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Best-practice transport planning

a comparison between the U.S. and Europe

Master's thesis 30 credits

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Abstract

Purpose of this paper:
The U.S. and European way of planning road-freight transport are different. These differences pose an interest of analyzing, assessing and evaluating. Transport planning in the U.S. is far more centralized and integrated than in the de-centralized inefficient European way. The aim of this paper is therefore to improve transport planning in Europe by analyzing the U.S. best-practice.

Methodology:
In order to fulfill the purpose of the study, one case study in the U.S. and two case studies in Europe have been examined. The focus was on developing cases which were comparable. Methods related to the case studies were interviews, documents and shadowing. Existing research in the field of transport planning was interpreted in a literature review.

Findings:
Fragmentation and many layers of decision in the European road-freight sector make it difficult to plan compared to the U.S. hauliers. The U.S. hauliers plan in a more centralized manner compared to the de-centralized way in Europe. The European hauliers are in need of a central integrated transport planning system and standardized communication tools.

Value:
The in-hand thesis contributes with unique and highly relevant research by examining one U.S. haulier and two European hauliers combined with an extensive literature review in an exceedingly germane manner.

Research implications:
The in-hand thesis has contributed to theory by comparing the U.S. and the European transport planning. Furthermore, a self-developed extended framework for control and planning has been constructed and utilized to showcase the different constellations of the involved case studies.

Practical implications:
A more efficient, central and integrated transport planning along with standardized communication tools in Europe implicates a game-changer in how European hauliers would work. Layers of decision-making would shrink and the utilization of capacity regarding vehicle and driver could increase.

Keywords: transport planning, dispatching, ATLF, best-practice, transport models

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List of Abbreviations

Abbreviations	Explanations
ATLF	Advanced Truckload Firm
CSA	Compliance, Safety, Accountability
EDI	Electronic Data Interchange
FTL	Full Truckload
GPS	Global Positioning System
JIT	Just-In-Time
KPI	Key Performance Indicator
LSI	Logistics Service Intermediary
LSP	Logistics Service Provider
LTL	Less-Than-Truckload
OTR	Over-The-Road
PTP	Point-To-Point
TL	Truckload

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This thesis is dedicated to my uncle and god father Lars Magnusson 2005-09-17.

Yours sincerely,

1. Introduction

The introduction chapter initiates with a presentation of the background to the studied topic. In a funnel-like approach, the goal is to provide the reader with the full picture and thereafter narrow it down to the scope of the in-hand thesis. Moreover, the purpose of the study along with its related research questions is presented followed by the de-limitations and a thesis outline.

1.1 Background

Freight transportation is fundamental to the economy (Crainic, 2003) but also complex, with numerous actors and layers of decisions (Crainic and Laporte, 1997, Sternberg et al., 2013a). In a world where markets are far away, it is undoubtedly a necessary service to transport freight to customers (Gemmel et al., 2013) and a one week disruption of road-freight would be devastating (McKinnon, 2006). The road freight market is highly competitive due to the relatively low investment cost for a new operator to enter (Burks et al., 2010) and the market share is divided by service and cost (Taylor et al., 1999). A shipper can find suitable carriers at fair prices even at the same day as planned delivery, due to the fragmentation within the truckload industry (Tjokroamidjojo et al., 2006). Road transport is by far the most utilized mean of transport in industrialized countries (Caputo et al., 2006) thus reducing emissions must therefore be assessed through planning transport better (Gajanand and Narendran, 2013).

In one particular situation, several hundred drivers are available to perform haulage as the challenge lies in discovering the right driver for the right load (Powell et al., 2002, Coslovich et al., 2006). Retaining drivers has been a huge problem for the haulage industry and the primary reason is very-long tour lengths which keeps the driver on the road (Üster and Maheshwari, 2007). Drivers aspirate long-distance haulage because salary is a result of miles driven, but also short-distance haulage to return to their domicile more often (Taylor et al., 2001). Quality of life on the road is considered to be low as the driver is either eating, driving or sleeping at all times (Taylor et al., 1999). Hence, transports must comply with drivers' regulations in order not to break any laws, which the transport planner must assert (Goel, 2010, Goel and Kok, 2012).

The transport planner must remembrance maximizing profit by minimizing circuitous routing or empty runs (Taylor et al., 2006). Transport managers can influence the road traffic through assessing the choice of transport modes, hauliers and trucks, vehicle routing and matching of loads (McKinnon and Woodburn, 1996). Empty positioning is considered to be a non-revenue task which should be minimized (Braekers et al., 2013). Pressing research issues relate to the progress of the next generation of methods and planning models for

shipper and carrier operations which incorporates modern technologies and policies (Crainic et al., 2009). Utilization (e.g. resource) and flow in the transport network is influenced by the way transport demand is handled (Sanchez Rodrigues et al., 2008).

The U.S. and Europe developed differently owing to the de-regulations in the respective road-freight sector. Since many years ago in the U.S., mega carriers in advanced truckload firms (ATLF) are being utilized (Corsi and Grimm, 1989, Corsi and Stowers, 1991). The notion lies in utilizing corridors or 'pipelines' on major highways with balanced freight flow and to keep the driver close to his or her domicile (Taylor et al., 1999, Taylor et al., 2009). A high degree of resource and driver utilization is ensured through i.e. zone dispatching (Taylor et al., 2001). These ATLFs were the result of the de-regulation of the road-freight market named the Motor Act 1980 (Corsi and Stowers, 1991).

However, the European transport market is considered to be highly fragmented (Klaas-Wissing and Albers, 2010) and complex due to the existence of many different actors and is in need of a more integrated planning and control (Sternberg et al., 2013a) especially in the FTL-segment. In Europe, several drivers are living in their trucks which result in a low degree of resource utilization and high allowances. Poor planning and frequent errors result in resource utilization waste for European carriers (Sternberg et al., 2013b). The European road-freight segment has issues with ineffective transports (European Commission, 2011). Therefore, it is one of the reasons to why the European Commission is looking at various ways to improve road transport operations in order to result in efficiency enhancing policies (European Commission, 2011).

The European road-freight segment is characterized as of a 'craft' type, vis-à-vis the U.S. 'industrialized' type (Walther, 2010). U.S. road freight firms such as Schneider International have tried to design an ATLF-model in Europe, but quit the strategy after little time due to the difficulties (Kille et al., 2015). Furthermore, it is possible to assume that U.S. road freight firms are trying to expand their market share into Europe once again (Kille et al., 2015).. But, this time by acquiring European road freight firms (e.g. Norbert Dentressangle) and utilize their own expertise in FTL and IT (Kille et al., 2015). Recently, the U.S. owned road freight firm XPO Logistics captured a reverse logistics and maintenance contract with Aldi in the UK (XPO, 2016).

To the author's best knowledge, the way the U.S. hauliers plan and carry out their road transport operations has been researched and implemented very limited within Europe. Evidently, a need to improve the way Europe is planning their transport exists. A great opportunity and challenge lies in extracting the knowledge from transport planning in the U.S. to improve transport planning in Europe.

1.2 Purpose and research questions

Evidently, the U.S. hauliers are superior at ensuring high utilization of resources and frequent home domicile returns for drivers. Contrariwise, the European hauliers are in a need of an integrated planning and control to overcome low resource utilization and low efficiency. Hence, the U.S. hauliers act as the best-practice in transport planning and their transport models are of interest for European hauliers. The purpose of the in-hand thesis is therefore *to improve European road-freight transport planning by analyzing the U.S. best-practice.*

Two research questions were formulated in order to accomplish the purpose of the study. Since the purpose is to improve European road-freight transport planning by analyzing the U.S. best-practice, the first research question provides the foundation by recognizing what differences exist. The second research question applies the knowledge from the perspective of differences and the answer showcases how the U.S. planning models can be applied in Europe. Thus, by answering the two research questions and fulfilling the purpose of the in-hand thesis it is possible to significantly contribute to theory on operational transport planning.

RQ I. What are the differences how the U.S. hauliers are planning their trucks compared to how European hauliers do it?

RQ II. How can the U.S. planning models be applied in Europe?

1.3 Delimitations

The operational level of transport planning will be the focus for the in-hand thesis. One case study in the U.S. acts as the foundation for the U.S. best-practice and two European case studies are thoroughly assessed.

The segment of interest in the in-hand thesis regards road-freight transport planning. The focus lies therefore on the transport process for hauliers and carriers performing road transport. The transport process occasionally involves additional modes of transport, but not within the scope of the thesis.

Björklund and Paulsson (2014) strain the importance of clearly presenting the delimitations and the directions of a study. The in-hand thesis will focus on FTL and thereby partly exclude LTL. The LTL-segment cannot entirely be omitted, due to the fact that FTL hauliers sequentially utilize LTL. Hauliers or carriers will be in-studied and thereby not the shippers. Shippers are evidently a large part of the process, however the operations of improvement lies within the hauliers and carriers. However, the relation between the customer and the carrier affecting the operational planning at the carrier are incorporated.

1.4 Thesis outline

The thesis is outlined in 7 chapters providing the basis of the study as also depicted in Figure 1. The following section visualizes these chapters in order of occurrence. The information included in the separate chapters is disclosed in italics at the start of every chapter.

1. Introduction

2. Methodology

3. Literature review

4. Theoretical framework

5. Empirical findings

6. Analysis

7. Conclusions and discussion

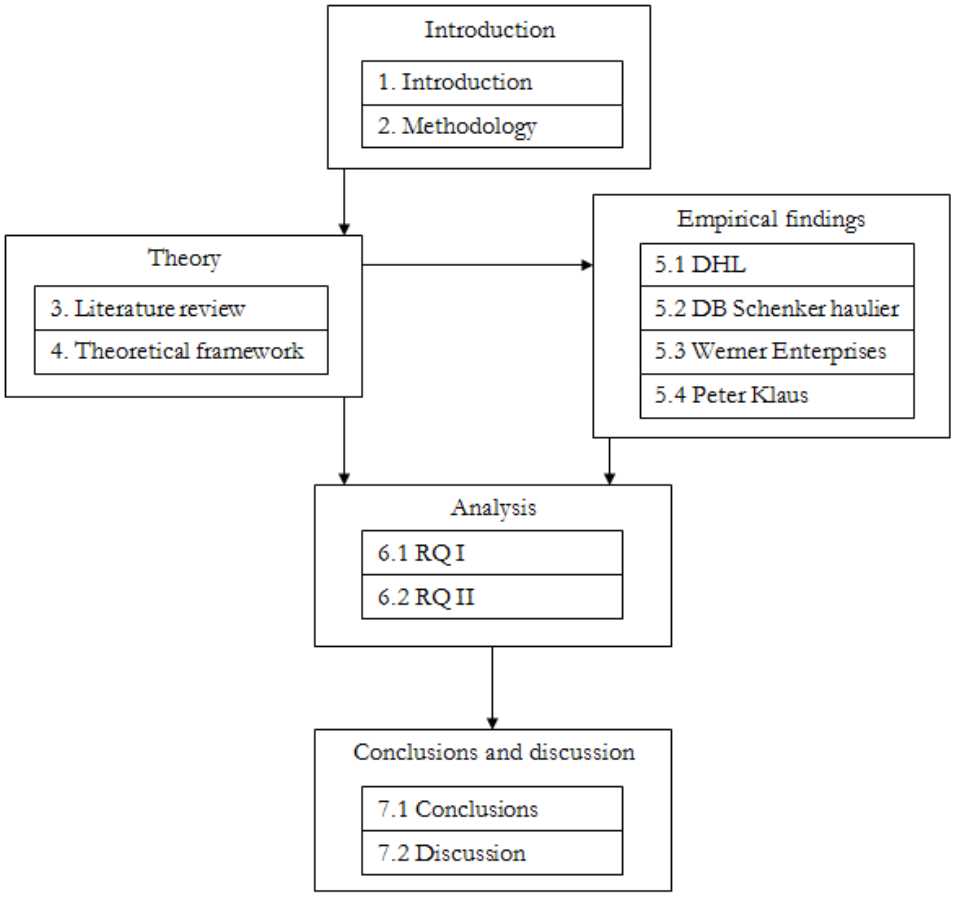

Figure 1: Thesis outline

2. Methodology

The methodology chapter provides the essential information regarding utilized approaches, combined with why and how they have been performed. Firstly, the literature review is described followed by a description concerning the multiple case study. Thereafter, the methods namely interviews, shadowing and documents are disclosed to the reader. The last part provides information about how data has been analyzed followed by a critical evaluation.

2.1 Literature review

A review of relevant literature aids researchers in making a meaningful 'drawing' describing the existing relations between the different segments of literature and the 'white spots' outlining the research (Frankel et al., 2005). Literature has mainly been obtained through Web of Science and Google Scholar. According to the author, the literature review shall perform as the foundation for the in-hand thesis. An initial search for the keyword *transport planning* resulted in a list of 30 000 hits, which consequently needed to be narrowed down through refining relevant research areas. The process of narrowing the search into hits which would generate thesis-related literature continued by adding words such as *logistics, distribution, truckload, carrier, haulier, transport models* and *advanced truckload firms*. Synonyms to *transport planning* such as *traffic control* and *dispatching* have also been examined in the search for articles. Boolean operators such as AND, NOT along with OR were used to combine the different search words. An example of a search combinations are truckload + dispatching or haulier + transport planning. During the literature review it became evident that the U.S. scientific articles utilized the word dispatching more than the European. Therefore, in the end, increased searches were performed with the search word *dispatching*. The challenge lied in finding the articles in which are the most relevant. The author therefore developed an Excel-file in which articles were ranked after their relevance to the topic of the thesis.

According to Patel and Davidson (2011), scientific articles provide the latest information compared to books which take relatively long to publish. Other factors which were considered during analysing were the year of publication, times cited and the impact factor of the journal in which articles were published. Another way that the author found articles was by examining the papers which cited specific relevant articles. Additionally, the author performed back-tracking to find earlier relevant sources. The purpose of the paper and its related research questions were constantly in the mind of the author when deciding which articles are relevant or not. Therefore, the differences between how the U.S. hauliers and European hauliers plan their transports were of great importance during the review. Moreover, the transport models utilized by U.S. hauliers were thorough analyzed. Transport

models mean how the U.S. hauliers manage their fleets in order to increase utilization and to ensure returns to home domicile.

Consequently, the articles were narrowed down to 62 articles, dated between 1959 and 2014, which constitute the foundation of the literature review. Percentagewise 37% were published in the years of 2006, 2009 and 2013 which is illustrated in Figure 19. The same figure also showcases the distribution of different research approaches during the years. The literature has therefore been categorized into case studies, theoretical and mathematical. As a single approach, the theoretical category stands for the majority with 44%. However, the case studies supplemented with mathematical formulations stand for the largest uptake of space during the review of transport planning models with 56% which is visualized in Figure 18.

An initial insight showcased five different journals which are frequent in the literature review. These are *Transportation Research Part E: Logistics and Transportation Review, Transportation Science, European Journal of Operational Research*, *International Journal of Logistics Research and Applications* and *Transportation Journal*. These five journals constitute 45% out of the total 35 scientific journals. Moreover, the journal named *Transportation Research Part E: Logistics and Transportation Review* yields independently 18% of the total number of articles. Figure 20 illustrates the reviewed articles in remembrance of which journals they have been published in. Scientific articles written both in English and German have been obtained. However, the English linguistic scientific articles clearly stand for the majority with 97%. The year of publication of an article must not deter the author from utilizing it. The author believes that the literature review shall show how research in the field has developed in chronological order. Under heading *3. Literature review* a separate chapter is presented constituting the outcome of the literature review.

