, between 2025 and 2029. (Council of the EU, Press Release 2019.). Along with that, in July 2018, the plan of the Government on the "Road to Zero" was established with a goal to decarbonize road transport in the long term and to position the UK as a leading designer and manufacturer of zero-emission vehicles. That is a major reason why the Road to Zero strategy claims that the freight industry is a critical part of the UK economy, and therefore zero-emission solutions need to be developed and made available for all kinds of HGVs commercially. (Transport Statistics Great Britain 2018.)

UK's GDP and ton-km levels have been far higher than in most other EU countries. In fact, this has occurred in several other nations including Spain and Ireland, but on the contrary, with freight ton-km growth being above economic growth. In principle, it should be easier for the UK to reach its carbon dioxide goals within a growing

economy by breaking the connection between growing productivity and increasing freight traffic. (Eurostat 2005.)

3.2 Container transport

The last few decades have been a period of great and rapid changes in many countries' political regimes and economic status. For example, several changes have been observed in the transport sector, and they concern both the global demand for foreign products and the way in which cargo is shipped. The operational framework and shipping industries have been directly influenced by these shifts. There is a wide range of shipping approaches to consider when delivering products to consumers. For the most part, these rely on the size and different types of cargo to be carried along.

According to the figures from the World Shipping Council (2017), container shipping now accounts for more than two-thirds of world trade by value, which is significant as global economies become more interdependent. Through academic studies, container shipping has been viewed as the most effective means of transportation across national and international boundaries (Container Logistics 2018). As a result of this development, the leading European ports have all experienced remarkable growth in container throughput. UNCTAD (2018) reported that 753 million twenty-foot equivalent units (TEUs) of containers were handled around the world. This means an increase by 6% from 2016 to 2017, which was the highest growth recorded over the last five years (see Figure 3).

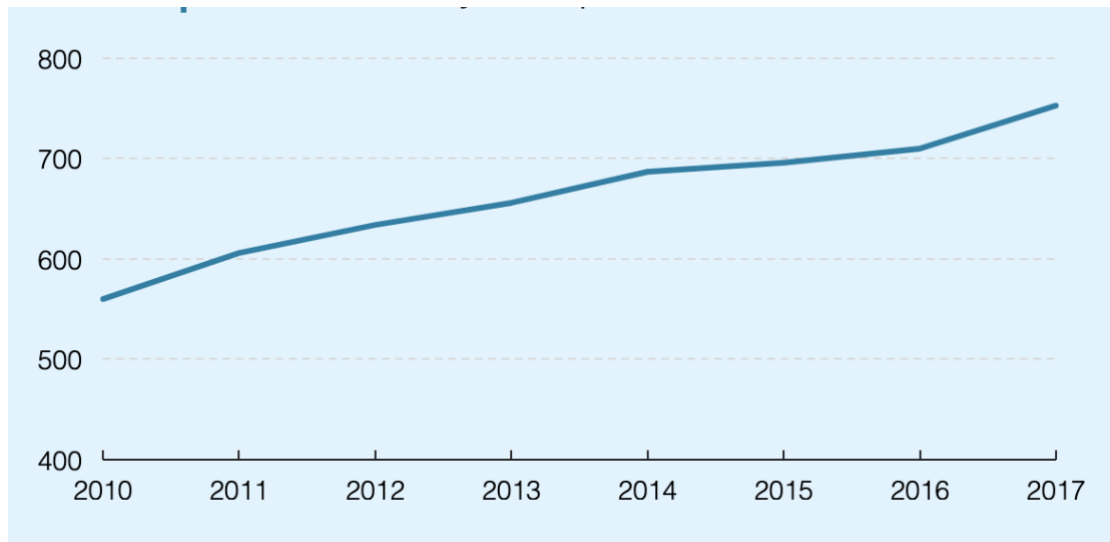


Figure 3. World container port throughput (Millions of 20-foot equivalent units) (UNCTAD 2018)

Container's standardised design ensures efficient and continuous transfer to various modes of transport. In order to capture shipping efficiency, the containers have to be standardized in terms of size for effective stacking procedures, so that shipping vessels, trucks and other modes of transportation are customized to accommodate the length and the size of these containers. They are predominantly 20-foot-long, which has been accepted as the industry standard benchmark of measurement, and they are referred to as the twenty-foot equivalent unit (TEU) and 40-foot long (known as 2 TEU) enclosed shipping containers. The supply chain uses a well-known shipping method: FCL cargo, i.e. Full Container Load shipping, LCL cargo, i.e. Less than Container Load shipping or breakbulk shipping. (IncoDocs 2018.)

Laik Ma and Way Tan (2019) report, however, that often companies who use FCL cannot maximize the utilization of the container's capacity. This might be due to lack of consolidation capabilities since companies may order fixed sets of containers for each manufacturing site in the shipment period (e.g. weekly, monthly) based on contract terms. Containers are filled up with whatever demands, resulting in low container capacity fill during low demand periods. Another major reason is an imbalance in container volume due to inaccurate forecasting. The UNCTAD (2017) report reveals a 9% decrease in demand in 2009. Taking into account the differences

between the estimated rates and the actual values emphasizes the distorted situation that the container shipping industry is facing. As shown in Figure 4, the efforts to achieve balance are currently present. In 2016, in particular, supply growth dropped by 7%, thus reversing the gap. The market is heading in the right direction, but currently, the existing gaps between demand and supply growth remain insufficient to address the short-term situation.

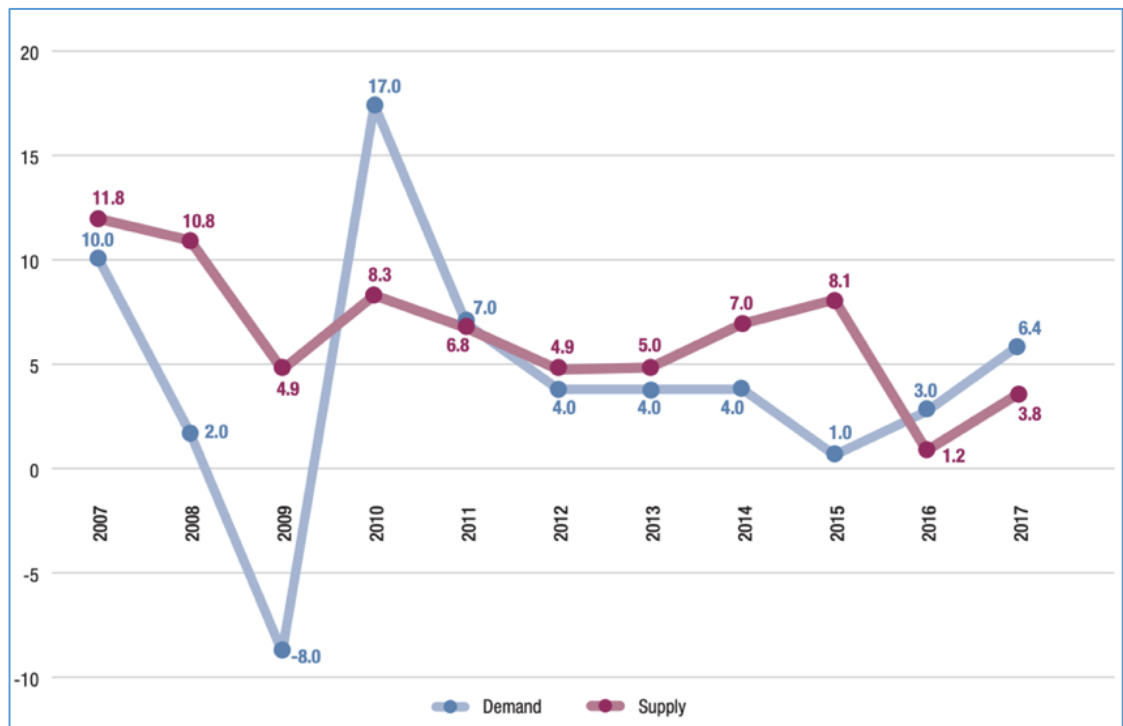


Figure 4. Growth of demand and supply in container shipping, 2007-2017
(UNCTAD 2018)

On estimate, 15% to 25% of the road haulages are traveling empty or partially empty, which reduces efficiency. At the same time, the total carbon footprint is higher than necessary and congestions of road traffic are challenging particularly around the port areas. It has been estimated that the cargo shipping industry wastes more than 17 billion euros annually due to inefficiencies. (Cargotec 2019.). The priority in every sustainable transport system should, therefore, be to decrease empty running.