2.2 Multiple case study

2.2.1 Scope

A case study approach constitutes an empirical investigation which studies an authentic phenomenon in its actual context (Yin, 2008). This fits unreservedly the studied process of road freight transport planning since the study constitutes a comparison. The author needed to first-handedly understand the events within road freight transport planning in the two different markets. Additionally, a case study approach also helps the process of understanding a research area considered to be complex (Meredith, 1998).

A multiple case study approach has been utilized for the in-hand thesis. Three cases therefore form the foundation for the qualitative empirical data collection. The goal was to have three cases which were comparable despite the vast differences between the U.S. and European

road-freight market. Comparable means companies which are performing similar services regardless of the different markets (the U.S. and the European market). This ensures the comparability of 'apples-to-apples' and enables the author to extract useful differences and similarities. Yin (2003) confirms this argument by acknowledging the possibility to extract differences between cases when utilizing a multiple case study. Therefore, one U.S. and two European carriers, which are relatively dominating in their respective continents' market, were selected. Since the purpose is to improve European transport planning it was important to locate a U.S. carrier which possesses adequate technology, experience and tradition to encompass enriching information. The next step was to ensure access to the three organizations, as naturally suggested by Yin (2008).

In order to fully incorporate the understanding of how U.S. carriers execute their operations a company visit was desired. Werner Enterprises[1] (hereafter named Werner) drew the author's attention with its ability to proprietary handle 7,400 trucks and 24,000 trailers as well as to simultaneously invest in in-house developed technology. A proper channel of communication with Werner was granted by a U.S. supply chain consultant. Due to the allocation of resources needed from Werner a three day company visit was conferred. The author visited Werner in Omaha, Nebraska between the 20th to the 22th of April 2016. Figure 21 in the appendices presents the agenda given at Werner. Evidently, the schedule was intense and a large amount of information could be collected. The author was asked to send information about which department and positions desired to visit and interview. The agenda was presented on the first day of the company visit. However, as Yin (2008, 82) stipulates: "a good case study researcher needs to be flexible and be able to adapt … as well as having a clear picture of the studied research questions". Thereby, by drafting what Yin (2008, 92) calls a "case study protocol" prior to the visit it was possible to quickly adapt and focus on the most important information needed.

It is important to mention that the author has vast experience within European road-freight transport planning which permeates the study. It also affects the selection of DHL in Helsingborg to cover one of the European road-freight case studies. Well-defined understanding and contacts existed beforehand, yet from the perspective of working at a transport intermediary. Nevertheless, DHL is undoubtedly one of the dominating logistics companies in Europe with a long tradition of road-freight. Additionally, a DB Schenker haulier performing transports for DB Schenker as a partner was selected to properly showcase the inherent relations within the transport planning process.

[1] www.werner.com/content/about

2.2.2 Interviews

Interviews are goal-oriented, spotlighting the research questions (Yin, 2008) and grant the possibility for a rare but harmonious exchange (Czarniawska, 2014). Semi-structured interviews were chosen to customize the interview process. Firstly, more general questions were asked to later on be more pointed out into the direction of the research. This made it possible for the author to continue asking questions concerning a specific area in which interest for the study was generated during the interview. According to Patel and Davidson (2011) along with Bryman (2012), the questions may or may not come in a specific order. Referring back to what Yin (2008) explains regarding the ability by a researcher to be flexible, none of the interviews looked the same except the beforehand prepared interview guide. Patel and Davidson (2011) express the notion of both the interviewer and the interviewee being co-creators of a conversation in a qualitative interview. In order to co-create a fruitful conversation, the author had to be flexible and adapt to the nature of the interview.

After the author was granted access to examine the three cases, the next step was to discover departments and positions where answers to the research questions might be hidden. Key transport planning personnel were identified to incorporate the sufficient knowledge and experience to guarantee a rewarding outcome. Since the topic is regarding a comparison between the U.S. and Europe in reference to transport planning it was essential to interview key transport planning personnel from both the continents. The same interview guide was utilized for both the continents, in order to identify the differences easier.

As recommended by Bryman (2012) a pilot interview was prepared and executed to identify flaws in the interview guide and to practice. The pilot interview was performed with a retired and vastly experienced transport planner in Sweden lasting for 45 minutes. During the pilot interview it was possible to identify certain obstacles where the respondent interpreted a question differently than the author intended. The outcome was that the author was granted the possibility to simplify and revise the interview guide. The pilot interview was foremost done to prepare the author for the interviews with DHL and the DB Schenker haulier in Sweden.

The author sent the translated interview guide to a supply chain consultant in the U.S. Despite the fact that the questions were the same, it was foremost done to ensure that the terminology and the nature of the questions would 'fit' Werner. Bryman (2012) supports this by acknowledging the use of a language that is appropriate to the people you are interviewing. The author discussed frequently with the U.S. supply chain consultant prior to the company visit at Werner to be prepared. It is important to mention that the author had no practical experience of the U.S. road-freight processes, making the discussions with the U.S. supply chain consultant tremendously important.

All interviews were performed in a quiet and friendly environment where the interviewee felt comfortable. Table 1 presents the altogether 14 face-to-face interviews which were performed. The interviews with the transport planners at DHL and the DB Schenker haulier were recorded with a dictaphone and directly transcribed, as recommended by Trost (2010). The transcribed interviews were then sent to the respondents to enable the respondents to withdraw parts or from the study if necessary. However, both the respondents accepted the transcribed material and signed a consent form prior to the interview. Under heading *10.3 Consent form* the developed consent form is presented. Yet, the interviews with personnel from Werner were not recorded due to legal reasons. The author compensated this by taking an excessive amount of notes and by asking follow-up questions through e-mail afterwards.

Table 1: Interviews

Date	Company	Position	Duration (mins)
2016-03-18	DHL	Transport Planner [Respondent A]	74
2016-03-23	DHL	Transport Planner [Respondent B]	62
2016-04-20	Werner	Vice President of Recruiting	60
2016-04-20	Werner	Manager of Driver Relations	60
2016-04-21	Werner	Associate Vice President of Operations	60
2016-04-21	Werner	Vice President of Werner Global Logistics	45
2016-04-21	Werner	Manager of International Dray*****	60
2016-04-21	Werner	Associate Director International Operations	30
2016-04-21	Werner	International Air Expedite Supervisor*****	30
2016-04-21	Werner	Associate Director of ITS	45
2016-04-22	Werner	Vice President of Dedicated Services	60
2016-04-22	Werner	Director of Dedicated Services	30
2016-04-22	Werner	Operations Supervisor	30
2015-05-12	DB Schenker haulier	Transport Planner [Respondent C]	55

2.2.3 Shadowing

During the company visit at Werner the permission to shadow employees was granted. The reason why shadowing was utilized at the company visit was to better understand the operational transport planning. Also, to in an enhanced manner capture the processes involved in handling the excessive amount of activities involved in handling a large proprietary fleet. Table 2 below presents the shadowing performed**.** Shadowing creates a situation to maintain the position of outsidedness in comparison to participant observation

(Czarniawska, 2007, Czarniawska, 2014). This claim was a bit difficult to overcome, because the author did not exactly 'fit in'. The author did ask the company about the dresscode, to be able to 'fit in' better as recommended by (Czarniawska, 2014). Nevertheless, the author still stood out in the crowd due to the attention granted by the employees. However, the author encouraged the shadowed employees to perform their work as if no one was watching. The employees who were shadowed were naturally informed about the arrival of a Swedish master's student and interruptions occurred several times to discuss issues not related to the in-hand thesis. Therefore, Table 2 below presents the effective time spent shadowing different positions.

During the shadowing it was possible to follow the process from recruiting drivers all the way to dispatching a load. In addition, conversations during the shadowing were performed in order to understand why and how different activities were performed. Occasionally, the shadowed person would get phone calls and then the author was able to listen through another phone. Naturally, the persons calling were informed that someone else was listening. This brought an additional value to the shadowing, due to the fact that the author could analyze the way the shadowed employees handled arising issues. Additionally, the author did put effort into not being biased during the shadowing in order to gather objective data. The data collection during the process of shadowing was surrounded by the questions of *why* and *how* certain activities were performed.

Table 2: Shadowing

Date	Company	Position	Duration (mins)
2016-04-20	Werner	Student Driver Recruiter	30
2016-04-20	Werner	Experienced Driver Recruiter	30
2016-04-20	Werner	Driver Replacement Manager	30
2016-04-20	Werner	Driver Relations Manager	90
2016-04-21	Werner	Customer Service Manager	60
2016-04-21	Werner	Load Planner	60
2016-04-22	Werner	Account Manager	30
2016-04-22	Werner	Account Manager	30
2016-04-22	Werner	Training and Development Manager	60
2016-04-22	Werner	Safety Manager	30
2016-04-22	Werner	Fleet Manager	120

The reader might retort the fact that no shadowing were performed with DHL in Helsingborg. However, as mentioned before the author has vast experience of planning

transport in Europe. The author has been working for ten years first-handedly with road freight transport planning from an intermediary's viewpoint. Thereby, being able to work with several of the dominant logistics providers in Europe has equipped the author with extensive knowledge regarding the European road freight market and the process of transport planning. The process of transport planning at DHL in Helsingborg was excessively explained by the two very experienced transport planners. The same underlying reason determined the choice of not shadowing the transport planner at the DB Schenker haulier either.

2.2.4 Documents

During the part of reviewing relevant literature to create the theoretical foundation along with locating 'white spots' in research, the author came across the German professor named Peter Klaus. Similar research had been performed by professor Peter Klaus, but it was immensely difficult to get hold of the scientific articles written. The author therefore decided to contact professor Peter Klaus and fortunately a newly produced report was made available.

Professor Peter Klaus visited together with four German trucking industry members ten large truckload companies in the U.S. during November 2015. The report written afterwards was not intended for publication and therefore the author was granted the possibility to utilize the report as personal communication with professor Peter Klaus. The report enabled analysis of new information captured in a fairly unique and prosperous manner including several truckload companies.

Several of documents were received from Werner to better understand how processes and activities are performed. Since the author was not familiar with the utilized fleet management system, numerous documents were handed over to understand the communication with drivers along with navigation through the system. Publicly available documents regarding the CSA and how Werner handled the scores were also handed over. Different documents of working responsibilities for employees were also received. This created a better understanding of how and why different activities were utilized.

2.3 Data analysis

Conducive to the process of analyzing data, the author firstly began reviewing literature in the area of research. The purpose was to locate gaps in research and to create a sufficient foundation for the thesis to build on. The literature review naturally initiated and founded the construction of the theoretical framework. It also acts solely in a separate chapter to profoundly depict the nature of the field's research.

The theoretical preparation conducted by the author thereby created the basis for the interview questions. Issues brought up in the field's research needed to be compared between the U.S. and Europe regarding transport planning. Therefore, the same interview guide was utilized for the two different continents. This made it easier to extract the differences and similarities and differences as Eisenhardt (1989) explains. However, as visible in Table 1 above, two positions interviewed in the U.S. were not profoundly relevant to the aim of the thesis. The author therefore had to be pragmatic and utilize only the gathered data which would contribute to fulfilling the aim and answering the research questions. The two irrelevant interviews are marked with a * in Table 1. The empirical findings chapter is therefore circling around *the transport planning process, freight flow and empty positioning, drivers, planning parameters and measurements*. These four headings were developed before the first empirical data gathering and implicitly depict the differences between the continents. The empirical findings were also discussed with the supervisor in order to locate proper analysis material.

After the visit to the U.S., the author located gaps in the gathered empirical data in Europe and therefore the DB Schenker haulier was interviewed to strengthen the arguments. The author thereby located flaws which would harm the analysis of the material and by being flexible and humble it was possible to gather more data. During the analysis, the author also had to contact interviewees at Werner to ask follow up questions regarding certain segments.

The theoretical framework also needed to be complimented after gathering empirical data. This was noticed during the process of analyzing data. It was thereby important for the author not to act proud, but to acknowledge the flaws and instead enrich the thesis. Figure 2 visualizes the process of analyzing data in a comprehensive manner.

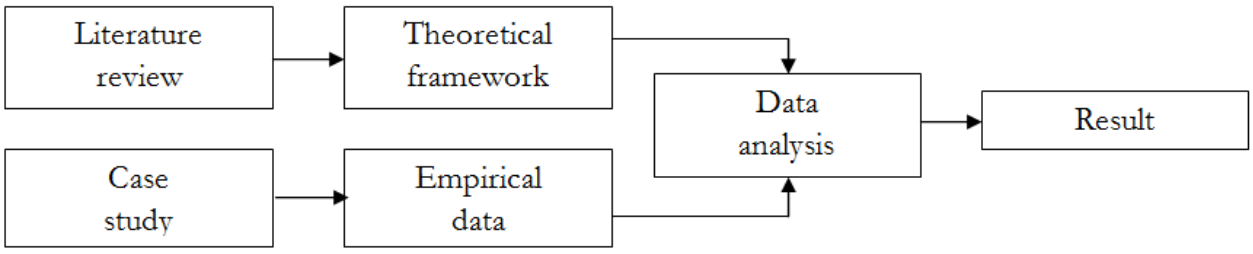

Figure 2: Data analysis

2.4 Critical evaluation

2.4.1 Validity

The internal validity means how well the result of the study presents the reality and the external validity aims towards if the result can be generalized on other cases (Bryman and Bell, 2011). The notion of validity permeated the whole research process and was constantly in the mind of the author. Furthermore, the data collection, data analysis and research design have been particularly important to conduct well-defined research.

The data collection followed certain prerequisites as depicted by presenting the continuous process. The interviews followed a systematic process of firstly conducting a pilot interview and to discuss it with an expert to ensure the capability of the interview guide. Additionally, all the interviews conducted in Sweden have been recorded and transcribed in order to ensure the presentation of the reality. The transcribed interviews were then sent to the respondents granting the possibility to ensure the correctness and the possibility to withdraw certain sensitive claims. Unfortunately, the author was not allowed to record the interviews at the company visit, due to legal reasons. As mentioned earlier, the author therefore took an excessive amount of notes instead and asked follow-up questions through e-mail afterwards.

However, the self-designed visualization of the transport planning process along with the planning and control has been secured to reflect the reality by the involved interviewee from all cases. The ability to analyze the document from Professor Peter Klaus granted the author the possibility to review observations conducted by an immensely experienced researcher in the area of research. This also increases the possibility to generalize the findings. Documents to understand the transport management system and the working responsibilities yielded by Werner were critically analyzed and created the foundation for further analysis and applicability. Literature has been gathered from scientific articles in journals with high impact factor and large amounts of quotations; ensuring the quality of the applied theory to the empirical findings.

2.4.2 Reliability

In order to create the prerequisite for another researcher to reproduce the same study it is essential to document the approach utilized (Yin, 2008). The author has therefore in-depth documented the scope of the case study along with the underlying reasons towards *why* and *how* certain cases and data collection tools were used. By providing the reader with the interview guide, in *10.2 Interview guide,* it increases the transparency and the applicability of a replicative study. The fact that the author utilized the same interview guide for the three different cases increases the notion of comparability, essentially reaching the purpose of the

in-hand thesis. Additionally, the author has provided an excessive extent in regard to the performed shadowing and efforts to reduce the risk of not blending in. Furthermore, the magnitude of the literature review has been described by visualizing search words and by giving the reader the opportunity to examine previous research. In the appendices, *10.1 Literature review* showcases what scientific journals where most of the literature have been collected. This in turn enables the researcher to inspect the relevance and to know where to explore. All the gathered information has been stored in a secure database, as recommended by Yin (2008).

2.4.3 Ethical considerations

The author considered ethical aspects prior, during and after the research. The author discussed and informed the interviewees regarding the topic and scope of the thesis before starting the interviews, as suggested by Silverman (2013). This granted the interviewees the possibility to either enter the study as respondents or decline participation. Naturally, the respondents were not forced into participating in the study and were aware of the possibility to withdraw transcribed information.