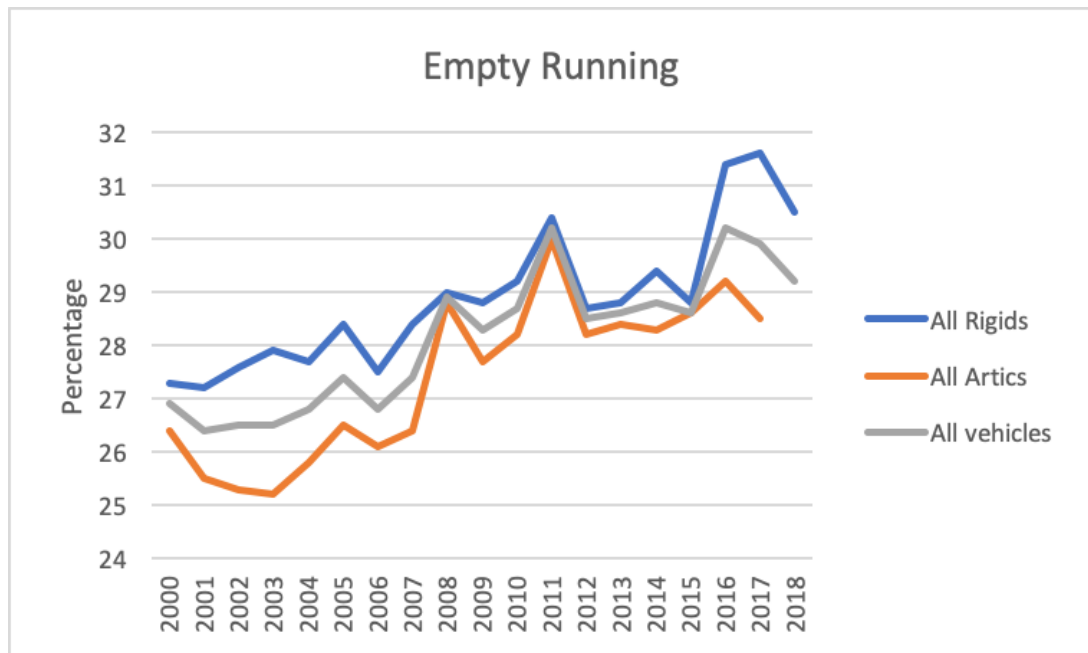


Figure 5. Empty running in UK (Department for Transport 2018)

Empty running in the UK dropped from over 31% to 26% of the total distance traveled between the mid-1980s and 2001. However, this has again risen since then to close to 30% in 2011. This meant that, in 2010, approximately 5.4 billion km were driven empty. The unladen running of rigid vehicles continued to overtake articulated vehicles a few percentage points higher until 2008 when the two values were merged at 29%. In the past two decades, the average empty running rates for both operator groups have remained quite similar. (Freight on Rail 2018.)

3.3 Cargo consolidation

For small enterprises and private businesses, partial vehicle loading is disadvantageous according to Transportica (2018), because it still implies full transport payment. Container shipping, the trucking community, and elected officials have looked at many approaches to monitor the negative impacts of the freight transport market, for instance, infrastructure investments to enhance the supply chain efficiency or regulatory proposals to force changes. One of the promising solutions during tightening the JIT pressure period is to maximize the capacity of the container through consolidation because consolidation more effectively fills up the

containers and reduces the overall carbon footprint. The computer results using real-world data indicate that carbon emissions have been significantly reduced by 13.4% when shipment consolidation is implemented. (Eurostat 2017.)

Consolidation, according to Cambridge Dictionaries Online, means “combining several things so that they become more effective”. In transport, cargo consolidation is, in fact, a hybrid method of shipment/freight consolidation and cross-docking in intermodal container transport. Both cross-docking and shipment consolidation allow several small shipments with the same destination combined into one single, larger shipment. (Higginson & Bookbinder 1995.). The goal is to increase the loading rate of the container and minimize the distribution costs since the fixed costs for transport can then be spread across other shipments. There is certainly room for further consolidation since loading rates in freight transport by road are low, whereas the percentage of vehicles driving empty is high. (Janssens & Caris 2013.)

The products are still loaded inside 20-foot and 40-foot shipping containers, and they are transported in the same way. However, in comparison to other methods, together with small orders of other customers, the LCL cargo is combined into a single transport batch for delivery in a fully loaded vehicle, which is called a consolidated container. For a packing company’s goods in an international container, any acceptable package can be used, such as cardboard bags, plastic bags, wooden boxes, or Euro pallets. Based on the total size (per cubic meter (m³)) or weight (per Metric Tonne (1,000kg)) of the products, the freight rates are paid. More handling fees are involved for transporting LCL cargo, as pallets more often need to be loaded and unloaded. However, one advantage in return is the acceleration of handling since loading and unloading of one container is ten times faster than the trans-shipment of twenty tons of boxes, packages, or pallets. (IncoDocs 2018.)

Three different models of consolidation were described by Hall (1987). The simplest model is inventory consolidation, where items that are produced, stored and transported in the same load. The goal is to align consolidation with inventory decisions, through the integration of shipment consolidating strategies and inventory management. The strategy of pure consolidation policies is primarily concerned with

the shipment size and dispatching of the transport vehicle. The combined shipment must be large enough to achieve the advantages of economies of scale, while also fulfilling the service requirements by means of the frequency of deliveries. A second form is vehicle consolidation, which is used for consolidating items over space. Terminal consolidation is the last form considered. Items from various locations will be stored at a depot, where they are sorted and reloaded into new vehicles. They can be delivered from the terminal to different destinations.

Six different transport options from an origin (O) to a destination (D) have been presented by Woxenius (2007), see Figure 5. Terminal consolidation can take place at every hub in these transport chains as described by Hall (1987). Since the goal of the system for freight transportation is to model large networks with multiple deliveries and multiple actors, only two options are taken into account. The first option is consolidating shipments between two common terminals by considering the corridor. The second option is the connected hubs, where the main haul of a shipment may be consolidated. The transport cost per shipment, as mentioned earlier, could decrease by consolidating multiple shipments. It also makes it possible for transportation resources to be utilized more effectively.

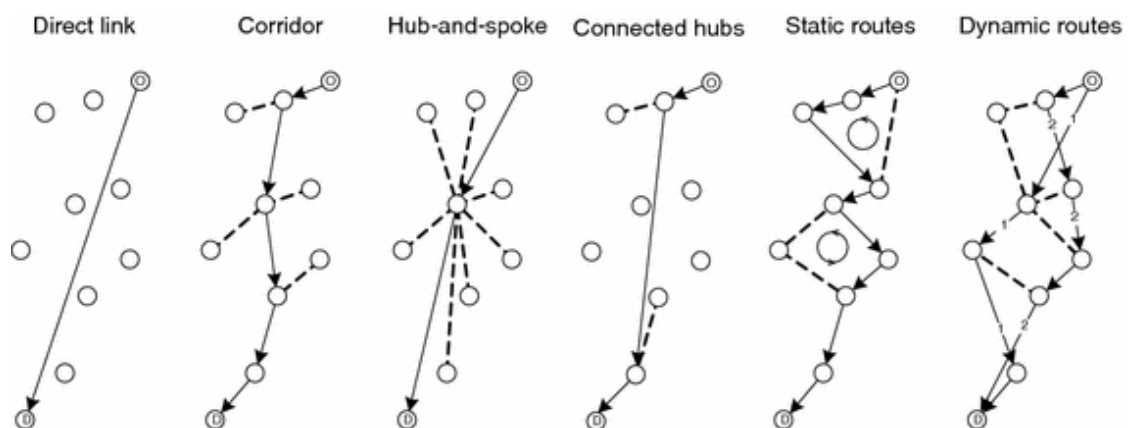


Figure 6. Consolidation Options (Woxenius 2007)

3.4 Transport Management System (TMS)

Choosing the right software for business may contribute to processing efficiency, supply chain coverage and shipping costs reduction. Transport Management Software (TMS), which is part of the supply chain management related to shipping operations is one of such software. (Mei & Eliot 2017.). In the context of increasingly complex cargo operations, TMS has become a powerful tool, either for manufacturers or carriers (3PL). According to ABIVIN (2018), to enhance the efficiency and productivity of logistics operations, it is necessary to have good business analysis and streamlined processes. Whenever an enterprise decides to use an integrated transport management software, the biggest goal is to increase the overall efficiency and productivity of its logistics operations. An excellent TMS system capable of storing and analysing every detail, KPIs in the field of transportation. It supports logistics managers by presenting comprehensive data analysis. With Machine Learning technology, a modern TMS system can continue to learn on its own and become better and more accurate as the business uses the software.

Over 15 years, the scope of TMS coverage also has expanded dramatically. TMS efficient shipping management every step of the way and enhances customer's experience by provide complete business transparency. This platform allows operations, supply chain providers, and customers to monitor various aspects of transport networks such as rates, route options, warehouse supply and distribution. (Salvendy 2001.). TMS facilitates the monitoring of all inbound and outbound orders, automate manual processes, secure lower carrier rates and analyse reports. Through integrating TMS with ERP, WMS or OMS, manufacturers and distributors can improve end-to-end monitoring throughout entire warehouse operations and distribution processes. This end-to-end analysis offers a broader view of the coordination and planning process. (Stackpole 2014.). For not WMS users, TMS can be installed using data uploader software. TMS provides a complete management solution with its integration with TMS Mobile, Fleet Operations Control Centre, tracking dashboard, and TMS dashboard. It integrates and presents all the available data points in an

easy-to-comprehensible format that enables the transport planner to make the best and most efficient decisions possible. (Cerasis 2015.).

Transwide Analytics Company (2019) used evaluation reports from TMS including shipping criteria to provide a comprehensive overview, evaluation card for each carrier, as well as transport cost. Along various routes, TMS will take price information from a variety of carriers, and arrange it all into an easy-to-read list, allowing the shipping managers to determine quickly and efficiently how to ship their cargo from one location to another, providing them with an ability to rate and choose the carrier they want. TMS turns the whole process into buyer's market, based on the price, the liability limit and transit time. This provides valuable information to make smarter, faster, and more objective business decisions based on data.

Another significant benefit of TMS is its ability to help businesses keep track of products at every stage of the process until it reaches consumers and uncovers any possible risks on the route. choose. According to the GEODIS Global Supply Chain Survey (2017), supply chain visibility is now the third strategic priority of 623 experts in 17 countries. From supplies to manufacturers and customers, visibility helps businesses effectively deal with important events and other events. This is done in a variety of ways through real-time maps, tracking progress by geographic zoning, Proof of Delivery (POD).

TMS has traditionally been very complicated, rendering their installation and over time maintenance expenses costly, making them unavailable to most small and medium-scale carriers. Nevertheless, cost savings and an increase in efficiency contributed by the system have given many large organizations a new advantage over their rivals in the market. As innovations and technologies continually make these products less costly, more user-friendly, more functional and less time-consuming to be implemented, altogether changed TMS current state. This enables smaller companies to benefit from these great advantages in terms of price, information, acquisition, productivity and communication flow. In its most recent "TMS Market Research" report, Grand View Research, Inc. says the global

transportation management market size is expected to reach 198.82 billion USD by 2025, at a CAGR of 16.2%.

TMS has enormous potential and will be routinely and sophisticatedly used by all serious carriers in the next 10 years. As the platform is unquestionably beneficial for managing and processing distribution networks, concurrently with price reduction. The business that does not adopt these practices, driven by the growth of TMS use, is becoming obsolete, as sellers beginning to target unexploited smaller companies. Those businesses had not been able to implement the program effectively before, now having the change to harness the power of a high-end databases to perform reliable and insightful data analytics.

3.5 E-invoicing

One of the ways for a modern business to overcome competitors, be profitable and sustainable is to optimize the company's internal operations. Invoicing management presents its self to be one of the most critical internal practices. (Schaeffer 2004.). As Brag (2013) pointed out, the processing of invoices in which techniques are connected, is viewed as a complex structure.

Under EU legislation, paperless transactions of B2B are authorized which allow companies to issue and submit e-invoices in PDFs or image files. In compliance with the 2019 E-Invoicing Report of Billentis, however, as much as 60-85% of invoices in the UK were still released on paper. It takes a considerably longer time for paper invoices to be received than with e-invoice. According to Forrester Research, 80% of businesses rely on manual data entry to handling expense documents. The number of problems related to invoice processing is, therefore, enormous. 25% of all invoices or more lack the basic information required to process them efficiently (Koch 2019). A study by Bloomberg's found that 27.5% of companies say that human error is behind most mistakes during entering data. Other issues included accidentally deleting custom Excel formulas (17%), and overwriting system data with numbers

measured elsewhere (13%). This adds up to thousands of hours lost on unproductive invoice processing in many organizations.

While several companies understand the issue of late payments, and the influence that it can have on their supply chain; others tend to be hamstrung by their existing systems, procedures and policies, and strive to make short or medium-term improvements that may help eradicate late payments. It is a global issue, however, there are simple solutions that could address it. E-invoicing is a digital offering that is bringing a smart approach to invoicing so manual handling can become a thing of the past. The traditional way to create invoices requires multiple steps. However, with E-invoicing, we can get rid of most of the steps as it is a direct exchange of invoice data between suppliers and buyers accounting systems, even if these systems are different. In an instant, the recipient can pay it with a click of a button without any paperwork. This eliminated the possibility of time-consuming labour-intensive steps, lower invoicing costs, and speed up cash flow, which makes the process easier and less complicated. Less manual steps mean fewer delays, fewer errors and a much quicker method of invoicing. A faster process means faster money circulation. All this leads to the fact that the company gets the correct amount charged and getting paid more quickly (Koch 2019).

The public sector in the UK has to follow an approach that will not conflict with vendors, which is E-invoicing to guarantee a consistent solution and fast adoption. A methodology that supports any business, which is already implementing – PDF invoicing. Nearly 4 years since the UK Government inquiry electronic invoicing ('e-invoicing') into the public sector, there has been significant progress. Savings time and related costs are obtained by both suppliers and consumers, while the total days payable outstanding (DPO) are minimized by the benefit in productivity. Speedy payment beyond question support economic development through promoting the longevity and growth of small and medium-sized enterprises and improve their chances of public procurement engagement and productivity (Finextra 2019).

4 Data collection

Several data collection approaches were used in this study. First of all, the volume report of beer transported in 2018, current consolidating tools and internal guidelines and other materials regarding the study's topic were provided by the case company's transport planning team. Secondly, the team's workforce was the source of internal interviews and personal observations during the consolidation process. Furthermore, the external database was conducted from results from interviews and discussion with benchmarking transportation firms. To summarize, the data gathering for the study was executed in three stages with observations and interviews.

The linking tools and interviews with employees illustrate a good overview of the case consolidation profile. The data contains sufficient information that can be analysed for the study purposes.

4.1 Observations

Two years ago, the author has worked at the case company for a couple of months and the company also confirmed the procedure had not changed within those years. The author has participated in the consolidation process, carried out projects, as well as took part in daily face-to-face meetings with team or carriers. The notes from the observations were documented in real-time so that they could be checked and eventually extended from further feedbacks and findings daily. The challenges found in the case are considered as being the inefficient consolidating way that the team is applying and difficult from the customers side. These initial observations were then gathered and address further with the colleagues in order to form the starting points for this analysis.

4.2 Interviews

Interviews have been carried out in the context of this study. Depending on the questions of the interview and interviewee, both semi-structured and unstructured interviews were conducted. In this study, structured interviews that accompanied precisely the same order planned questions were not conducted.

Interviews were conducted in order to obtain an overview of support staffs' initial opinions and feedback on the current process. Since the support staff group is consists of transport planning advisor, transport planning experts, and transport planning specialists; they are responsible for caring out the process and have practical experience in different stages of the process. They gave feedback on how well the process functions according to their standards. The participants' first contact was made via mail. The appointment for phone interview was made if they accepted to take part in. The interviewer explained about the purpose of the interview, and the content of the questions to the interviewee in advance. In this way, the willingness to respond of the interviewed person increase. The interview begins by ensured of confidentiality of the transcripts. The interviews were audio-recorded, and eventually transcribed. Only pen and paper were used to document the interviews in some cases.

For a limited period of time, interviewer could only interview a limited number of interviewees. Nonetheless, several sources of error are found in interviews (Herbert, & Irene 2005). Several parties have been interview multiple times throughout the study in order to reduce the potential sources of error arising from the interviews. Moreover, the aim was to question all participants, to provide a complete overview of the current situation from the viewpoint of each individual involved in the case.

Questions have been developed to collect data, and is a means to communicate between the researcher and respondents in all interview methods. Although there is not set standard for building questions, the preparation of informative questions is a necessary condition for accurate data collection. Below are questions for the

interview, and depends on the position of the interviewee in the team, some questions are not used.

1. Would you please tell me the current situation of the team consolidation process?
2. What is the consolidation's difficulty from your perspective?
3. Do you have any improvement recommendations?
4. Does the team have any plan for developing the process, if it has, could you please tell me briefly about those?
5. What difficulties does the team may face from those plans and how does the team solve those difficulties?
6. Which target that the team wants to achieve now? And how?