However, none of the respondents did choose to erase parts of the transcribed information, making the author believe that the information yielded was not an issue. The developed consent form provided the foundation for the respondents to enable quotations and also to withdraw information. All the respondents in Sweden did sign the consent form. Nevertheless, the author naturally respected the legal reasons formed by Werner and therefore did not record any of the interviews performed.

During the shadowing process at Werner, several phone calls were listened to. The shadowed person informed the person calling that an external part was listening to the conversation and had the opportunity to decline participation. However, none of the persons calling to the shadowed persons chose to decline the participation.

3. Literature review

The following chapter depicts the previous research conducted in the study's field of research. Firstly, the U.S. road-freight market is described followed by the European road freight market. The focus still lies on the two continents differences in accordance to transport planning. Thereafter, a review of best-practice transport planning efforts is presented. Lastly, a categorization of different transport planning parameters is presented in a table.

The previous knowledge around the in-hand thesis is considered to be limited. Only two similar studies have been found during the process of reviewing literature. These similar studies as the in-hand thesis have been conducted by the German logistics researchers Müller and Klaus (2009) along with Walther (2010). Walther (2010) completed his dissertation named '*Industrializing Transportation Networks: An Analysis and Evaluation of Alternative Approaches to Cargo Transport Services with Special Reference to the European Over-the-road Truckload Carrier Industry'*. However, the focus lies not strictly on the notion of transport planning but rather on the U.S. ATLF network model's applicability on the European network model and its differences. Transport planning fits undoubtedly within the network and Walther (2010) did examine alternative planning models. However, Walther (2010) also states that further research should enlarge the sample of carriers and cover other segments than only the German general freight TL carriers.

The following literature review aims to continue finding patterns in differences between the U.S. road-freight market and the European road-freight market when it comes to transport planning. Firstly, the literature on ATLFs in the U.S. is assessed followed by the European road-freight market. The last part is a review of best-practice transport planning which is relevant to the purpose, as the author aims towards improving European transport planning by analyzing the U.S. best-practice.

3.1 The U.S. road-freight market

This section aims to depict a comprehensive review about the success of the U.S. ATLFs. The differences from the American point-of-view began to form during the Motor Act of 1980 when the trucking industry in the U.S. got de-regulated. Several studies have been done about the effects from the de-regulation of the trucking industry in the U.S. (cf. Hirsch (1988), Keeler (1989) and Boyer (1993)). These studies merely focus on the economical change that followed the de-regulation and how it changed the labor environment for stakeholders involved. However, research in the U.S. about ATLFs has been conducted almost independently by a handful of researchers.

The substantial moderation of restrictions for carriers to enter new markets was the most significant outcome of the Motor Act of 1980 (Cambridge Systematics, 1997). The Regular Common Carrier Conference's (RCCC) forecasted that without any change during the Motor Act of 1980 it would cause the industry to only consist of three mega-carriers, which would harm the pricing levels and the environment (Corsi and Stowers, 1991) and that owner-operators would be 'driven off into the sunset' (Corsi and Grimm, 1989). This is not entirely the reality, but not very far from it either. Thus, a new terminology named Advanced Truckload Firms began to form in the North-American trucking industry. This group of truckload firms competes for long-haul traffic in high-density corridors with a pioneering approach focusing on customer service and reduced costs (Lane, 1987, Corsi and Grimm, 1989, Corsi and Scheraga, 1989, Corsi and Stowers, 1991, Rakowski et al., 1993). The notion of competing in high-density corridors provides the foundation for being able to efficiently dispatch trucks and serve customers.

Winston (1998) stated that the ATLFs have captured considerable traffic from firms that before the de-regulation performed their own transports. Corsi and Grimm (1987) along with Corsi and Stowers (1991) argued that mileage per truck for ATLFs increased by utilizing driver teams and having the trucks operating more hours. This was also exemplified by Corsi and Stowers (1991) who discovered that the utilization of a vehicle for a ATLF are 104,400 miles[2] per year and for an owner-operator firm it is 80,200 miles per year. This showcases a tremendous productivity difference between ATLFs and owner-operators. The group of ATLFs utilizes economies of scale with high volumes and out-competes owner-operators through e.g. by gaining discounts for insurances and when purchasing large quantities of trucks. According to Corsi and Stowers (1991) ATLFs found that their drivers who were not members of the union are better than owner-operators. By better it means more productive, safer and more dependable. Improved dispatching technology and a decrease in empty mileage compared to owner-operators also gave the ATLFs a large success (Corsi and Grimm, 1989). Improved dispatching technology means highly innovative and computerized planning, in which the degree of centralization is considered to be high.

Research concerning only the terminology of ATLFs has been conducted during the 1980s and 1990s. An obvious reason is due to the Motor Act of 1980 and after one or two decades it became so 'normal' that other issues within ATLFs were assessed instead. Even though the articles and terminology are quite old, ATLFs keep on making profit and increase their market share.

[2] 1 mile = 1,60934 kilometre

3.2 The European road-freight market

Throughout the 1980s and 1990s the international road transport in the European Union also got de-regulated. Lafontaine and Valeri (2009) examined the effects of the de-regulation in the European Union of international trucking. One of the findings which were not necessarily due to the de-regulation was that shippers in Europe for both international and national transports relied heavily on for-hire hauliers or so called sub-contractors. The European road transport sector is although highly fragmented with many layers of decisions and in need of a more integrated planning (Sternberg et al., 2013a). This statement is supported by Baumgartner and Léonardi (2004) who suggests that further research in the European road-freight sector should involve advanced technologies and an understanding about how the utilization of sub-contractors affects the efficiency. Andersen et al. (2009) argues that hauliers in Europe need to rely more on smarter planning, design and execution of operations in order to survive in such a competitive market.

In the fragmented truckload industry, there are possibilities to collaborate between shippers and hauliers in order to lower the costs (Ergun et al., 2007). Walther (2010) also suggested European hauliers to centralize planning to create better operations and make use of economies of scale. Additionally, if collaborative de-centralized planning, a joint pool of loads can be utilized (Walther, 2010). Lafontaine and Valeri (2009) composed evidence to as the de-regulation in the EU was as efficiency enhancing as in the U.S. However, the European Commission has acknowledged the need for more efficient road haulages in Europe to enhance industrial growth (European Commission, 2012). It is although clear that the ATLF-model has not been implemented in Europe yet, but Walther (2010) along with Müller and Klaus (2009) acknowledged no reason to why it cannot be with some adjustments. Walther (2010) names the European road-freight segment as of a 'craft-type' in need of an 'industrialization' approach which the ATLF model could provide.

The European TL segment is characterized by a highly fragmented market structure, thousands of carriers with similar service, low profit margins, which lead to a tough competition in the European TL market (Walther, 2010). Within the European road-freight market, thousands of drivers are living in their trucks which automatically cost allowances. It is hereby possible to acknowledge the need for a new assessment of how the ATLF's planning models can be utilized in the European road-freight market.

3.3 Best-practice transport planning

The notion of transport planning has been an endless process of concern for researchers. Dantzig and Ramser (1959) began formulating an optimal planning instruction through

acknowledging the shortest route for gasoline delivery trucks. The shortest route was formulated through a generalization of the traveling-salesman problem. Dantzig and Ramser (1959) also implicated that if the dispatching problem would be handled in this way it would void the need for daily computation of dispatching plans. It was although assumed that every point of delivery had a fixed demand and had to be delivered in one delivery. The process of planning and dispatching trucks has although developed significantly and more complex models dealing with more factors than only the shortest route have been invented. One of these models was developed by Braekers et al. (2013) who continued with the traveling-salesman problem to deal with empty container movements. Both an integrated and a sequential approach were examined, where the integrated approach was the one performing the best (Braekers et al., 2013).

Case studies in the field of transport planning illustrate different manners of complying with high-density freight corridors. The researcher called Taylor G. D., has conducted many studies related to efficient dispatching and transport planning in the U.S. Driver retention is a seemingly large issue for American hauliers and is usually solved through keeping drivers close to their home domicile (Taylor et al., 1999, Taylor et al., 2001, Taylor et al., 2006, Taylor et al., 2009, Vergara and Root, 2013). Several mathematical models have been developed during the years in order to optimize transport planning. A company which is frequently mentioned in the literature is an American truckload company named J. B. Hunt. It can definitely be argued that J. B. Hunt is considered to be within the ATLF-segment, which is supported by Walther (2010) as well as Corsi and Stowers (1991). Six different case studies collaborating with J. B. Hunt have been found during the literature review. In order to improve European transport planning, it is to the author's best interest to analyze transport models that are utilized by the ATLFs.

Taha et al. (1996) developed a simulation system to evaluate hub-and-spoke transportation networks. The simulation system was both tested in industrial and academic settings. The results showcased reduced driver tour lengths, but at the cost of circuity and first dispatch empty miles (Taha et al., 1996). However, Taha et al. (1996) suggested that only limited implementation of the hub-and-spoke network should be implemented in order to function optimally. Taylor et al. (1999) strained in their paper the development of regularly scheduled delivery capacity by utilizing lanes, zones and hubs. The overall focus of the paper was to improve driver retention and customer service. In fact, by improving dispatching operations and convert over-the-road (OTR) operations to regional. Data was supplied by J. B. Hunt and analyzed through experiments and discrete event simulation. Drivers converted to the lane and zone system have a lower turnover rate than ordinary OTR drivers (Taylor et al., 1999). Measures to evaluate the performance are categorized into key service provider metrics, key driver job quality metrics, key customer service metrics and secondary

performance metrics (Taylor et al., 1999). Mason and Lalwani (2006) developed two transport key performance indicators, divided into sustainable distribution and overall vehicle effectiveness. The transport planning process undoubtedly affects these key performance indicators. By using measurements to evaluate the performance of a system it is possible to understand its influence.

Taylor et al. (2001) further developed the dispatching operations into multi-zone truckload trucking. The planning of trucks was designed to examine five different zones and 23 hubs with balanced freight flow as the baseline scenario. Exploiting a balanced freight flow is essential when developing zone and hub systems for transport planning. Several scenarios were simulated and it is evident that the minimal imbalance scenario is the most effective (Taylor et al., 2001). Once again, retaining drivers is concerned as a major barrier for the trucking business. Operating with multi-zone systems and being able to balance the freight better can result in an easier way to retain drivers and improve the recruiting of drivers (Taylor et al., 2001). Another factor which was examined is circuity (out-of-route miles) (Taylor et al., 1999). Planning transports which would increase the 'straightness' are considered more efficient. Taylor et al. (2006) continued to stress the importance of driver retention in the research about regional fleet design. Although, by utilizing a regional fleet design it would most likely not result in wages large enough for regional drivers compared to OTR drivers. Drivers who spend more time at home and have more frequent returns to their domicile are then likely to stay at the trucking company. Taylor et al. (2006) suggest additional activity-based pay to compensate for the decrease in mileage. Service areas for a region should not exceed 300 miles in radius. The region is then considered to be encompassed to ensure drivers frequent returns to their home domicile.

Taylor et al. (2009) researched the implementation of utilizing 'pipelines' in truckload trucking. The notion lies in using high-density freight flow delivery highways. Loads with less circuity will be handled on the 'pipeline' which would not be longer than 1/2 or 1-day in distance. The underlying reason is again to keep the drivers close to their domicile. Results showed in fact that more than 22% of J. B. Hunt's loads could be moved to 'pipeline' deliveries. It is important to emphasize balanced freight flow in order to utilize the 'pipelines'. Vergara and Root (2013) proposed ways of dispatching and a relay network design in order to lessen total transportation and set-up costs for mixed fleets. The model is formed through a mathematical formulation and combines transports from source to destination with the use of relay points. By utilizing relay points it is possible for drivers to exchange trailers and thereby return to their home domicile more often.

Tjokroamidjojo et al. (2006) strained the importance of assessing the usage of advance load information in truckload trucking. The whole concept origins from the idea that the shipper should provide advance load information to the hauliers in order to enable pre-planning. By

enabling pre-planning, the drivers would know what to do in advance, thus lowering the idling times and consequently benefit their job satisfaction. Incentives to make the shippers reveal advance load information to the hauliers' planners can be utilized through using the minimum cost difference between pre-planning and dispatching by looking forward (Tjokroamidjojo et al., 2006). Advance load information would assist in what Krajewska and Kopfer (2009) presented as the integrated planning problem with an own fleet of trucks and the complex situation of utilizing subcontractors. It could be seen that utilizing both an own fleet and subcontractors would decrease costs significantly. Advance load information makes it easier to decide what will be subcontracted or handled by the own fleet. This brings an interesting factor to the development of ATLFs and the European way of operating. ATLFs exercise large fleets of own trucks with some owner-operators, at the same time as European shippers utilize many subcontractors with many layers of decision.

Powell et al. (2002) summarized the issues which arose when implementing a real-time planning system to assign drivers to loads. An optimization model was developed which assigned drivers and loads, but it did not reflect on the imbalance of empty trailers. When state-of-the-art planning systems are available, how come they are not used? Why are the recommendations not followed? These are some of the questions which Powell et al. (2002) were trying to answer. An eye-opening rationale to why implementations did not result in the planned manner was actually due to lack of information. The transport planner had information that the system did not have, and vice versa. Despite the fact that the article is relatively old, these discrepancies have to be undertaken today as well. In summary, it exist a strong need for an integrated planning system which incorporates all the needed information and that transport planners actually use it. Crainic et al. (2009) found that many optimization-based systems are built to 'help' than to actually 'decide', which is regarded as an element in the issues of already built models. Furthermore, Crainic et al. (2009) also discovered that much information was stored in the dispatchers' brains and it is important to find a way to make the interaction between human and system better.

3.4 Concluding discussion

The literature review clearly verifies differences between how the U.S. hauliers plan their transport compared to the European hauliers. The European hauliers merely utilize the 'craft-type' and the U.S. hauliers have applied a more 'industrialized' manner as Walther (2010) explains. The European road-freight market is more fragmented with many layers of decision as compared to the more centralized ATLF compliance. It is evident that most of the research in transport planning in the U.S. aims to counter-act the large truck driver turn-over rate. It is solved by keeping the drivers close to their home domicile. This showcases a great potential for the European road-freight hauliers as well, due to the expensive

allowances in which need to be paid for drivers living in their trucks. Mathematical models with zones, hubs, 'pipelines', relays and regions have been developed to streamline the dispatching processes. However, the driver retention issue is not a parameter that has been fully researched in Europe. Thereby it can be concluded that it is not a big of an issue. It is evident that a large amount of different ways to improve transport planning has been researched. New and previous issues rise to the surface and need to be handled. Transport planning systems are not utilized in the intended nor optimal manner. Another important issue identified is the notion of balanced freight flow, which enables the ATLFs to operate in such a manner. Another discussion point is the exploitation of driver teams and the sectioning between OTRs and regional drivers.

Table 3 presents categorized parameters between the approaches named lanes, regional or zone, hub and exchange points to provide an overview.