The table 2 provides a summary of the interviews carried out in the study.

Table 2. Interviews of the case company's employees

Interviewee's Position	Years in operation	Types of interview	Times interviewed	Duration (Minutes)
Transport Planning Specialist	2 years	Semi-structured	2	20
Transport Planning Senior Specialist	4 years	Unstructured	3	20
Transport Planning Expert	6 years	Semi-structured	2	40
Transport Planning Intern	1 year	Semi-structured	1	30
Transport Planning Specialist	3 years	Unstructured	3	30
Transport Planning Intern	1 year	Unstructured	2	20
Transport Planning Intern	1 year	Semi-structured	1	20

Transport Planning Specialist	4 years	Semi-structured	3	30
Transport Planning Intern	1 year	Semi-structured	1	30
Transport Planning Intern	1 year	Unstructured	2	20
Transport Planning Senior Specialist	5 years	Semi-structured	3	40
Transport Planning Supervisor	3 years	Semi-structured	2	40

As seen in Table 1, there have been 12 in-depths phone interviews carried out. The internal interviews gathered insights and information from the colleagues, in particular on the current situation, problems and suggested solutions for addressing them. During the study, internal unstructured and open-end discussions on the challenges of the consolidation process were conducted regularly.

Furthermore, the potential way to improve consolidation process for the transport planning team are then searched from the literature, industry standards and transport benchmarking companies. There are external unstructured interviews to explore ideas about how similar challenges in other transportation companies have been solved. Nine interviews have been conducted with other transport company, overview is showed in table 3.

Table 3. Overview of transport companies' interviews conducted

Geography	Company size	Duration (Minutes)
Europe	Small	15
	Medium	20
	Small	20
United States	Small	15

	Small	25
	Medium	15
Asia	Medium	15
	Small	25
	Medium	20

5 Data Analysis

5.1 Current state overview

When a customer orders less than a full truck, the planning team needs to check all the small loads on the D2 basis (will be delivered in 2 days after consolidating day), the space available on the trucks, the geographical location of the clients and customer's preferences and features. Based on this orders data, the planner needs to input this data manually in the tools that are used for consolidating. Later, the planner individually decides which loads to combine, small loads usually consolidated with other loads that share the same origin and delivery on the same day with enough time gap between two deliveries to fit into one truck. If the gap is not enough, the transport planner needs to ask the Front Office for a time change with customers who have small orders that need to consolidate (Appendix 2). The consolidating process is required to find the best solutions for the cost, truck utilization, and green initiatives. The consolidation process is currently utilized macro-coded excel and team's tool based on Google Maps. The tools' features are described below.

5.1.1 Process Tools

- *Optimization Excel (Phase 1, Appendix 3)*

In the Pivot Table, there is available pre-set for the following filters:

- *Origin city:* Magor, Samlesbury (2 main breweries/ sites in the UK)
- *Trip ID:* must be selected as blank to filter out uplifts.
- *Shipment pallets:* pre-selected less than 26 pallets
- *Shipment delivery to date/time:* During evening consolidation, transport planners are only consolidating orders which “Delivery from” D2 basis (the delivery time is 2 days after current day). On Monday, Tuesday and Wednesday, the “Delivery to” field shall be selected on the D3 basis and set time to 00:30. On Thursday evening optimization “delivery to” has to include the next Tuesday with time 00:30 and during Friday evening optimization the “Delivery to” shall be set for next Wednesday with time 00:30. The reason behind this is to have enough time if there is a need for reconfirmation from customers with the time change, as well as answers from carriers if the linking works.

Origin City	Origin Zip/Postal	Load ID	Shipment ID	Destination Location	Destination Zip/Postal	Shipment Name	Commodity	Weight (KG)	Shipment Pallets	Shipment Delivery To Data/Time DD/MM/YYYY	Load Pallets	Load Weight	Colour
MAGOR	NP26 3RA	32206369	1017609776	WM MORRIS	NN15 5YT	FGOODS - Fin	26082.00	2400.0	19/09/2019 09:30	2400.0	26082.001	green	
MAGOR	NP26 3RA	32206465	1017609775	WM MORRIS	ME10 2TD	FGOODS - Fin	25754.00	2400.0	19/09/2019 21:30	2400.0	25754.001	green	
MAGOR	NP26 3RA	32206464	1017609774	WM MORRIS	TA6 4FG	FGOODS - Fin	26083.00	2300.0	19/09/2019 09:15	2300.0	26083.001	green	
MAGOR	NP26 3RA	32205830	1017607121	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 08:30	2500.0	26340.001	green	
MAGOR	NP26 3RA	32205819	1017607120	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 08:00	2500.0	26340.001	green	
MAGOR	NP26 3RA	32205818	1017607119	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 07:30	2500.0	26340.001	green	
MAGOR	NP26 3RA	32206462	1017607038	A.F. BLAKEM	DY6 7UP	FGOODS - Fin	26655.00	2400.0	19/09/2019 12:30	2400.0	26655.001	green	
MAGOR	NP26 3RA	32206461	1017607037	KK MAINI & K	B5 6TG	FGOODS - Fin	25884.00	2400.0	19/09/2019 10:00	2400.0	25884.001	green	
MAGOR	NP26 3RA	32206460	1017607036	MATTHEW CL	B6 7AX	KEGSUK - Keg	27108.00	1800.0	19/09/2019 08:30	1800.0	27108.001	green	
MAGOR	NP26 3RA	32206459	1017607035	MILLENNIUM	RM19 1ND	FGOODS - Fin	22831.00	2200.0	19/09/2019 10:45	2200.0	22831.001	blue	
MAGOR	NP26 3RA	32206379	1017606972	CO-OP CAST	DE55 2EH	FGOODS - Fin	24654.00	2400.0	19/09/2019 17:10	2400.0	24654.001	blue	
MAGOR	NP26 3RA	32206085	1017606960	COOPERATIV	SP10 3UX	FGOODS - Fin	26721.00	2400.0	19/09/2019 12:10	2400.0	26721.001	green	
MAGOR	NP26 3RA	32206084	1017606959	COOPERATIV	SP10 3UX	FGOODS - Fin	25512.00	2400.0	19/09/2019 10:10	2400.0	25512.001	green	
MAGOR	NP26 3RA	32206378	1017606958	THE CO-OP	NM8 8AQ	FGOODS - Fin	25351.00	2400.0	19/09/2019 12:30	2400.0	25351.001	green	
MAGOR	NP26 3RA	32206028	1017606735	GREENE KIN	IP33 3PB	KEGSUK - Keg	27886.00	1800.0	19/09/2019 08:30	1800.0	27886.001	green	
MAGOR	NP26 3RA	32206027	1017606734	MILLENNIUM	RM19 1ND	FGOODS - Fin	25331.00	2500.0	19/09/2019 11:30	2500.0	25331.001	green	
MAGOR	NP26 3RA	32205627	1017606395	COSTCO WH	NN6 7TZ	FGOODS - Fin	25795.00	2500.0	19/09/2019 06:30	2500.0	25795.001	green	
MAGOR	NP26 3RA	32206517	1017607136	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 10:00	2500.0	26340.001	green	
MAGOR	NP26 3RA	32206516	1017607135	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 09:30	2500.0	26340.001	green	
MAGOR	NP26 3RA	32206515	1017607134	TIME WHOLE	IG11 0JE	FGOODS - Fin	26340.00	2500.0	19/09/2019 09:00	2500.0	26340.001	green	
MAGOR	NP26 3RA	32206395	1017606975	WM MORRIS	CV9 7WA	FGOODS - Fin	26313.00	2400.0	19/09/2019 09:30	2400.0	26313.001	green	
MAGOR	NP26 3RA	32206410	1017606973	WM MORRIS	ML4 3QD	FGOODS - Fin	24069.00	2300.0	19/09/2019 20:50	2300.0	24069.001	blue	
MAGOR	NP26 3RA	32206121	1017606968	COOPERATIV	DH2 1AE	FGOODS - Fin	27426.00	2400.0	19/09/2019 23:59	2400.0	27426.001	green	
MAGOR	NP26 3RA	32206120	1017606967	COOPERATIV	WA9 5AX	FGOODS - Fin	27212.00	2400.0	19/09/2019 23:59	2400.0	27212.001	green	
MAGOR	NP26 3RA	32206088	1017606965	CO-OP CAST	DE55 2EH	FGOODS - Fin	27607.00	2400.0	19/09/2019 18:10	2400.0	27607.001	green	
MAGOR	NP26 3RA	32206607	1017612785	MATTHEW CL	G5 0TT	KEGSUK - Keg	25301.00	1800.0	19/09/2019 10:30	1800.0	25301.001	green	
MAGOR	NP26 3RA	32206610	1017609778	ALDI STORE	S83 9BL	FGOODS - Fin	11136.00	1200.0	19/09/2019 11:30	1200.0	11136.001	yellow	
MAGOR	NP26 3RA	32206609	1017600194	GREENE KIN	NG16 3SE	KEGSUK - Keg	20406.00	1700.0	19/09/2019 09:30	1700.0	20406.001	blue	
MAGOR	NP26 3RA	32206608	1017600183	MATTHEW CL	WA7 1SE	KEGSUK - Keg	16311.00	1200.0	19/09/2019 09:30	1200.0	16311.001	brown	
MAGOR	NP26 3RA	32206606	1017600182	HEINEKEN U	RG19 4NJ	KEGSUK - Keg	28112.00	1900.0	19/09/2019 06:30	1900.0	28112.001	green	
MAGOR	NP26 3RA	32206604	1017600181	MATTHEW CL	LS23 7FZ	FGOODS - Fin	23568.00	2300.0	19/09/2019 11:00	2300.0	23568.001	blue	
MAGOR	NP26 3RA	32206602	1017600180	ONE STOP	WF6 2TZ	FGOODS - Fin	26093.00	2400.0	19/09/2019 01:30	2400.0	26093.001	green	
MAGOR	NP26 3RA	32206600	1017600179	ONE STOP	WF6 2TZ	FGOODS - Fin	28111.00	2400.0	19/09/2019 21:30	2400.0	28111.001	green	
Grand Total													

Figure 7. "Linking with planned load" Excel sheet (Appendix 4)

- *Google Geocoding Map (Phase 2)*

- Paste Destination Zip/ Postal Code from Excel to Google Batch Geocoding Map. The team has created their tool based on Google Maps with a large number of UK postcodes, which are geo-code on this tool. The tool shows a consolidated overview of all the part loads, their geographical locations as

well as the weight of the loads, and the number of pallets they represent (See figure 2).

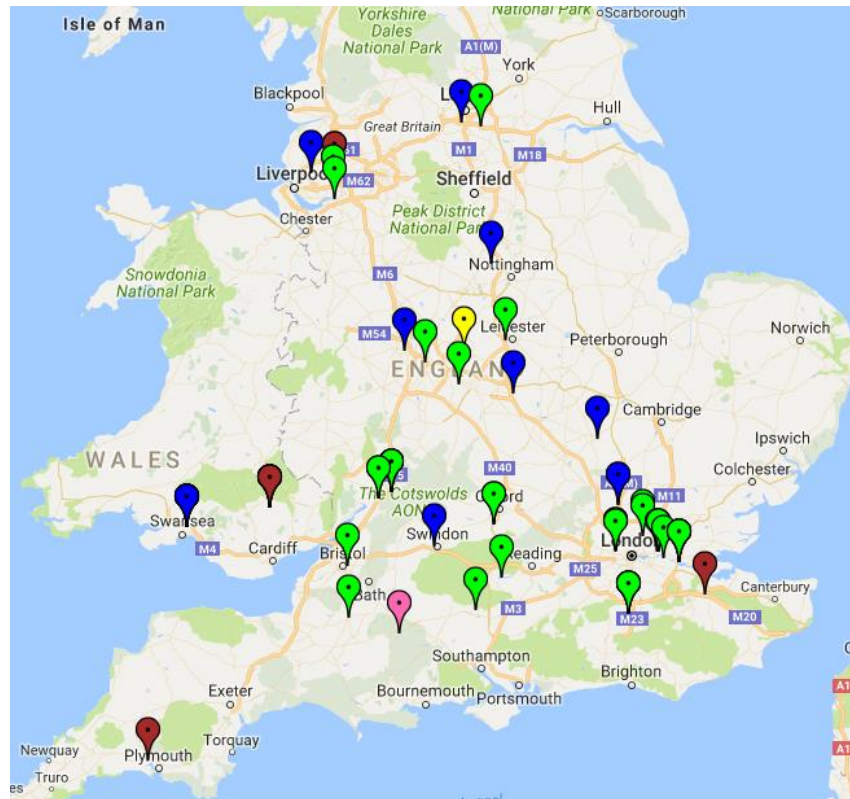


Figure 8. Loads values are shown in Batch Geocoding Map for the selected day

- Legend for markers:
 - Pink Anything below 3 tonnes
 - Red From 3 tonnes to 5 tonnes
 - Orange From 5 tonnes to 10 tonnes
 - Yellow From 10 tonnes to 14 tonnes
 - Brown From 14 tonnes to 20 tonnes
 - Blue From 20 tonnes to 25 tonnes
 - Green Anything above 25 tonnes

- If we click on each marker, a bubble will show up including:
 - Shipment/ Delivery ID
 - Count of drops

- Gross Tonnage/ Count of pallets
 - Commodity (Finished goods/ Kegs)
 - Customer name
 - Carrier
 - Status of the load (tendered or open in TMS)
 - Delivery date & time
- Linking rules:
- Link with a load which would have the same destination zone
 - Find the best variation depending on Weight per shipment, need of time changes, the distance between drops and priority of linking
 - Below are the linking possibilities (arrows) and priority of linking (numbers), number 1 is the highest possibility.
 - Always check the stops. Usually, the best practice is to take delivery from shorter distance drop (on the way) and put it to the last shipment (2nd or 3rd drop). UNLESS one of the shipments has been already tendered/set to planned.
 - Set to planned all the consolidated loads that are in the system, leave in open those which are waiting for time change confirmation.

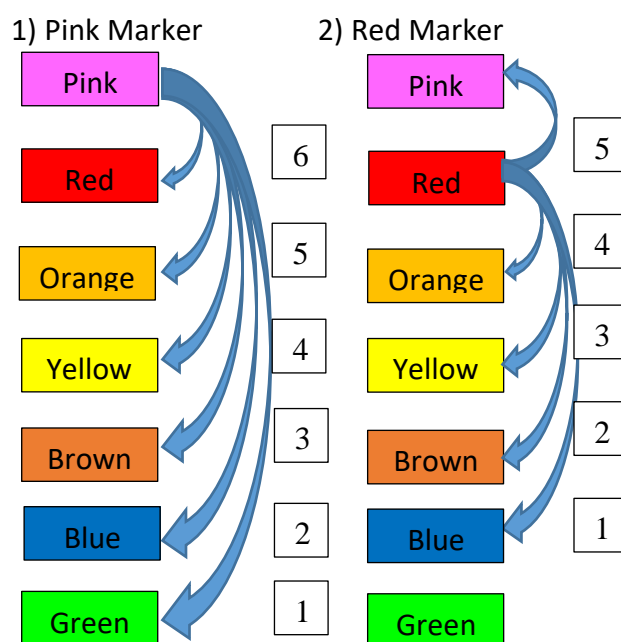


Figure 9. The linking possibilities and priority of linking (1)

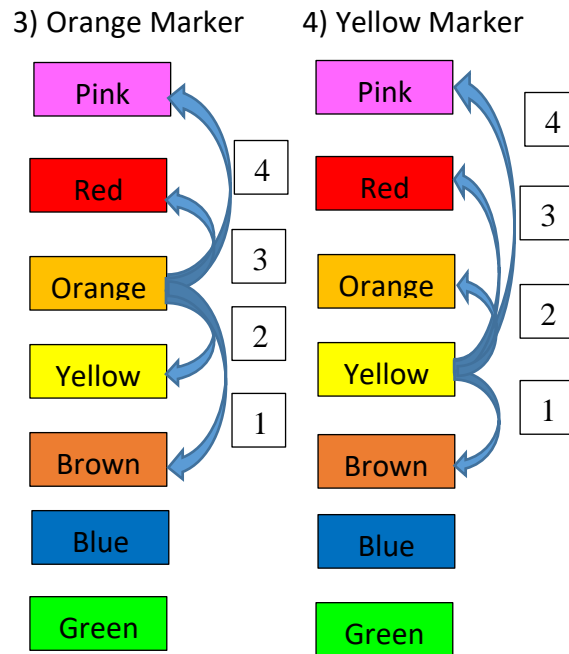


Figure 10. The linking possibilities and priority of linking (2)

- Sometimes it is possible to link Red with Green, Orange with Blue, Yellow with brown but these combinations are quite rare. For simplicity, those combinations are not needed.
- The evening optimization process in the team is structured to ensure that consolidation activities are compatible with the key processes of the team.