Table 3: Categorized planning parameters

Parameters	**Free flow or PTP**	**Lane or 'pipeline' approach**	**Regional or zone approach**	**Hub approach**	**Exchange points approach**
Driver turnover	Driver turnover for OTR-drivers are large (Taylor et al., 1999, Taylor et al., 2001, Taylor et al., 2006)	Reduces driver turnover (Taylor et al., 1999, Taylor et al., 2009)	Reduces driver turnover (Taylor et al., 1999, Taylor et al., 2006)	Decreased driver tour length would imply lower driver turnover (Taha et al., 1996)	Offers an opportunity to decrease driver turnover (Vergara and Root, 2013)
Vehicle utilization		Offers the possibility to increase vehicle utilization (Taylor et al., 1999, Taylor et al., 2009)	High equipment utilization (Taylor et al., 2001)		Initiative to increase vehicle utilization (Vergara and Root, 2013)
Driver utilization		Utilize maximum by having ½-1 day trips (Taylor et al., 2009)	High driver utilization (Taylor et al., 2001)		Initiative to increase driver utilization (Vergara and Root, 2013)

Circuity		Close to no circuity (Taylor et al., 2009)	Smaller level than the hub approach (Taylor et al., 1999)	Too few hubs leads to more circuity miles (Taha et al., 1996, Taylor et al., 1999)	Increased circuity with less RPs (Vergara and Root, 2013)
Balanced freight flow		Balanced freight flow in order to work (Taylor et al., 2009)	Minimum imbalance scenario performs best (Taylor et al., 2001)		
Advantages		Tour length reduction by using lanes, positive effect on driver retention (Taylor et al., 1999) Reduced transit times compared to OTR (Taylor et al., 1999) Draymen and linehaul drivers will have frequent returns home (Taylor et al., 2009) Seems to perform well even during seasonal varieties (Taylor et al., 2009)	Possible to use traditional dispatching methods (minimize empty movements). Close to their domicile. Know the geographical area well (Taylor et al., 2001) No need for 'drop and swap' locations (Taylor et al., 2006) One load, one driver (Taylor et al., 2006) Leaves the truck well positioned for next load (Taylor et al., 1999) Loads left for OTR-drivers tend to be long-hauls. The regional fleet rather helps the OTR-fleet (Taylor et al., 2006)	Savings in terms of driver tour length is possible (Taha et al., 1996, Taylor et al., 1999)	No physical hub where truckloads are handled is needed. Just a location to switch trailers or containers at. (Vergara and Root, 2013)

Disadvantages	More dependent on driver regulations (Taylor et al., 1999) Loads have to idle due to driver regulations (Taylor et al., 1999)	Need to 'build in' enough slack for next dispatch. The 'pipeline' can't support every load and driver. Might negatively affect the remaining OTR-fleet. Mostly beneficial for large companies than for smaller ones. (Taylor et al., 2009)	Must match inbound and outbound freight flow (adds transit time). Requires additional IT-systems to handle 'drop and swap'. Cost associated with 'drop and swap' locations (Taylor et al., 2001) Not every driver can be a regional driver. Might need some incentives for drivers to switch from OTR to regional (question of money) (Taylor et al., 2006)	Less miles per day per driver, circuity and first dispatch empty miles (Taha et al., 1996, Taylor et al., 1999) Underutilized hubs are common (Taylor et al., 2001)	You cannot move goods in or out of a trailer at a relay point.
Driver vehicle coupling	Driver bound to vehicle and vice versa	Driver bound to lane or pipeline. Exchange with draymen.	Exchange at border of region or zone.	Exchange at hub.	Exchange across relay network at relay points.
Driver depot coupling	Not bound, but returns home after 'enough' time	Driver bound to lane or 'pipeline'	Bound to region or zone.	Bound close to hubs which are close to home domicile.	Utilizes relay points to exchange and return home.

4. Theoretical framework

The literature review showcases a tremendous point of improvement for European transport planning. First of all, the notion of transport planning will be examined followed by principles involved in truckload trucking. Moreover, relevant transport models will be presented in-depth.

4.1 Transport planning

Crainic and Laporte (1997) identified issues in transport planning and presented it using the three classical decision-making levels: strategic, tactic and operational. Many different scientific articles in the field of transport planning base their research on these three decision-making levels (cf. Grünert and Sebastian (2000) and Li et al. (2007)) The following sector explains these decision-making levels by Crainic and Laporte (1997) in-depth:

Strategic planning undertakes the notion consisting of i.e. the position of logistics facilities and the design of physical networks. Decisions concerning the strategic planning are often of long-time horizons and require large monetary investments. Typically, the government, consultants and international shippers mull over these levels of decision. The top level of management is normally involved in the decision-making due to the large monetary investments and the long-term impact. The strategic decisions also determine general progress policies and form the operating strategies of the network. The strategic planning concerns levels of international, national and regional where many carriers are considered. (Crainic and Laporte, 1997)

Contrary, the tactical planning is more of a mid-term horizon character. It aims to allocate and efficiently handle the existing resources to enhance the performance of the complete system. Tactical planning concerns not only the existing resources, but also route choice, what service to perform, work share between terminals, repositioning of i.e. empty trailers and the share by trade-offs between operating costs and service performance. The tactical planning also incorporates the transportation plan which determines the day-to-day work for a haulier. (Crainic and Laporte, 1997)

Finally, the operational planning affects the short-term time horizon. Local management performs activities within the operational planning, such as dispatchers and terminal employees. The working environment is highly dynamic and therefore the time aspect is critical to the performance. Dispatchers are thereby directly responsible for the operational performance in real-time. Important operational decision concerns adequate dispatching of trucks, maintenance and arrangement of services. (Crainic and Laporte, 1997)

Figure 3 illustrates a summary of the different planning levels as a support to the theoretical framework.

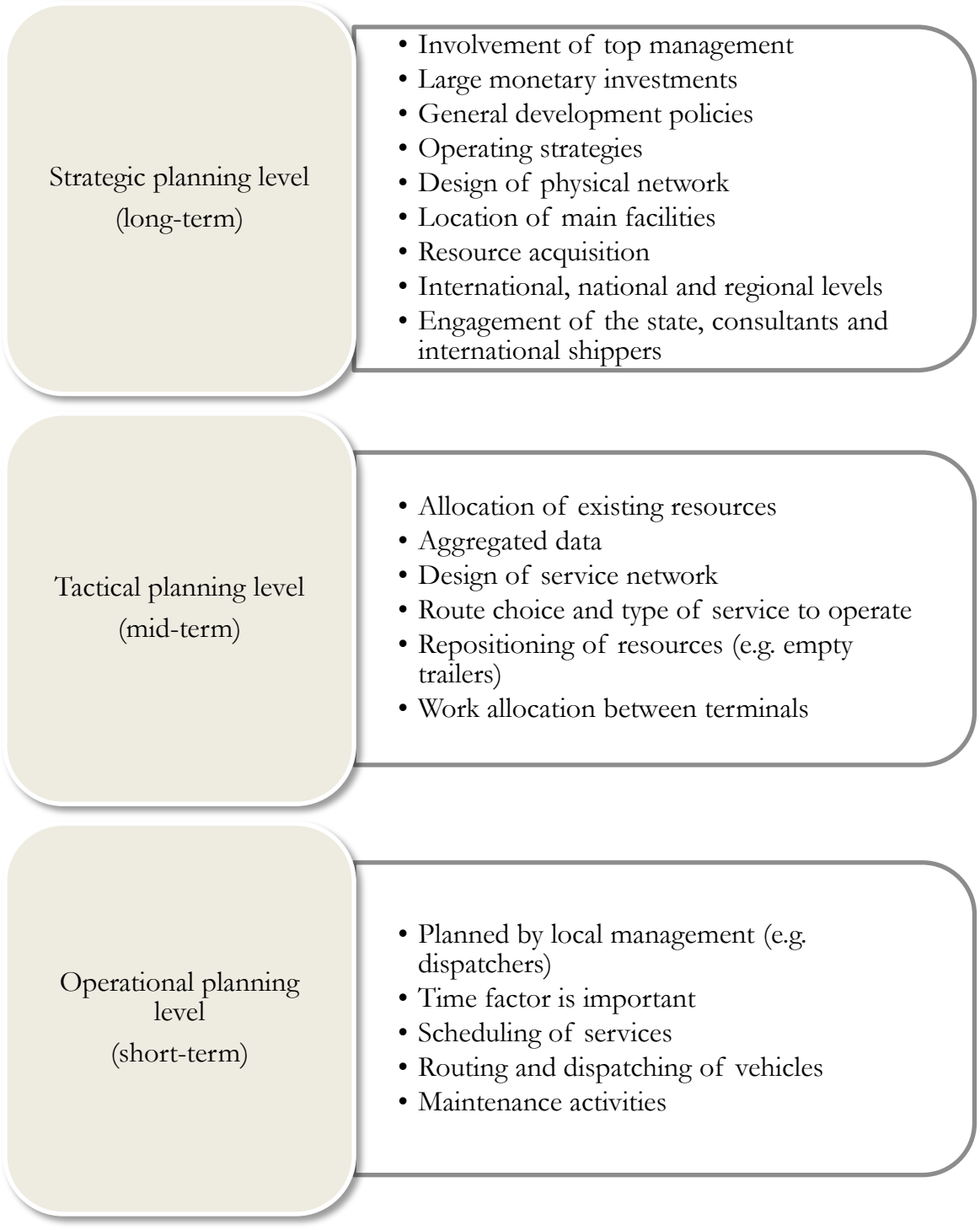

Figure 3: The three planning levels, adapted from Crainic and Laporte (1997)

The following continuation further explains the operational planning level in depth as it serves the core of the in-hand thesis. Crainic and Laporte (1997) continued to describe issues in regards to the operational planning level.

The first one describes the issues relating to *scheduling of services*. The tactical plan can offer services that can be performed over a planning period or by schedules (Crainic and Laporte, 1997). Schedules can be fixed or it can be deliveries within a certain timeframe (e.g. 6-10 pm). Road freight are considered to be handled with both fixed and interval deliveries (Powell et al., 1995). The service level is hardly surprising affected by how the transport is performed (Ambrosino and Scutella, 2005).

Empty vehicle distribution or repositioning is vital to a firms enduring processes (Crainic and Laporte, 1997). It is although a non-revenue generating activity and there is a need to reduce it (Braekers et al., 2013). The differences in supply and demand can be realized when i.e. some terminals have many vehicles at one point, while other terminals face shortages (Crainic and Laporte, 1997). McKinnon and Ge (2006) stressed the importance of considering factors constraining the 'backloading' of trucks. The factors are then the priority of outbound deliveries, unreliability of collection and delivery operations, not enough knowledge of available loads, lack of co-ordination between purchasing and logistics departments, incompatibility of vehicles and products along with resource constraints (McKinnon and Ge, 2006). Dejax and Crainic (1987) defined four different problem criteria in regard to empty flows namely type of flow, transportation mode, fleet homogeneity and type of company. The type of flow considers the flow of empty and loaded arrangements. The choice of transportation mode considers which transportation mode to utilize and if you should use more than one mode (multimodal). The issue of fleet homogeneity realizes the treating of either a homogenous fleet or one with many different vehicles. Lastly, the type of company specifies i.e. if the company owns or hires their trucks and what is transported.

Crew scheduling deals with the assignment of employees to trucks, maintenance or terminals (Crainic and Laporte, 1997). According to Crainic and Roy (1992), at a certain point in time many different routes and drivers are available. They therefore proposed a 'set coverage', which would ease the assignment of drivers to routes. The 'set coverage' inhibits segment generation (segmentation of services), route generation (set of legal efficient routes) and route selection (optimal regular sets of routes) (Crainic and Roy, 1992).

Allocation of resources handles the distribution of empty vehicles to the right terminals or hubs, moving trucks to maintenance, returning trailers from customers to terminals, etc (Crainic and Laporte, 1997). According to Frantzeskakis and Powell (1990), the vehicle allocation problem occurs when one carrier has to handle a fleet of vehicles over a planning period to maximize profits.

On the operational level, the focus lays on *when* something occurs rather than *how* and *where* as on the tactical planning level (Crainic and Laporte, 1997).

4.2 The transportation and logistics network

Figure 4 presents the collaborative logistics management model developed by Stefansson (2004). The carriers point the most interest concerning the in-hand thesis. According to Stefansson (2004), carriers typically perform point-to-point FTL transportation or LTL services in a pre-determined delivery route.

Stefansson (2006) continued to describe services performed by carriers such as inbound and outbound transportation, door-to-door transportation and contract deliveries. Demonstrably, the carrier fits in the middle between the shipper and the receiver with contact to LSPs. Both information flow and material flow undergoes these different parts of the network. According to Stefansson (2006), the carriers often own a major part of their resources and are considered to be asset-based operators. Sink et al. (1996) categorized activities within transportation to consist of shipping, forwarding, (de)consolidation, contract delivery, freight billing, household goods relocation, load tendering and brokerage. Stefansson (2006) added administrative activities such as transport scheduling, tracking and tracing along with delivery performance tools.

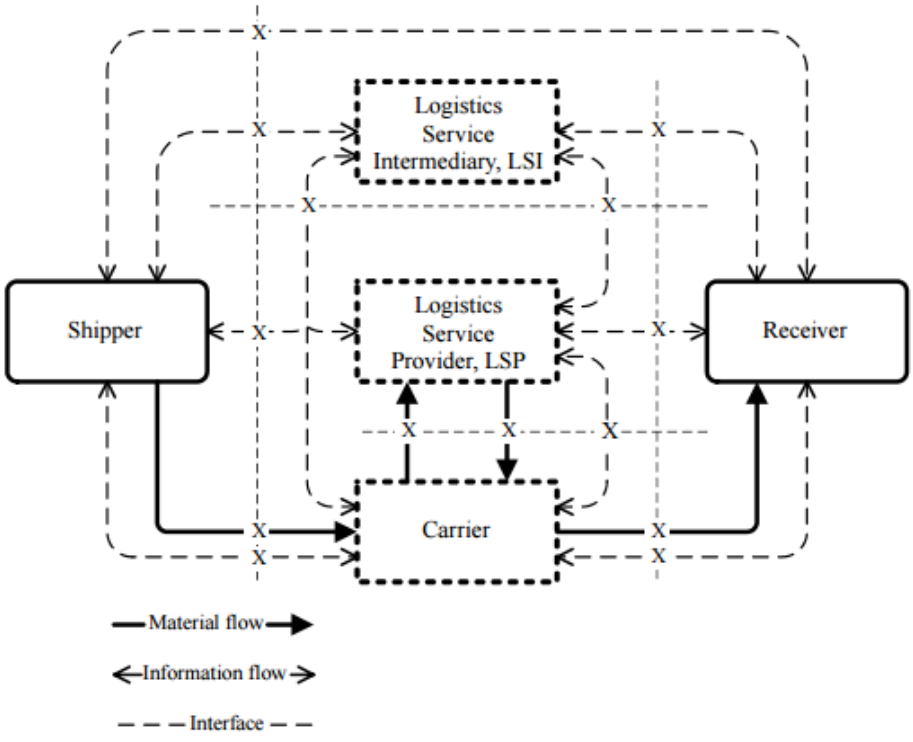

Figure 4: The Collaborative Logistics Management model (Stefansson, 2004, 255)

Figure 5 presents the model named 'customization of third-party services' developed by Stefansson (2006). Evidently, carriers perform in a narrow scope of services and utilize a low degree of customization. According to Stefansson (2006), carriers offer customized services to some degree, but the already mentioned ones are the classical ones. The degree of customization is usually determined by the size of the company, due to its ability to overtake the transportation network (Stefansson, 2006). The overtaking of the transportation network can be described by for example the capability of doing cross-docking, merge-in-transit or by running terminals. By doing so, there is a possibility to increase the companies' share in the transportation network (Stefansson, 2006). Woxenius and Sjöstedt (2003) state that hauliers take a stronger position in the domestic transports and have the possibility to outsource when more money can be made.