5.1.2 Process Chart

Step by step of Company A's consolidation process are described in the chart below:

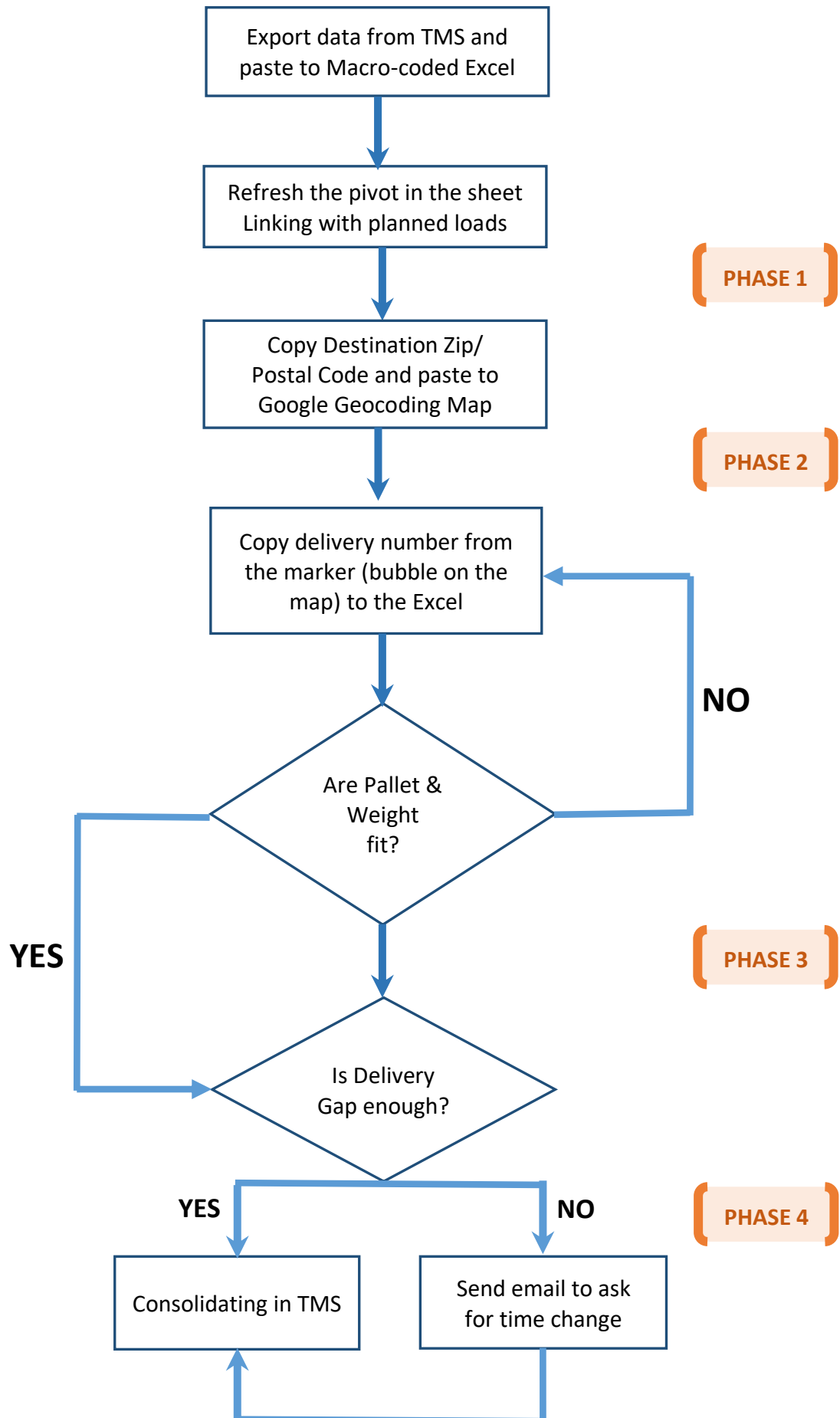


Figure 11. Current Consolidation Process

The invoice can be generated after confirmation of the shipments (Phase 5). The uninvolved parties were exempted from the charts which display the readability of specific stages. The flow chart does not include all the steps which are required to be done since certain steps were combined in order to simplify the chart. All the steps such as check carrier's lane and carrier's capacity have been combined under the step "Consolidating in TMS". The phase involved many emails, as the time change requires corrections from customers. In the process, multiple excel spreadsheets were also used. The process takes hours to complete, as several validations delay the process.

5.2 Discussion on the interview results

The results of interview were analyzed and similarities between answers were compared. Through critical analyzing of the existing process definitions, based on the author's personal experience and interviews of transport planners in the team, it can be stated that the challenges which the operation is experiencing are divided into two aspects: External and Internal factors.

External factors

Customers are not having Minimum Order Quantity (MOQ) set up in the contract or customers are not respecting MOQ. For example, customers placed several orders with small quantities on different days, delivery times provided by customers are not suitable, and customers are not willing to change time due to different reasons: they are full, their storages are closed by needed time, etc.

"Sometimes we end up with very light orders which cannot be linked as there are no loads going in the nearby area on the same day."

Geographical challenges on one hand, as it is very difficult to make an efficient load linking with minimum driving distance, and partial orders are spread throughout the whole country.

“There are some depots which are hard to reach and therefore hard to consolidate.”

On the other hand, the maximum utilization of the trucks is difficult to achieve, as there is no sophisticated overview to show space on the truck and filter out only the loads which can be combined.

Currently set cut off time for loads to be accepted from Carrier side is ATM 12:00 UK time. Transport planner has to ensure that every small shipment has been consolidated, otherwise a reminder shall be sent at 10:00 in the morning. Planner has to send an email to the Front Office requesting them to do the needed time gap for customers who have consolidated orders (as explained in current state overview). Carriers who are responsible for the chosen destination are always in copy. It gives them visibility to preserve capacity. If both loads changed in time successfully - linked orders are sent to the carrier responsible for the last drop destination. If time change (to have more delivery gaps between deliveries) is not made till cut off time, transport planners have to split loads which are waiting for the time change, plan them again and send them separately to each carrier who is responsible for each line (postcode).

“Because there are so many things to consider by, sometimes there is unsuccessful consolidating due to the impossible time changes.”

Another difficulty presents when loads are being assigned to a carrier is not all combinations have been precisely tendered, a common rule which has been agreed to will be applied. That is to assign a certain combination of loads to the carrier to whom the most distend stop belongs. This however often represents issues when linked loads considered too "uneconomical and inefficient" by the carriers. Therefore, the linking oftentimes includes discussions with the carriers and corrections after the initial planning. The process costs the team precious time to deal with and risks finalizing the daily plan after the official deadline.

Internal factors

As mentioned earlier, the team has created their tool based on Google Maps, where a consolidated overview is available of all the part loads, which include their geographical locations, their weights and the number of pallets they represent.

“This tool makes it easier for the planner to create combinations and link the loads but it doesn't guarantee optimal planning as there is still the human factor involved.”

The process is carried out manually based on experiences, so it changes every day. There are things to consider and also depend on the planner's decision making.

“The disadvantage is that you do the consolidating manually by searching the shipment one by one on the map for the best option.”

The most common issues are human errors, such as missing some loads, incorrectly planning loads as overweight or assigning the loads to the incorrect carrier. Additionally, different members understand and see issues in the current process differently. Consolidate shipments need to be done manually, and because different loads include different commodities, very often opportunities for utilization are missed or trucks are planned incorrectly (being overweight for example).

“The biggest part of the linking is done manually. Therefore, the most difficult thing could be to organize correctly the data, analyze the content and decide which links could bring the best value afterwards”

Although the case company take steps to ensure accurately and timely payment processes, the transport team operates with some small-size businesses where online invoices are not available, but only paper invoice can be sent by the transport planning team. The company and these customers are trying to set up within company systems. In these cases, the paper invoice difficulties are showed as from

Loading to Ready for payment frequently take 5-10 days to complete the whole process.

“There are usually delays due to postal transits, manual processes and acceptance cycles, lost or refused invoices”

“The problem could be formulated as a higher number of invoice handling steps”

It means that reliability of the system depends on different, barely controllable factors, such as working stream, intake of invoices, the personal operational capability of staffs and work accuracy of involved machinery.

The team is using Excel Spreadsheets tool and Google Geocoding map to consolidate shipments for upcoming orders. The problem is that it is not optimal when there are interface problems with those platforms.