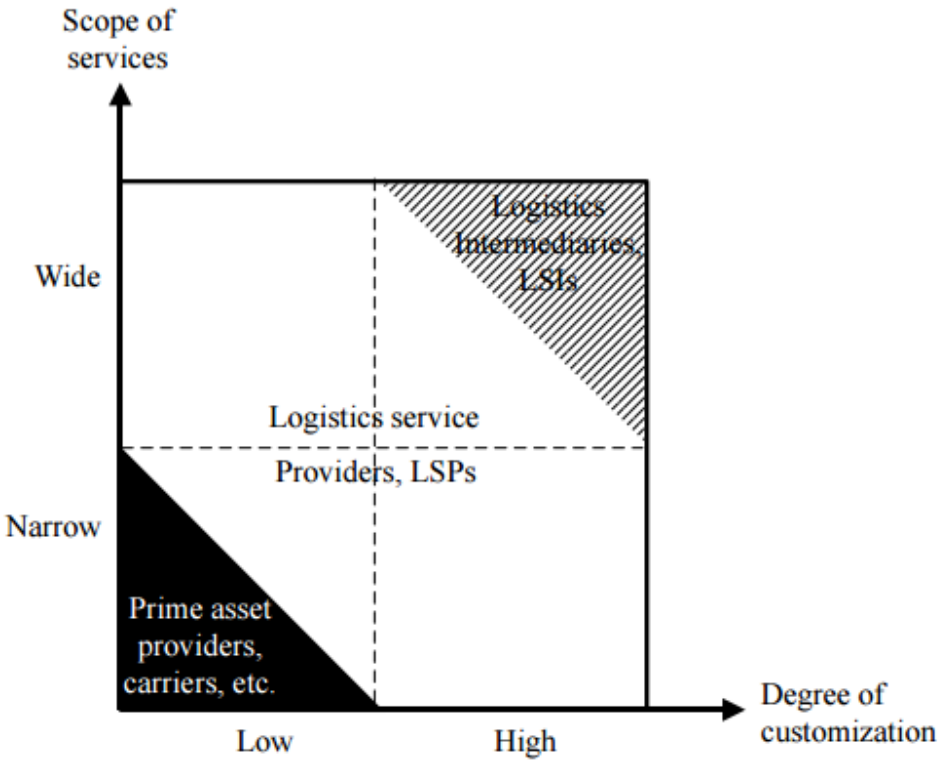

Figure 5: Customization of third-party services (Stefansson, 2006, 89)

Sternberg et al. (2013a) discovered that hauliers' vehicles utilized in road freight transports usually pertain to small fleets which leads to fragmented control and planning of road freight transports. Sternberg et al. (2013a) also complemented the traditional network by Bask (2001) and developed a new framework for transport planning and control. Sternberg et al. (2013a) took the three dyadic relationships between buyer-seller-haulier and presented two different constellations within the haulier.

The two constellations are named simple constellation and complex constellation. The simple constellation can be exemplified by a more centralized control. The fleet is of a homogenous and proprietary character with own employed drivers. The transport planning and control is then considered to be handled internally. However, the complex constellation visualizes more relations and more actors. For example, a haulier might utilize subcontractors which use their own fleet and drivers. Another part in the model showcases that the proprietary fleet might be leased and therefore not entirely owned. A haulier might cooperate with another actor and plan and control transport in a cooperative manner. This adds to the complexity by having to acknowledge a partner fleet. (Sternberg et al., 2013a)

Figure 6 presents the extended framework contributed by the author from incorporating the models from Stefansson (2004), Stefansson (2006) and Sternberg et al. (2013a). The framework showcases an extension of the carrier and its constellations. The relations between the involved actors stay in its unified form, however, extended by the simple constellation and the complex constellation. This extension contributes to the reader by providing the anticipation of how the carrier is positioned along with its relations. It also further inhibits the relations of LSIs and LSPs, from only inhibiting the buyer, seller and haulier.

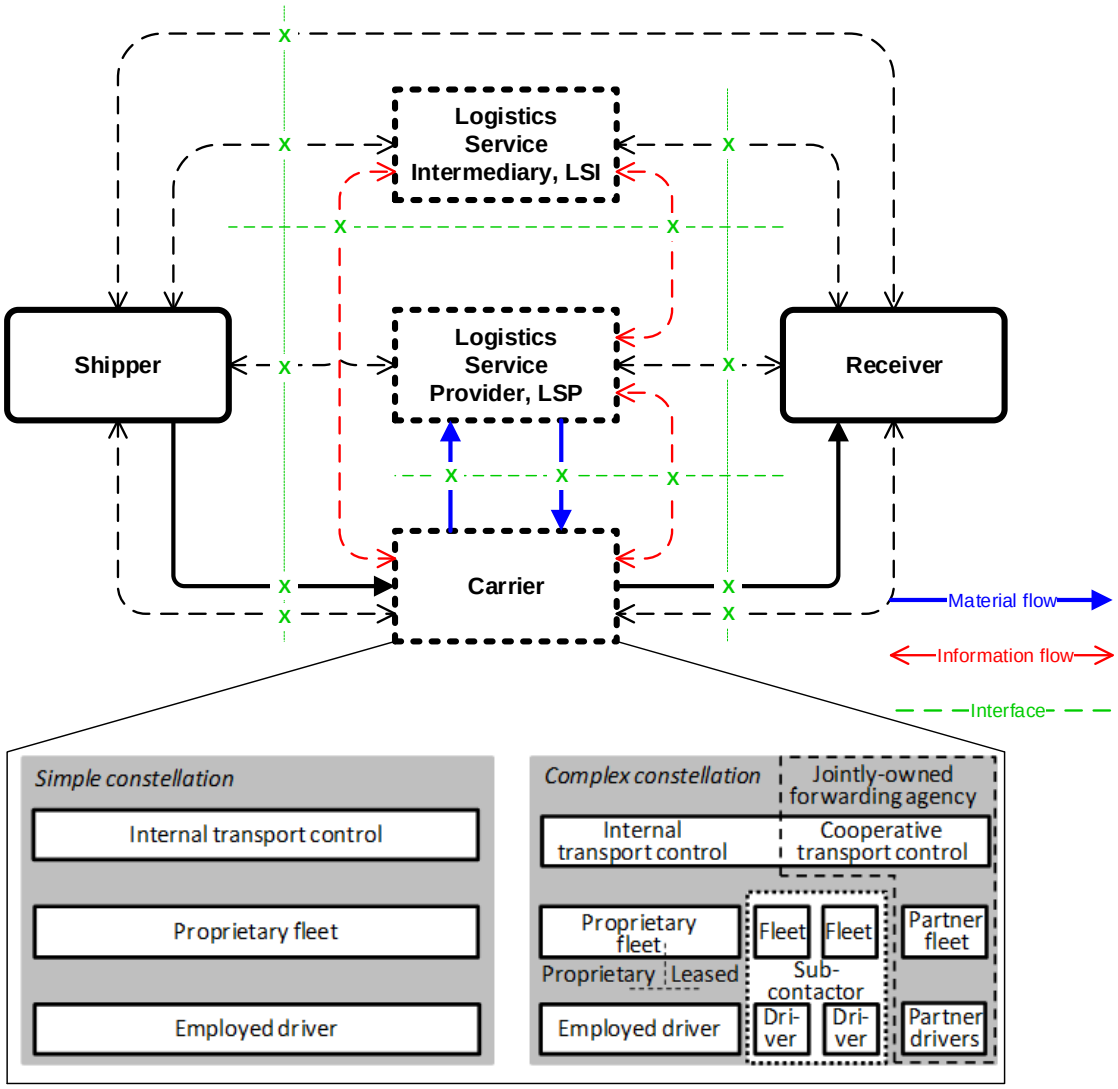

Figure 6: Extended framework for transport planning and control, by the author (based on Stefansson (2004), Stefansson (2006) and Sternberg et al. (2013a))

Figure 7 presents an uncertainty logistics model developed by Sanchez Rodrigues et al. (2008). It utilizes the logistics triad model from both Beier (1989) and Bask (2001). The model clearly showcases the complexity for where a carrier is located. Sanchez Rodrigues et al. (2008) extended the model to incorporate the transport perspective with the sources of shipper, carrier, customer, control systems and external. Uncertainty for the carrier can be injected both directly and indirectly (Sanchez Rodrigues et al., 2008). As depicted in the model, human resources and finance are considered to indirectly relate to transport operations. Moreover, the direct relations are categorized into scheduling and routing, transport fleet management, transport process, transport network management and finance.

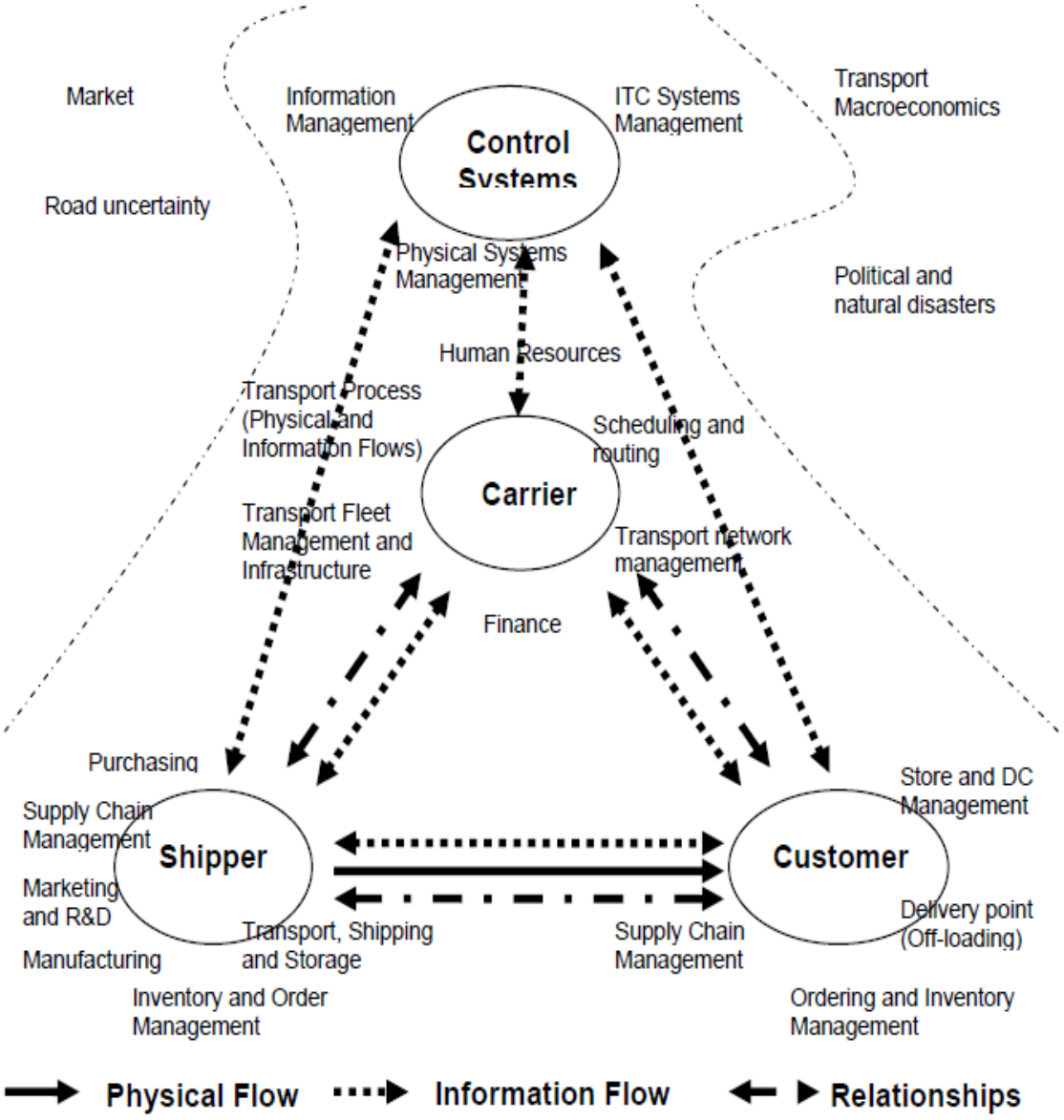

Figure 7: Uncertainty Logistics Triad Model (Sanchez-Rodrigues et al., 2008, 4)

Uncertainty in scheduling and routing can be exemplified by e.g. that visibility in requirements and shipments may be lacking for transport schedules, thus creating a risk of utilizing the wrong mode of transport (Christopher and Lee, 2004). According to Fowkes et al. (2004) badly performed transport scheduling can result in delays affecting e.g. driving time regulations and random arrival times.

Esper and Williams (2003) exemplify uncertainty for transport fleet management in capacity utilization by acknowledging the risk of producing empty miles between inbound and outbound destinations. Another reason of uncertainty in the transport fleet management is

according to Morash and Clinton (1997), the absence of flexibility in terms of delivery frequency, time, location and product.

The next categorized relation is the transport process, which considers both the physical flow and the information flow. According to Mason et al. (2003) along with McKinnon and Ge (2004) the transport process can encounter delays due to faulty vehicles or an absence of drivers. This is directly related to uncertainty within the transport process. Furthermore, Mason et al. (2003) strain the need for information about the position of trucks and drivers. A lack of information can lead to less visibility downstream towards the customer and delay the transport process (Mason et al., 2003).

In regards to transport network management, Choy et al. (2006) along with Naim et al. (2006) stipulated the need for information sharing between carriers especially when different transport modes are utilized; otherwise collaboration and integration issues may arise. Naim et al. (2006) also stated that transport needs to be performed in a holistic and collaborative manner.

Noteworthy, Sanchez Rodrigues et al. (2008) put cost as reason to uncertainty and Hoffman (2006) states that low margins can increase the uncertainty.

4.3 Industrial network approach

The underlying logic behind the industrial network approach is that the firm is dependent on resources monitored by another company (Skjoett-Larsen, 2000). Sternberg et al. (2013a) utilized this approach in order to understand and depict the structures of control within the transport network for different firms.

Dubois and Gadde (2002) discovered that when assessing control in supply chains, three components are analyzed:

- Activities, e.g. the activities performed in a transport planning process
- Resources, e.g. resources utilized by the company owning it
- Actors, e.g. the involved actors in the process

Thus, the industrial network approach is useful in order to depict the structures of control and planning within a transport network. Therefore, the industrial network approach will be utilized to present the different transport firms in regard to control and planning.

4.4 Transport planning models

4.4.1 'Pipeline' or lane dispatching

A 'pipeline' or lane is utilized for deliveries where a reasonable volume and balance is at hand (Taylor et al., 1997, Taylor et al., 1999, Taylor et al., 2009). Restricting drivers to lanes automatically shortens the tour-length of a delivery, hence improves the life quality of a driver (Taylor et al., 1999). Although, it is important to remember that utilizing a lane increases the load circuity in comparison to point-to-point deliveries. Taylor et al. (1999) experimented with data from a truckload company and compared lanes to point-to-point deliveries as a baseline scenario. They found that reasonable lane involvement reduced delays, but reduces miles per day per driver as well. Taylor et al. (2009) discovered that a 'pipeline' should not exceed ½ - 1 day of a one-way delivery. The underlying reason is to ensure the driver of returning to his or her home domicile every day or every second day. The 'pipeline' can be seen as the trucking counterpart of the railway share of an intermodal delivery (Taylor et al., 2009). Figure 8 presents the overall idea of how a 'pipeline' can be used. Some drivers can then be positioned as draymen and some as line-haul drivers. Draymen are then positioned close to their home domicile and the line-haul drivers would live in either end of the 'pipeline'. Taylor et al. (2009) explain two differences between 'pipelines' and lanes. Lanes supply small service areas and exploits only one driver per load. However, the 'pipeline' utilizes one line-haul driver and two draymen (Taylor et al., 2009). It is important to emphasize the load circuity, as loads used in the 'pipeline' cannot have too much of it. In the case of Taylor et al. (2009), 50 out-of-route miles have been set as a limit for loads carried through the 'pipeline'. Time-critical loads shall not be used in the 'pipeline' as the loads will need three diverse dispatches.

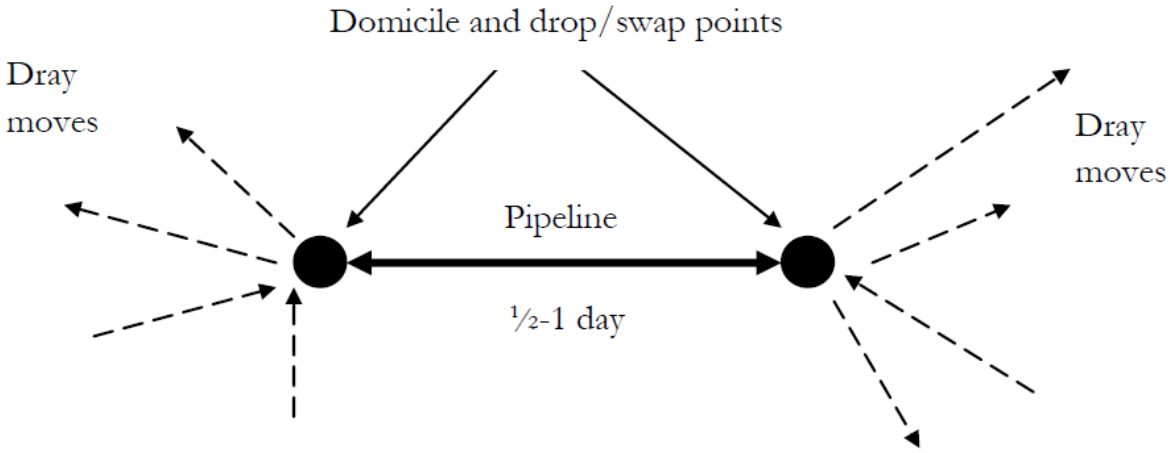

Figure 8: 'Pipeline' operations, adapted from Taylor et al. (2009)

4.4.2 Zone and regional fleet dispatching

Taylor et al. (2001) strain the importance of not just recognizing the favorability for carriers and customers when it comes to dispatching, but to acknowledge the drivers as well. Excessive tour-lengths have to be reconsidered and Taylor et al. (1999) along with Taylor et al. (2001) suggest a promising way of dispatching by zoning deliveries. Zone dispatching origins from the idea of letting drivers deliver loads from within their zone, to drop off loads at the boundary hubs or terminals of the zone and to collect loads for deliveries inside their zone (Taylor et al., 2001). Figure 9 showcases the differences between point to point deliveries and zone dispatching. Instead of utilizing point to point deliveries and go from O-1 (origin 1) to D-1 (destination 1) it is possible to deliver a load at the zone boundary and have another driver complete it. In this way, the drivers can still stay within their zone and close to their home domicile. Drop offs at zone boundary hubs puts the driver in a good position for the next delivery (Taylor et al., 1999). Taylor et al. (1999) also found in their case study that their zone model encountered less first dispatch empty miles, used less drivers and fewer late hours compared to other dispatching methods. Furthermore, Taylor et al. (2006) developed a new dispatch system which involved the notion of regional fleets. Regional drivers are performing transports within a closely assessed area. In contrast to zones and hub systems, no 'drop and swap' locations would be needed and the notion of keeping one driver to one load will be kept (Taylor et al., 2006).

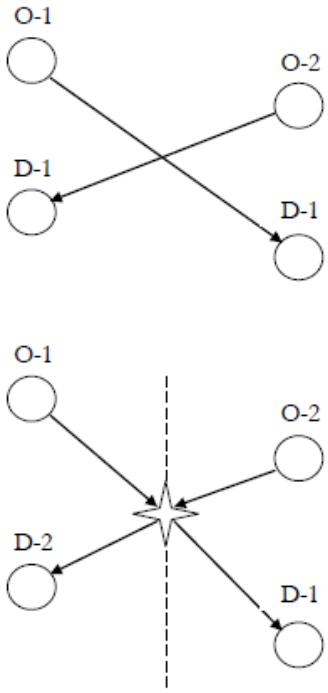

Figure 9: Point to point dispatching vs. zone dispatching, adapted from Taylor et al. (2001)

4.4.3 Hub approach

Alumur and Kara (2008, 1) define hubs as the following citation: "special facilities that serve as switching, transshipment and sorting points in many-to-many distribution systems". Hubs can also act as locations where activities such as cross-docking can occur. There are two types of hub networks named single and multiple (Alumur and Kara, 2008). The differences lay in the degree of centralization. In the single allocation network all inbound and outbound transport goes through one hub, compared to the multiple allocation where it is possible to transport through several hubs (Alumur and Kara, 2008). Campbell and O'Kelly (2012) define the hub location problem as the involvement in the location of a hub and which flows that should go through it.

The hub-and-spoke network can be seen as a combination of integrated hubs (nodes) connected with spokes (arcs), i.e. roads or routes (Taha et al., 1996, O'Kelly, 1998). Figure 10 showcases a simple version of a hub-and-spoke network in a local environment. Taylor et al. (1999) strained the importance of decreasing driver tour-length by utilizing hubs, but it is also important to discuss disadvantages such as circuity, less miles per day per driver and first dispatch empty miles. On the other hand, loads can be dropped off at a hub and delivered by another truck without encountering a sleep cycle (Taylor et al., 1999). Taylor et al. (2001) discuss the notion of closing down underutilized hubs in order to create more freight density for other hubs. Vergara and Root (2013) explain the differences between a hub-and-spoke network and a relay network to consist of that no sorting or consolidation of freight is needed for the relay network. This means that no actual physical hub is needed, but more of a space to exchange i.e. trailers or containers at.

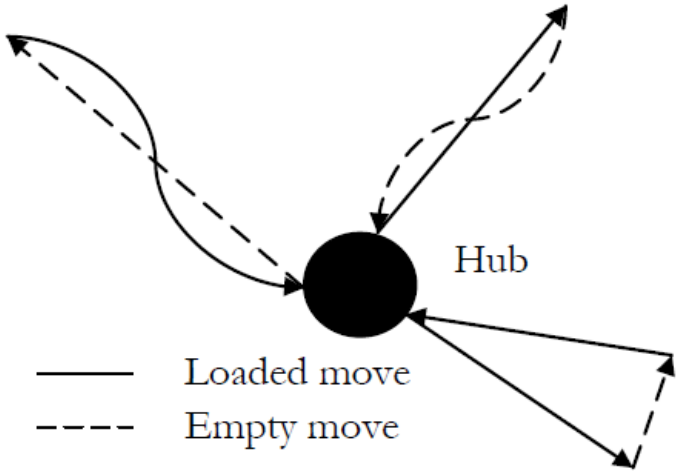

Figure 10: Local hub-and-spoke network adapted from Taha et al. (1996)

5. Empirical findings

This chapter presents the empirical findings of the study. Firstly, the empirical data gathered from the European road-freight companies are showcased followed by the U.S. road-freight company. The sub-chapters are categorized into analogous headings in order to exemplify the differences easier. The final heading supplies personal information gathered from Professor Peter Klaus.

5.1 DHL in Sweden

The following sub-chapter provides the gathered data from DHL in Helsingborg, Sweden. The export transport planning department is divided into different regions. Two export transport planners were interviewed, responsible for the south of Sweden and the middle of Sweden. The fleet of trucks is divided into different constellations. About 90% are foreign (not Swedish) hauliers and the information flow goes through the hauliers' transport planner who then informs the drivers. Information in this case is communicated through e-mail to the external transport planner and then forwarded in a text message to the drivers. These e-mails are written in English. The remaining 10% of the hauliers are owner-operators or smaller hauliers with two or three trucks. In total the two interviewed transport planners have the responsibility for 30-50 truck drivers each, depending on the day of the week. DHL does not own any of the trucks or trailers. Hauliers are contracted to perform transports for the company and trailers are rented short- or long-term.

5.1.1 The transport planning process

The transport planning process initiates with a customer's order to the central customer service department containing loading destination, weight, volume, time of loading and "other information". "Other information" can contain information such as if the goods are ready for pick-up already or if they are e.g. hazardous goods. Customer orders have to be placed before 14:00 the day before loading, to enable the central customer service department to enter the order into the system and for the transport planner to plan the transport. However, this is not entirely the case, since some customers believe that they can place an order at any time they want. The deadline of 14:00 also guarantees that the goods will be picked up the day after. If the deadline of 14:00 is not met, the goods will be picked up in two days. Exceptions can be made if the order is processed and the transport planner notices that there is capacity to pick the goods up one day before.

The central customer service department receives and then enters the customer order into the system and a "booking ticket" is created. This booking ticket is then sent to the responsible transport planner. The booking ticket is physically at hand as a piece of paper for

the transport planner and contains the information mentioned above. Thereafter, the transport planner can, whenever time is available during the day, start to plan for the following day.

However, the actual transport planning starts after 15:00 when information is provided by the import department. Export and import department collaborate intensively and the information flow is crucial. The import department informs the export department about which trailers and trucks will unload where and when. Then the export department can roughly plan which trailers and trucks that should load what and where. Loads can be both LTL and FTL, which the transport planner needs to assess when planning a transport. The export department can also easily visualize if they have enough trucks for the loads in their respective region through the information from the import department. The booking ticket can be seen as a part in huge puzzle. The transport planner then calculates weights and volume to decide what can fit into the trailers for LTL. Information such as which country the goods are destined to is also crucial. If the transport planner has to put goods that belong to different countries it has to be sorted in a terminal and put on other trailers, which is costly. A FTL trailer that has goods destined to one particular area in for example Germany can go straight there without any sorting at a terminal. However, this is not entirely possible at all times. Respondent B further explains this in the following manner:

> ”Sometimes a customer has large amounts of goods to several countries. When we are there and load, we load everything. Otherwise, that customer might get ten different trucks on one day, where every truck collects for each country. That is not perfect, so it depends.” (Respondent B)

The export transport planners subsequently start to roughly plan the following day’s loads. Then around 08:00 the following day, the drivers or the hauliers’ transport planner send a status report. The status report contains information about if a driver is done unloading, or when the driver will be at the destination to unload and also how many driving hours the driver has left. The status report can be sent via SMS, e-mail or phone call. However, as mentioned before 90% are sent through mail. This is the moment when the transport planner knows if the rough plan from the day before is achievable. Different scenarios can cause the preliminary plan to fail. Examples of different scenarios include that the driver is late at the unloading destination, it takes more time to unload the trailer than usually or that the driver has less driving hours than planned. The transport planner does not know anything about the driving hours left before the status report is received. Naturally, when the status report has arrived the transport planner begins to send orders to the drivers or the transport planner.

Orders are sent either through e-mail or text message. The transport planner then utilizes the booking tickets to produce an e-mail or text message. All the necessary information is typed by hand into an e-mail or a text message. Notably, the text message is sent from a phone which takes additional time. Also, when sending e-mail and text messages, the transport planner has to check where the customer is located since it is not provided on the booking ticket. Usually the transport planner remembers the location since it is rarely new destinations. Thereafter, the hauliers' transport planner or the driver sends a confirmation that the order has been accepted. Occasionally, misconceptions take place due to the e-mails. English is neither parts' native language, therefore further explanations are needed which uptakes additional time. The e-mail also needs to be forwarded to the driver and then confirmed by the transport planner. This also requires additional time compared to just sending an SMS straight to the driver. Respondent B further declares this in the following paragraph:

> "With the foreign hauliers we can lose some time and quality. There can be a lack of information, due to the added step or layer." (Respondent B)

The transport planner or the driver then sends a confirmation to accept the order. Then the transport planner can put the different loads into an Excel-file. This is done to ensure what all trailers contain and to prepare the terminal if goods need to be sorted. It is also performed to enable invoicing to customers and salary to drivers.

During the process when the drivers are loading the trailers, it is crucial for the transport planner to access information about the process. The communication is of high importance since loading times need to be followed. Occasionally, the transport planner does not give the driver the whole route to keep control during the process. The transport planner can send the remaining orders if the process has been performed without any issues. Or if the process takes more time than planned, it is possible to imply changes. The reason why it sometimes is smarter to just send parts of the process to the drivers is further explained by respondent A:

> "The largest and probably the most frustrating problems are that drivers today, especially the cheaper hauliers do not communicate that well. You can then think that everything goes perfectly, but it can just as well be the opposite. Therefore the communication is important." (Respondent A)

When all the goods have been collected, the driver sends a confirmation to the transport planner. Or in the case of foreign hauliers, the other transport planner forwards the message to DHL's transport planner. The transport planner then wants to know when the driver can arrive at the terminal if it is goods to several countries in an LTL transport. The reason for this is to inform and prepare the terminal workers so that they know when the trailer arrives

and the sorting can be performed. If it is an FTL transport with goods to one particular area in for example Germany, the transport planner wants to know when the driver can be at the ferry. The transport planner then informs the department responsible for Germany in Sweden and they book a ferry ticket. Then the information goes to the German side of the company stationed in Lübeck. They then take care of the trailer when it arrives at the port in Germany. This process is also dependent on if the driver is foreign or Swedish. The Swedish drivers stay in Sweden, which means the trailer will embark the ferry without truck. The German side of the company then covers the process further by assigning another driver at the port. If it is a foreign driver, the driver can embark the ferry with the trailer and complete the whole journey.

Figure 11 presents DHL's veracious transport planning process as precisely outlined in text. The figure assists in understanding the exhaustive process already depicted textual. The transport process figure also depicts which actor is performing each activity added with decision-making activities. Figure 12 departures from the same origin, but focuses on outlining the relations between DHL's transport planners and the hauliers' transport planner. It showcases external and internal planning control utilizing the industrial network approach depicted in the theoretical framework. Despite the fact that DHL's transport planners selects or matches loads to drivers themselves, it is noteworthy to acknowledge the added layer for plentiful of the cases. TP_H here presents the transport planner at the utilized sub-contracted haulier by DHL.