“Google updates every month so the tool will stop working. Thus, the consolidated overview is not ready, so we have to consolidate shipments manual-manually and it takes forever”

The lack of technical specifications challenge is identified throughout the interview:

“It’s really inefficient having to use multiple different softwares like Google maps, sap, TMS, excel, email, instead of one direct application”

Moreover, sometimes when Excel-spreadsheet is not working properly, a few linked shipments are not transferred from TMS to excel. When that happens, the transport planner has to check one by one shipment to see what the problem is and make the link shipments visible, thus it is time-consuming. In the case context, consolidating mistakes tend to be expensive.

Most of all employees recognize the macro-coded excel could not fulfil the needs of the process since it is going beyond Excel's limitations. Therefore, current tools could not provide enough support for the consolidation:

“There wasn't anyone who could improve the tools because the tools were created by experts in the team and even the experts could not improve it furthermore”

The whole process's problems are the manual workload, the process' transparency and traceability are poor because of the incompatibility of the system. Therefore, the current consolidation process is contributing to creating more jobs for the workers, but it has low effects. Significant manual work impacts the overall function of the transport system and consolidating operation in particular. As stated by Schaeffer (2007), the risk of human factor errors was increased in manual work. In this case, if the transport planners want to link already tendered load with load from Open (Load which has not assigned to carrier yet), they also have to make sure they consolidate the orders under the tendered shipment. If it is mistaken, the stock will not be taken to the customer. The procedure uncertainties often lead to huge amounts of repetitive and wasteful email exchanges and actions from warehouses or carriers.

In the table below, the effect of these challenges is measured in two main groups, Time and Workload and is measured on a three-level scale (High, Medium, Low). Challenges with Low effect raise the workload to a minimum of one hour of working time. Challenges with Medium impacts can add workload up to 3 hours of working time in total. High impact challenges increase over a period of three hours of workload in total. On the basis of process' analysis and interviews, the challenges observed were discussed and the scale for evaluation was created by the author. In most interviews, each interviewee was asked what challenges and the effects which they had experienced. For example, these questions were about: how long each phase has taken, the number of emails needed to exchange in a phase, what the most difficult stage was and which can be done differently. The working hours that are used in the process are interviewees' assumptions, so that those numbers should not be mistakenly embraced.

Through critical analysis of the existing process definitions, based on the author's personal experience and interviews of transport planners in the team, it can be stated that the challenges the operation is experiencing are divided into two aspects:

Table 4. Observed challenges in the consolidation process

Challenges	Affected party	Affected phase	Time effect	Workload effect
Customer flexibility	Carriers, Planners	Phase 4	Medium	Medium
Manual allocation risks	Distribution centres, carriers	Whole process	High	High
Technical Specification	All	Whole process	High	High
Geographical challenges	Carriers, Customers	Phase 2, Phase 4	Medium	Medium
Paper Invoice	Customers	Phase 5	Medium	Medium
Cut-off time	Planners, Carriers	Whole process	Low	Medium

The transport planning team must now improve its consolidation process and invoicing operation. Most team's employees agree that use of technology throughout the consolidation process may play an important role in resolving the problem, as the number of planners who making decision on future shipment is decreased.

"As linking is done mostly manually, there is definitely a room for improvement in terms of digitization and automation of certain steps"

"There should be new projects which concentrated on the efficiency improvement within the team process by closing the gaps in the manual tasks with automatization"

Improvement could be a foundation for the team to actively respond to market changes. However, the entire team needs to go through current challenges and getting used to the new platforms during the first phase of development. The improvement offers team members an open opportunity to training themselves and also allows them to enhance their planning level, from receiving orders to delivering to customers. This change could help the team to improve the efficiency of the whole process.

4 Improvement Recommendations

The transport planning team of the case company is striving to create the most efficient planning of transport in terms of cost and fleet capacity, in order to achieve the set-up target on variable logistic costs by protecting service level. This can be achieved by optimizing the weight per shipment and delivering the order with the minimum number of vehicles (delivering on time in a full truck). The main objective of load consolidating which also are without planning errors. However, there are inadequate tools in the existing consolidation procedure, resulting in a heavy dependence on manual tasks. There is no appropriate interface from start to finish and the process activities have been divided and performed on multiple different platforms like Excel, Google Maps, SAP, TMS, email, etc. Because there was no central platform, the process did not guarantee that all of its activities create added value to the overall customers.

Real data and other findings were used to analyzed and the arisen results have been obtained from the group discussions of transport planning team' experts, following an evaluation of the process in the case company and a comparison with the best practices and techniques used by other transportation companies.

“Our company has used a freight consolidation program for years so there is not a huge work for employees in the process. We are focus on customer orders as well as stocks”

“The consolidation process is automatization, hence we just need to re-check at the end of the day”

“We have consolidation program so at the moment none critical manual workload challenges, except for the poor data quality that the team could face and it could lead to a small amount of links created automatically”

“The recent technology adoption of consolidation solution gave our company more insights in terms of delivery schedules, has offered consolidation optimization, has significantly reduced processing time and chances of manual errors”

“We are constantly improving our existing consolidate software as well as ensuring service level by reduce planning errors and pushing carriers to perform better”

“Retailers need more frequent orders but smaller quantities. This means less product and shorter lead time for filling full truck. Hence, it’s more necessary to have a direct consolidation program under the present market circumstances than it was a few years ago”

“This has all been done manually before, and today’s company program is much more effective”

“Our freight consolidation is an automated process, the software reads each shipment information and links them to the same trip (consolidating) based on the data provided by the shipment entry team”

The bench-marked companies were not very willing to share information about their internal processes. Not every question has been answered in a complete way so the responses were gathered at a general level without the required levels of detail. Nonetheless, both incompletely and indirectly responses showed that these

companies had encountered similar challenges and acknowledged the needs of technology solutions for their consolidation process. These bench-marked companies have invested in the enhancement of efficiency, managing all parts of the consolidating and shipping process, and eliminating all delays related factors in order to address their problem areas. Consequently, they use freight consolidation programs commonly known as consolidation of truckloads to fulfil these demands. New approaches will be proposed in the next sections for improving the case company's process of consolidation.

4.1 Short-Term Improvement

There are some suggestions for the team to solve these problems:

Create customer profile

A business with a large number of customers will be difficult to satisfy each customer while having not so much time and resources. One solution is to classify customers by dividing the type of customers who have been in contract with the company according to similar characteristics: their working hours, cluster customers to know which ones are flexible in time changes and which are not. After classification, transport planners could understand customers' preferences better and have appropriate plans based on each characteristics of the customer group. The more information the team has about its customers, the more it will make consolidating process effective.

It will save time and workload by consolidate multiple shipments with unable-to-change delivery time by tackle specific customers and make them order during same day.

Collaboration with the Inventory team

Order Taking Team, Inventory Deployment Team and Transport Planning Team share common objectives, including ensuring that customers receive their orders in time or that supply chains of the company are reliable. Collaboration between different logistics departments ensures the most effective and efficient operation of the entire process. Thus, the employee from must be in touch, communicate and support each other on our interests.

Sometimes it is impossible for transport planning team to find good consolidation, so the inventory team could help to reroute orders to the other warehouse which may have other potential LTL orders. In this case, transport planning team will avoid send small order separately in one truck, which is better for team's weight per shipment target.

Collaboration with Front Office

As Front Office is working direct with customer and helping Transport planning team contact customer with requested delivery time for consolidating shipments, the team should have good collaboration with Front Office and have a regular monthly call discussing what they can improve.

For example, Front office could help the team with pushing customer to order in Full Load quantities, which will help the team to avoid unnecessary consolidating and potential risks failing.

Collaboration with carriers

Carrier collaboration well worth the effort since there are potential for lowering risks and costs, and improving customer satisfaction and loyalty, even it may be challenging to implement. It found that organizations collaborating with carriers on any of the levels were 38% more likely to meet or exceed their cost reduction in a recent survey of about 1000 Supply Chain Managers (Deloitte 2012).

Instead of sending small orders in one truck or van network which is not effective in term of costs, the team could negotiate with carriers and let the carriers help by consolidating the case company's small orders which cannot be linked with other small orders they have from other clients. However, it requires much advance notice to be effective.

Collaboration with other Fast-moving consumer goods companies

Cooperation between companies has always been consistently to preserving a delicate balance between demand and supply. The main objective of the partnership is to ensure the goods are delivery at the right time and in right place (Supply Chain Game Changer 2019). For many businesses, it works well and is a systematic way to address the changing needs of their customers through the right benefit-sharing model by transforming Win-Lose situations into Win-Win opportunities.

They can collaborate to share trucks to achieve effective in terms of costs. However, it is just a short-term improvement since there is a risk that some other companies might prioritize their deliveries and the quality of the service might decrease.

4.2 Long-Term Improvement

Implementing a Freight Consolidated System

From the interviews with the planning advisor of the team, there is a planned investment in an upgrade of the current transport planning tools. The transport planning team should, therefore, strive for a good budget system that ensures shipments consolidation and effective planning. The new custom-built system should manage the requests from receive order to consolidation throughout its entire cycle. Moreover, it should be a direct application or a direct tool that is not connected to google maps in order to make sure the team can utilize it at any time. The application should be able to 'read' the data of each shipment and put them on the same truck based on the information that is inserted by the order entry team.

The system needs to be automated to create linking proposals based on set rules, which are in alliance with the team targets and carrier preferences in order to guarantee the best combinations in terms of price and driving distances and duration. Later, the system would automatically optimise the loads consolidate and will eliminate the human tasks for the most part by carried out with technical support. The team then just need to make sure that all the necessary information is available (freight charges, working hours, pallets, sizes, distances from the production plant, trailer commodities, etc.). In order to do that, the team is should cross-collaborating closely with other supply chain teams to keep track of the efficient data entry.

By implementing a good consolidation system, puts control of the process in the hands of the transport planner, allow to monitor and speed up the processing time for their requests. It also aims to immediately solve problems that have occurred during the consolidation process, allows the team to react to the customer demand quickly and correctly, and accepts timely difficulty of the required cut-off time with the good quality. Besides that, this enables the process and exchange of information among the case company's logistics departments more efficient and provides a realistic time frame to build business strength and stability in the industry.

New invoice type: E-invoicing

Paper invoice involved a large number of expenses, including printing cost, paper cost, envelopes cost, physical costs of delivery, and much more hidden costs. As the company want to reduce paper use within the supply chain as part of case company's sustainability commitment and moving towards to online payment processes. Consequently, the team should start substitute paper invoicing with e-invoicing with small business mentioned above.

When changing from paper invoice to E-invoice, both parties are expected to gain these following important benefits: (Meinvoice, 2018)

- Capturing digital invoice (fewer manual work)

- Automatic validation invoices (fewer errors)
- Reduction of costs: Due to the elimination of manual work and avoidance of late deliveries.
- Better cash management: Directly transferred to the accounting system.
- Lower carbon footprint: No paper is used throughout the entire process.
- Better process handling: Reduces the number of calls regarding the invoice's status and amount's accuracy from suppliers
- Improved optimisation of IT infrastructure
- Security: Ensure there will be no alteration or damage with the invoices during the distribution.

E-invoicing is the perfect complement for other freight accounting services that operate in accordance with both a transportation management system as well as controlled transportation services. Accounts payable staff can now just issue one check to cover all transportation carriers' weekly costs, instead of checking hundreds of invoices, each in a different format from multiple suppliers. The case company will also be provided a transcript containing specific information on each transaction that can be used to support internal reporting and further improve compliance with the complicated governmental regulations in addition.

In conclusion, the adaption of E-invoicing is going to provides many benefits of adapting. This can be regarded as the key thing since its profitability will rise and the case company can expand its productivity and compete healthily with those businesses.

5 Discussion

5.1 Answer for research questions

This thesis began by defining the issues of process, triangulation of observation, and interviews were used for data collection. Specific identified problems have to be

solved to ensure efficiency output based on the results of current state analysis. The study is aimed at finding best practices such as adopting technology solutions to tackle these challenges and a comparison with other transport companies was also benchmarked.

The main questions of the study were:

What are the challenges existing in the current method?

The transport planning team currently uses its own excel tools and google geocoding maps but they are in many different sheets and quite complicated. There is no direct software or program available for supporting the workforce. The manual sorting of all shipments with spreadsheets and map website can take hours and probably transport planner will not even cover all the possible options in attempting to route many of shipments. Time and workloads are the most common issues that impacting and reducing performance productivity when customer requirements are not met.

Which technology solutions can improve the team's consolidation efficiency?

The short-term solutions, such as building a customer profile, collaborating with Front Office, Inventory Team, and partnering with Carriers and Fast-moving consumer goods companies, have been highlighted because they could be applied from none to low costs in a timely manner. It has been recognized short-term solutions proposed should be implemented for the greatest benefit.

The long-term solutions proposals offer a more aspiring state and future vision. The most important long-term ideas concern various IT tools such as the adoption of new consolidated program or switching to E-invoicing. The adoption of new program is believed to be a positive step towards boosting consolidate performance and leveraging working tools for the case firm. The team can automate certain daily manual tasks, to build flexibility that is critical for the team, and to increase the chance to get off work on time. Many long-term improvement proposals, however, require quite radical organization change.

Should the team invest in the solutions mentioned in Question ii?

If the case company decides to implement the improvement recommendations presented in this thesis, the transport planning team can be assured that the challenges found in the current process outlined earlier will be minimized. Those technology solutions can take minutes to automate the process, as time required for calls or emails will be reduced. Besides that, all data ready on spreadsheets can decrease the amount of time needed to fill manually data, and complete detailed reporting by pressing a button as using the E-invoice. To support this, the case company need to contact those specific clients to provide documentation that needs to be completed to set up system. A Purchase order (PO) can be given once the client installed the network.

At the same time, the proposed system will operate more efficiently and effectively and will concentrate on delivering value throughout all its activities. The new system needs to have a dedicated process manager who is able to monitor the daily operations and handle customers, carriers, and employees' feedback in order to make the system able to function for a longer period. The process manager will need to ensure the system procedures are modified and developed in accordance with the changing needs of its. The new system should remain consistent and actively supports the missions and strategic objectives of the transport planning team.

It is, however, difficult to implement these solutions in the beginning, since it requires the appropriate time and business method. In order to enforce these changes, the case company needs to concentrate on the following things:

- Planning and organizing an appropriate new process chain: It is complicated because it requires a lot of resources. The team needs to make a more throughout strategy to prevent the new interface from leading to a reduction of service level. When the transport planning team is innovating the system, they have to make sure the system runs constantly and avoid interruption due to lack of work.

- Organizing technical training workshops for the team's employees to join at the administration training centre or hiring experts for training on-site. With a suitable training plan, the team will be familiar with the new system and its procedures soon.

5.2 Reliability and validity of research

Observation, theory and interviews combine a basic knowledge of the case process. The interviews have been conducted at a particular time, thus interviewees' thoughts and assumption may have personal bias in them. It is normal to qualitative study. (Welch 1985.). If two evaluators either able to reach the same conclusion or support a third person's conclusion, the research results can be considered reliable. Validity derives from perception and the consistency that a phenomenon is research and analysed through the best principles and methods available. Generalization, indicating the potential to carried out and apply a study result in other studies, can also result in validity. (Taherdoost 2016.)

Since this study theories and principles are generalized, its theoretical can be viewed as the starting point for similar studies. For quantitative research, it is easier to determine reliability and validity, but in qualitative research, it is more complicated. Because this research was a case study, interview data collected is only relevant to the case company and its project. Thus, only the case company and its project have reliability of the analyses and validity of tests, recommendations and conclusions. Every organization has different circumstance, it needs and project differ by scope, length or expected outcomes, therefore, not all results can be used as references. (Golafshani 2003.)

6 Conclusion

Background for making this study was that a case company is using Excel Spreadsheets and Google Geocoding maps to consolidate container shipments, later sends paper invoices to specific small size businesses. This is at the moment, gives

them several difficulties in form of wasted time in operational work. The aim of the author was to identify the challenges that the team is facing and to propose potential technology solutions.

The current tools are low level of traceability, but it can be enabled with more advanced IT systems. Many functions in the process could be implemented into a consolidate program. The automation of the process increases transparency and agility. In addition, it could provide the carriers and customers with an opportunity to follow up the process, and on-time tracking of shipment delivery. The result from of research suggests that a direct program is needed for long term improvement, the transport planning team should implement a consolidate program and start to set up E-invoice with small-size business to make processes use less manual work and paper-based use to have better efficient data in digital form. With automation and better payment flow, time between the finished production and the delivery demand is reduced as well as the costs of transportation. This direct system can help to fulfil customer expectation.

Because of the limited time for review and analysis, not all improvements and solutions have been found to remove all the root causes of the problem. The study could have provided a more comprehensive action plan on how to execute the proposed changes if more time had been spent identifying steps for improvement. The actual testing of the enhancement proposals cannot be carried out as no relevant cases were found during this research. This cause the analysis of the effects is done by estimating how the improvements would have impact the identified problems in the process during the study. The results of the study, therefore should be viewed as approximates results rather than absolute results. This leaves room for another researcher to carry on with the results. This study was an interesting research topic since it contains a wide range of process parts and improving moments. For future development, the case company should start to implement consolidation programs proposed in this study and further work to identify more roots of problems.

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