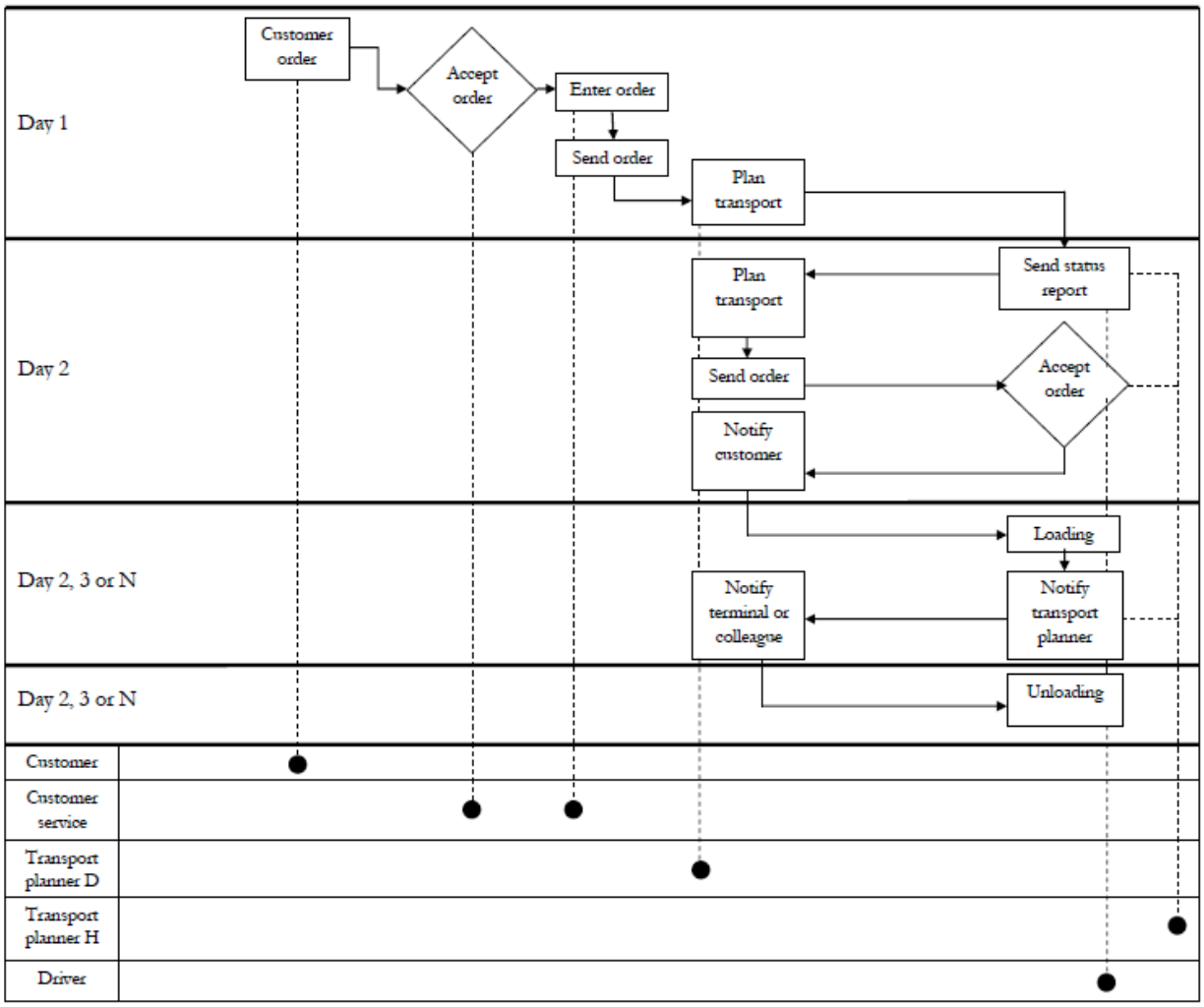

Figure 11: DHL's transport planning process

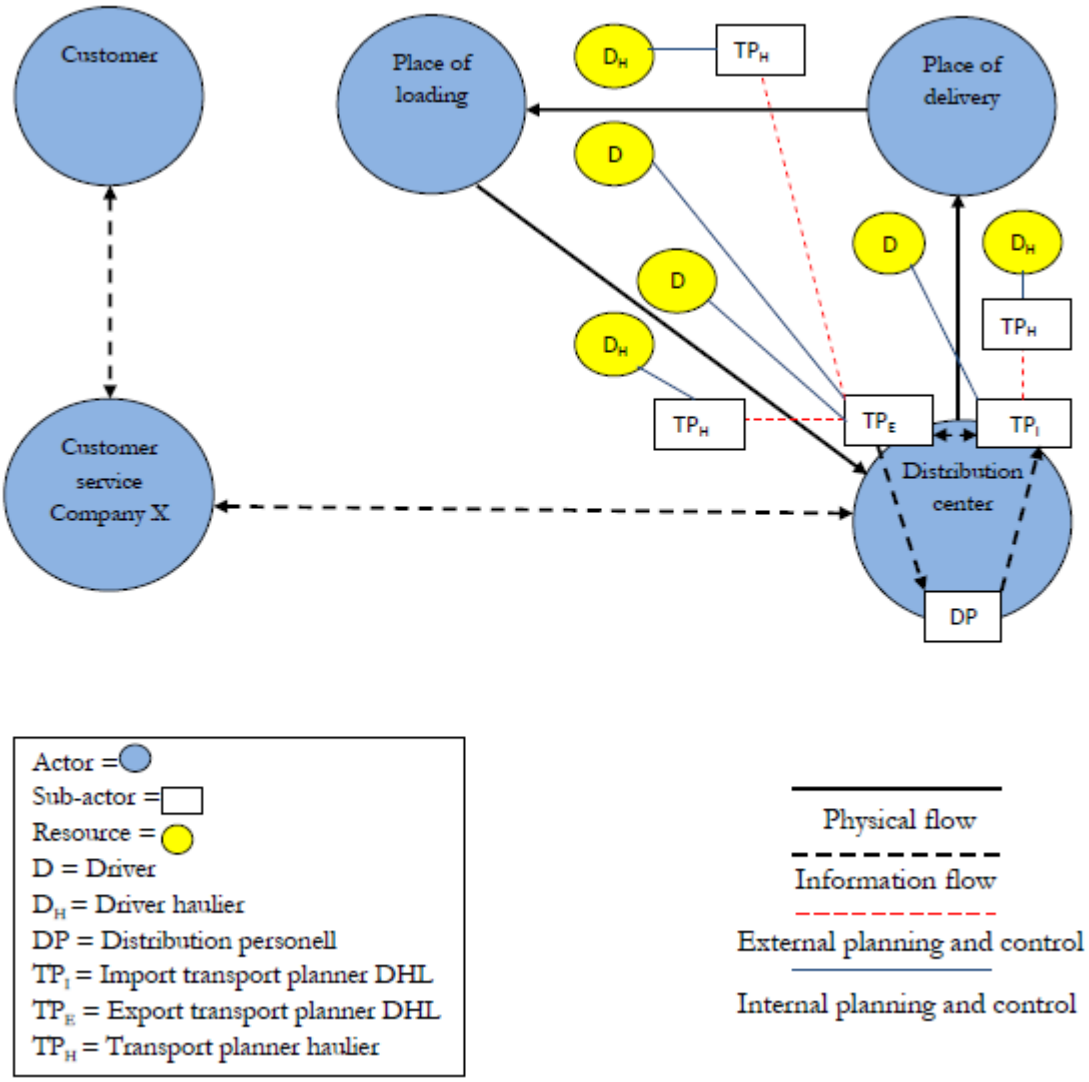

Figure 12: DHL's planning and control

5.1.2 Freight flow and empty positioning

Some regions in Sweden are consumers and some are producers which create geographical imbalances (Vierth et al., 2012). This creates a difficult situation for carriers. DHL is no exception and examples of consuming cities in Sweden are Stockholm, Gothenburg and Malmö. Naturally, the import department usually has more trucks and drivers going to Stockholm than there are loads out of Stockholm. However, the opposite situation is apparent in southern regions of Sweden such as Småland. The area covers many manufacturing companies and there is an imbalance of import and export.

Because DHL is a large company, they can try to solve it by communicating with the domestic side. If there are many trucks within the Gothenburg area and there are no available

loads, the drivers can pick up domestic goods within Småland and unload it within the area. By doing that it is possible to relocate drivers and trailers to an area where they are needed. However, the foreign drivers are not allowed to perform too many domestic transports due to the cabotage rules (European Commission, 2009). It is something that the transport planner needs to assess and communicate with the driver or the other transport planner about. Respondent A and B claim that the communication with the domestic side of the company is not very frequent though. Another way to deal with this situation is to perform transports for another transport company or watch the spot-market. However, the prices in this particular situation are considered very low.

DHL has a fleet department whose task is to relocate empty trailers. The transport planners then communicate their need and the fleet department makes sure to relocate trailers to desired areas. In a particular situation, loaded trailers might be put on the train from south of Sweden to Stockholm. Then a local drayman performs the transportation and then leaves the empty trailer in Stockholm. Another situation can be that the transport planner takes on a one-way transport from southern Sweden to Stockholm. Then the same situation occurs and the amount of empty trailers increases in the Stockholm area. The fleet department then puts the empty trailers on the railway from Stockholm to a desired area, because it is cheaper than having a truck driver relocating one at the time. This is thus possible due to the fact that the trailer is constructed to fit intermodal transports.

Occasionally, drivers unload a trailer in Stockholm on a Friday. If the driver is foreign it does not matter if he or she sleeps in the truck during the weekend. However, Swedish drivers have different contracts and needs to be at home during weekends. Then the truck driver will relocate the empty trailer that was unloaded during the day, if there are no available loads down to the southern region. Naturally, this is more expensive than moving the trailer by railway. Nevertheless, the truck driver has to drive home for the weekend. Then the truck driver can perform the empty positioning.

Northern Sweden also contains a large amount of manufacturing companies which results in another imbalance. The transport planner can then put an empty trailer on the railway from Stockholm up to the northern part of Sweden. Up there a local driver can perform the loading and then put the trailer on the railway down to the southern part of Sweden. By doing that the amount of empty trailers located in Stockholm are repositioned and the imbalance problem is better dealt with.

5.1.3 Drivers

Drivers want to work as much as possible, because they want to increase their monetary income. The interviewed transport planners at DHL verified this and added that they do not

have any responsibility to make sure the drivers as much as they can. Respondent A and B have the responsibility to ensure the collection of goods at the right time, not to guarantee the drivers of full working-days. The second priority is the drivers. The hauliers are divided into A- and B-transporters, with a mixed number of truck drivers. The A-transporters are guaranteed work, but the B-transporters are partly guaranteed work. Both owner-operators and hauliers with two to three trucks are used. Additionally, larger hauliers with up to twenty hauliers are utilized as well. Furthermore, different intermediaries are utilized to handle variations in demand. The demand of truck drivers is naturally larger during seasonal increases, but also depending on weekday. Mondays and Fridays are usually heavier in terms of workload, compared to the remaining weekdays. The underlying cause is because the import is larger during these days.

As mentioned before, the interviewed transport planners are responsible for 30-50 truck drivers per day. It is during Fridays and Mondays that 50 truck drivers are planned and on average 30 truck drivers the remaining days. The management decides which drivers to use and Respondent A further develops this in the following quote:

> "It is our bosses who decide which hauliers to use. They are the ones who make the contracts. Since the transport market is like it is, cheaper hauliers are used. Unfortunately." (Respondent A)

Further absorbing the notion of ensuring the drivers full working days, it is evident that the transport planner assess it even though it is priority number two. Respondent A exemplifies this in a quite trivial way, but it showcases the overall thinking in regard to keeping the trucks rolling.

> "Even though some drivers are not happy about just driving 250 km a day it is nothing that we plan out of spite. If a driver arrives in Gothenburg and there are absolutely no goods, we don't send that truck down to Helsingborg empty. Then the driver has to wait until there are goods available. Maybe not two days, but usually until the morning after. Otherwise we are quite good at keeping the trucks rolling." (Respondent A)

Respondent B further adds valuable insights to the issue and declares that the driving regulations are an important factor.

> "Sometimes the driver only has four hours left to drive. Then he gets a very small job because it is not worth to give the driver something that could've filled the day that instead would've jeopardized the following day. Everything depends on the status report." (Respondent B)

A pre-determined rule of thumb is to let the driver who is done first get the next available job. However, some hauliers are guaranteed a specific lane or flow. These specific lanes or

flows are between terminals. Naturally, the lane-driver gets the next job even if another driver is done before. Then the other driver has to wait and idle until there are loads available.

The communication between the transport planner and the driver is essential, as established in the process of collecting goods. The drivers that the interviewed transport planners have responsibility for live in different locations. There are also lots of variations between the drivers if they have to return to their home domicile every day or not. Drivers based in Helsingborg who have to return to their home domicile every day aspirate jobs within Skåne and Småland. This ensures that the drivers are able to return and still cover a working day. Furthermore, lots of drivers are residents in Trelleborg. The city of Trelleborg nearly guarantees jobs due to the fact that the ferry from Germany docks there. Drivers also like to get some hints about what to load, because some loads are better than the other (e.g. light goods). Respondent A exemplifies where drivers resident in Trelleborg try to influence the planning decisions:

> "Many trailers arrive in Trelleborg. But if it's not possible to return the driver to Trelleborg and he gets to Helsingborg it has to be that way. Then you might get 'taunted' like "can't you get me down to Trelleborg?" Then you can take a look at the planning again and see if you can fix it. But, otherwise the driver has to drop the trailer and drive down to Trelleborg on his own." (Respondent A)

Due to the pre-determined contracts with hauliers and drivers that are guaranteed to return to their home domicile during weekends it can cause empty runs. They are guaranteed to initiate their next week on Sunday evening from their home domicile. The transport planner then has no choice but to send the driver south with an empty trailer from e.g. Stockholm. However, foreign carriers that live in their trucks for weeks can stay in Stockholm over the weekend. This results in omitting the risk of empty movements.

5.1.4 Planning parameters and measurements

As mentioned before, the two interviewed transport planners foremost strain the priority of solving the specific loads with specific intervals. The second priority is the drivers, which means getting drivers home to their domicile or filling their days with work.

The interviewed transport planners have different parameters which need to be assessed and planned in a highly dynamic environment. The time factor is of high importance to the transport planner due to the stressful work environment. A number of of the loads are urgent which puts pressure on the transport planners.

First of all the empty kilometers need to be as low as possible and the filling rate as high as possible. Both interviewed transport planners consistently strain the importance of incorporating these two parameters when planning a transport. It is then the transport planners' responsibility to make sure that these two parameters are optimized. In an FTL transport the filling rate is not something that needs to be considered, but since the transport planners also examine LTL transport it cannot be ignored. In an FTL transport it is the reduction of empty kilometers that becomes highly important. The relation between an FTL- and a LTL transport brings us to another planning parameter which the transport planner needs to assess. As mentioned before, an FTL transport destined to a specific country also determines the driver's endpoint for the day. This in turn determines if the driver will get home to their domicile or not. However, if the driver is a foreign carrier it does not really matter.

Another parameter is the driver regulations which determine what can be performed. Since the transport planners do not know about the drivers' driving-hours left before the submitted status report, it is difficult to plan. The pre-plan might be well-defined, but it usually gets foiled when the status report arrives. The interviewed transport planners also mention issues when foreign carriers suddenly need 'weekend breaks' in the middle of the week. Foreign carriers have then performed transports in Europe during the weekend and they needed to postpone their rest. Then the transport planner is forced to acquire drivers and if there are not enough A- or B-transporters, the transport planner has to go search for intermediaries.

The fact that orders vary is also a parameter that needs to be incorporated. DHL has customers which e.g. always have two trailers at the loading site. These two trailers are switched every day and replaced by two empty trailers. Then the customers have one day to load the empty trailer. This order is consistent, but the drivers performing the job are different. The interviewed transport planners also state that DHL has fixed contracts with some customers but the quantity of orders change. One day it might be two small packages and the other it might be two FTL trailers. Seasonal varieties also occur, especially before holidays. Respondent B elaborates and gives an example regarding seasonal varieties:

> "Industry holidays in June for example. Then a customer who normally has 1 kilogram has 10 kg, the one who has 10 kg has 100 kg, the one who has 100 kg has 1 ton, the one who has 1 ton has 10 ton. Then the one who has 10 ton has ten FTL. That is how much it increases, drastically, when the summer holiday is approaching." (Respondent B)

The interviewed transport planners with much experience can forecast the increase to some extent, but it is difficult to predict. Usually customers realize very late that they have to increase their loading volume.

Another parameter which the transport planners need to assess is what type of trailer, truck and education the driver needs to have to perform a transport. Some transports need a larger trailer than the standard trailer. These larger trailers are called MEGA-trailers. The transport planner then needs to make sure that there is a driver unloading nearby with a MEGA-trailer that can perform the loading afterwards. However, a MEGA-trailer can be used for standard trailer goods but not the other way around. Some goods are extremely heavy and require a truck that can tow the large amount of goods. Then the transport planner needs to secure that there is a truck driver with that type of truck unloading close to the loading site. Fortunately, the extremely heavy transports need to be booked earlier, to make sure that the transport planner has time to schedule them. Outside these parameters, transports with hazardous goods can be ordered. The transport planner then needs to make sure that there is a driver close by the loading site with the correct education to perform that transport.

Respondent B spontaneously suggested a centralized transport planning instead of dividing everything into regions:

> "The way that Respondent A works is principally the same for me with the exception that we have different regions. But we are looking at solutions that could be better. An example would be to see the whole of Sweden as "one" instead of different regions. Then you could be approximately four people who could cover the whole Sweden. A little more centralized, than being locked to one specific region." (Respondent B)

This is directly connected to the communication between different regions. It is easy for the transport planners to solely focus on their specific loads and you do not care about the other regions. The interviewed transport planners exemplify occasions where it would be better to cross each other's borders to optimize a transport.

DHL measures key figures and the transport planners meet on a weekly and monthly basis. During these meetings the overall monetary result, empty mileage, filling rate and delivery performance are presented. The weekly meetings by a whiteboard are just around fifteen minutes, but the transport planner assesses if there is enough time to go there or not. However, the monthly meetings are mandatory and last for around thirty minutes. The key figures are measured in total, which makes it difficult for the individual transport planner to analyze his or her performance. Respondent B states that it is more of a matter about how the transport planner feels about his or her performance:

> "One feels, within yourself, how the performance has been. It is measured in total, so it's a bit difficult to perceive your own share. But, it stays fairly intact every month." (Respondent B)

When asked about if key figures directly visible when planning a transport would be requested, Respondent A reacted in the following way:

> "If I would have worked in a smaller company, where I would be more involved in the whole process. Then I think I would have been more interested about how the result was. Now it is so big and the work so extensive. It is therefore not something that I feel that I need to know. Just as long as I can feel with myself that I've done a good job. Or at least as good as I can. It's so rapid changes and it goes from day to day. But absolutely, if I would have had it a bit calmer then I would be interested to see how it goes. And in that case if there is something that we in the group produce wrong. Then you want to know, so that you can make it different." (Respondent A)

5.2 DB Schenker haulier in Sweden

Even though the process is different at DB Schenker compared to DHL, the following empirical data showcases the next step in the constellation of working with a subcontractor or partner. In order to understand the whole chain of events in the planning and control a contracted haulier was interviewed. The haulier is situated in Helsingborg, Sweden and owns a fleet of 15 trucks. The haulier is performing transports for DB Schenker on certain predetermined lanes domestically in Sweden. Freight booked on the lanes is guaranteed for this haulier due to the contract. Freight covered by the haulier can be both FTL and LTL.

The haulier's office in Helsingborg, Sweden houses three employees divided into transport planning, finance and dealings with waybills. Trucks and trailers owned by the haulier has to incorporate the appropriate logo of DB Schenker, but it is still allowed to have a logo of the own company. Earlier, DB Schenker tried to have the contracted hauliers to only have DB Schenker logos on their trucks and trailers. However, after virtuous discussions the contracted hauliers were allowed to have their own logo as well.

DB Schenker and the haulier utilize a common IT-system where customer orders are transferred from DB Schenker to the appropriate haulier. As mentioned before, this particular haulier is performing transports on certain predetermined lanes. Additional hauliers are performing transports on other lanes.

5.2.1 The transport planning process

The transport planning process initiates with a customer's order either to DB Schenker or to the haulier directly. In the case where a customer's order is booked through DB Schenker, it is possible to transfer the customer's order to the appropriate haulier. Nevertheless, if the customer decides to book directly through the haulier it can be done through either e-mail, phone or through the customer's website. This means that the transport planner manually

adds these bookings. The haulier uses a deadline for bookings at 15:00 to guarantee pick-up the other day. The transport planner has in most cases created a rather well-defined contact with the customers and emphasizes the importance of it in the following manner:

> "The person on the customer service center sometimes has to locate who the customer needs to talk to. Then the one at the customer service center has to contact DB Schenker's office in Helsingborg and they have to contact us. By doing so I think there can be some person who thinks it is too much of a hassle. Then you might lose a customer because such a thing. But it seems like DB Schenker are working with the presence on the local level again. It is pretty natural that you want to have a close contact with the one performing the haulage. It is the same thing if something goes wrong. It is better if I as a haulier have the close contact with the client. If I did something wrong, I did something wrong. Then I can take it directly with the client." (Respondent C)

Occasionally, the haulier receives requests on performing a transport that is not through DB Schenker. Respondent C explains the situation and the solution in the following way:

> "If we get requests from a customer, I call the traffic manager at DB Schenker in Helsingborg and tell that a customer has called and wants to send goods with us. Then he can say "No, we won't do that" or he says "Yes, you can do that". Or in 99% of the times I say to the customer: "Yes, we can do it, but you will get the invoice from DB Schenker". We are contracted by DB Schenker and shall work in synergy with each other. I cannot perform transports outside of DB Schenker and at the same time take advantage of them. They are not supposed to send "my goods" with another haulier either." (Respondent C)

After receiving the different customer orders it is the transport planner at the haulier who plans the transports. The transport planner calculates weights and volume to assure that enough capacity exists when LTL goods. Loads are then put on the different trucks and trailers to encompass a high degree of fill-rate. The transport planner literally drags the different loads to the appropriate truck and lane in the system. In front of the transport planner is a piece of paper visualizing the different trailers and what loads are put on them. This is mainly done to act as a support for the transport planner, even though the information is in the system as well.

After doing so it is possible to send the orders to the truck drivers using a communication tool. The trucks are equipped with a communication tool to handle incoming orders and messages between the driver and the transport planner. The driver consequently accepts the order and can then use the communication tool to scan waybills and communicate pick-up times as well as unloading times. This information is stored and the transport planner can access it if necessary. The communication tool is integrated with DB Schenker and the common IT-system. However, in order to reach the positions of the trucks, another IT-

system is utilized. The same goes for the monitoring of fuel consumption which is part of another system.

Since the distance on the lanes nearly fills a whole working day for a driver, certain draymen are utilized. Respondent C explicates it in the following manner:

> ”The driver then arrives in [city] around five in the morning. Then he hands over the truck to the drayman. Then we have an apartment in [city] that the haulier owns, where the driver can sleep during the day. Then he gets his truck back in the evening and drives back to the haulier in Helsingborg again. Then he gets substituted. Therefore, the truck can roll virtually around the clock.” (Respondent C)

Figure 13 under depicts the planning and control regarding the DB Schenker haulier as explained in text earlier. The author chose not to showcase the transport planning process for the DB Schenker haulier since it solitary handles lane participation and fixed schedules for drivers. Figure 13 therefore solely presents the relative complexity and acts as the foundation for analysis.

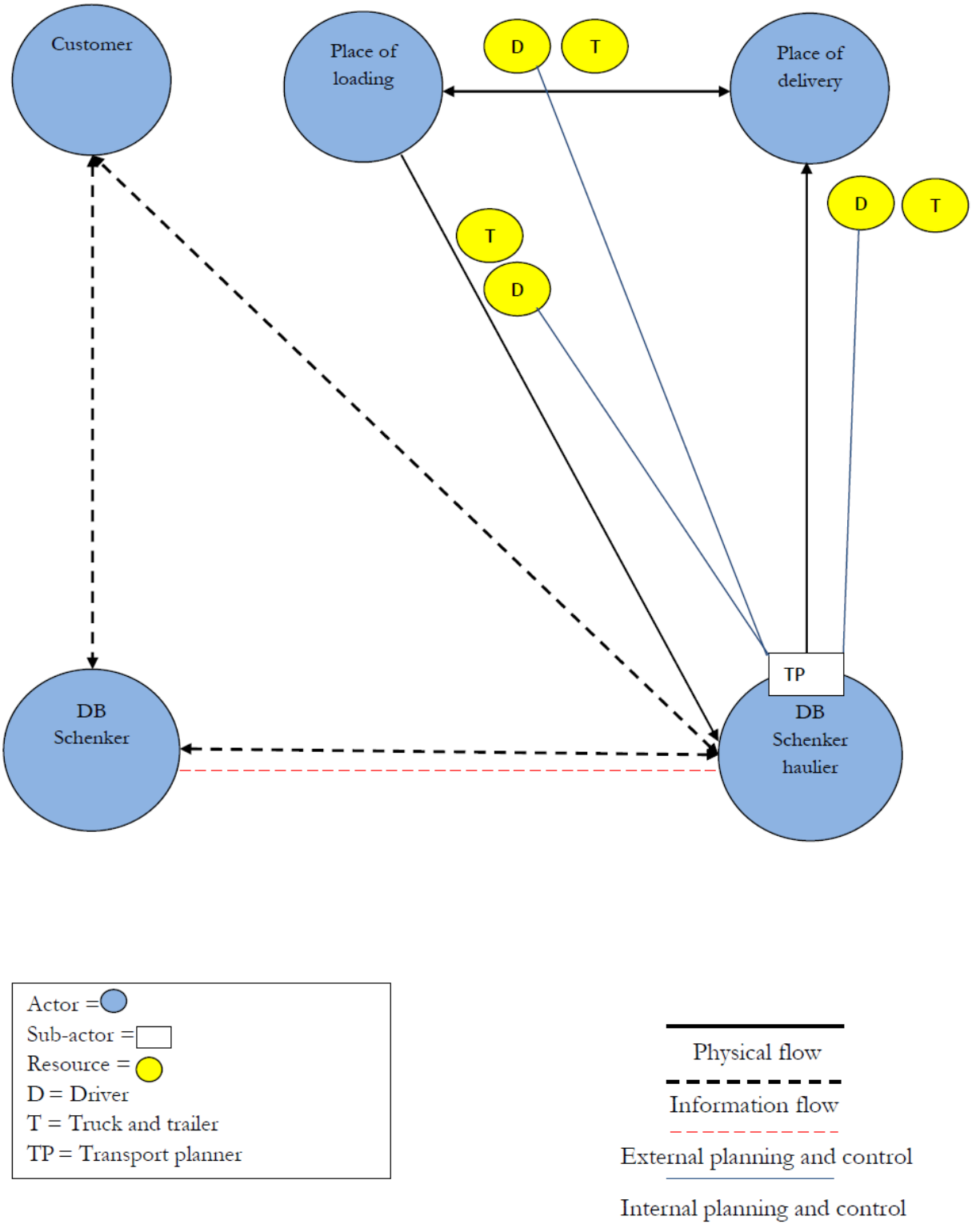

Figure 13: DB Schenker haulier's planning and control

5.2.2 Freight flow and empty positioning

Coupled with written beforehand, the DB Schenker haulier performs transports on pre-determined contracted lanes. Freight can be both LTL and FTL, which the transport planner needs to analyze in order to optimize. Due to the pre-determined lanes, the DB Schenker haulier naturally notices imbalance problems. Especially since the lanes initiate in the south of Sweden and end in the northern part of Sweden. Consequently, the DB Schenker haulier performs transport both back and forth on the pre-determined lanes. Respondent C explains the issue and the solution in the following way:

> "I need more goods from north to south. We have more goods north than south. For example, cities like Stockholm and Uppsala does not produce very much. It can happen that I don't get goods home, but I can get goods to Gothenburg. Then we can help the haulier that has Gävle to Gothenburg and we can save money." (Respondent C)

It is evident that the DB Schenker hauliers help each other when the possibility exists. If one haulier does not have the capacity on a certain day, the DB Schenker hauliers will communicate with each other and collaborate for a desirable solution.

Re-positioning of empty trailers is not an issue for the DB Schenker haulier, since the trailers are hooked to the particular truck. The DB Schenker haulier tries to have the same driver with the same truck at all times and the transport planner expresses the reasoning in the following way:

> "They have their truck and get a feeling for the truck. A driver then gets to know the truck better and knows it inside out. If he notices that it starts going slow uphill, he will tell us." (Respondent C)

5.2.3 Drivers

Drivers are directly hired at the DB Schenker haulier and paid a monthly fixed salary regardless of how much they drive. The transport planner is the one who needs to ensure that the days are covered. The drivers are scheduled in an order where the schedule is changing through the different weeks. Hence the occupied lanes are relatively long, it means that the driver cannot drive back to Helsingborg when arrived north. Consequently, the driver needs to sleep and gets paid allowance. However, the allowance is quite low since the haulier owns the apartment where the drivers sleep. Owning an apartment is naturally not for free, but it is per se regarded by the haulier as cheaper than larger allowances.

Retaining and recruiting drivers is not seen as an issue for the DB Schenker haulier. Respondent C elucidates it in the subsequent manner:

> "It is easier to hire drivers for the night shifts than to hire draymen. I don't know how it will change onwards due to the "Yrkeskompetensbevis" (YKB)[3]. That might change everything. Since many of the ones who drive during night are part-time farmers. They drive the truck as a "job on the side". If they then don't have the education needed they won't be able to drive. Then it might be more difficult to find such personnel. But, I don't know yet." (Respondent C)

When asked to elaborate on why it is not difficult to retain drivers, Respondent C explained it in the following way:

> "It is probably the lanes and I suspect that they feel at home. The human is maybe a kind of habitual human as well. Then if nothing extreme happens which creates an uncomfortable situation, you'll stay." (Respondent C)

5.2.4 Planning parameters and measurements

As mentioned before, the drivers have a fixed schedule which changes over the weeks. The transport planner does not have such a big issue with getting drivers back to their home domicile. The driving hours are not regarded as an issue when planning the transports either. Respondent C elaborates this in the following way:

> "I don't have to care that much about the driving hours. That is well-established with the lanes. It would be if something extra that we normally don't drive would pop up. Before, we used to have a pick up where problems with the driving hours occurred. Then a driver had to take a personal car and meet the driver on the way, to make sure that the driving hours stayed within the regulations. Some loads can be on the borderline. Problems can however occur if the driver has to make a detour from the lane." (Respondent C)

The interviewed transport planner however strained the notion of filling-rate when LTL. However, it is not measured per se in the system or by the transport planner. Respondent C elaborates it further on:

> "I can probably check the filling-rate afterwards, but I work with it personally. It goes hand in hand. We fill the trucks as much as we can, because we want to make more money. Also, the more we've filled them, the less environmental impact." (Respondent C)

Regarding empty running, Respondent C elucidates the situation in the following manner:

[3] ≈ Certificate of Professional Competence (CPC)

> "It happens that we sometimes must go empty from [city]. Especially if we send many trucks up there. But usually we have empty goods (e.g. empty pallets) that must get down to Helsingborg. If we don't take it down here, we have to buy new here." (Respondent C)

When asked to elaborate about the most difficult when it comes to planning transport, Respondent C expressed it in the following way:

> "The most difficult is when a customer increases an order late in time. Sometimes large increases. Especially vegetables. Then you can get in trouble." (Respondent C)

> "Another issue is that sometimes the goods are not finished when you arrive." (Respondent C)

The DB Schenker haulier does measure performance, but only on the fuel consumption and the environmental impact. Respondent C explains it furthermore:

> "We measure the fuel consumption to make sure that it's not too much. That is probably the most practical. Otherwise it is the environmental work, because some customers demand it." (Respondent C)

5.3 Werner Enterprises in the U.S.

The following sub-chapter provides information gathered from a company visit at Werner in Omaha, NE. Two parts of the TL segment within Werner will be examined, namely the Van Network and the Dedicated Services. The author visited the regional part of the Van Network and therefore it is the only part that will be studied. The third part that will not be examined in the in-hand thesis is the Value-Added-Services (VAS) sector. Figure 14 showcases the load flow within the Van Network. However, within the Dedicated Services it is one person who incorporates all the three inter-organizational parts (customer service, load planning and operations) called an account manager. Werner utilizes the same computerized planning system for both the Van Network and the Dedicated Services. Drivers are hired by Werner, either as owner-operators or directly employed. Within the Van Network approximately 12% are owner-operators followed by 3% within the Dedicated Services. This means that a clear majority is employed directly at Werner. However, the owner-operators need to hire the same communication tools that are installed within the proprietary fleet. This ensures a standardized communication process with the owner-operators as well. A fleet manager within the Van Network usually handles 30-60 drivers depending on the goods. The number of drivers for an account manager within the Dedicated Services is fairly similar. Transport planning is centralized in Omaha, NE within the Van Network. However, the Dedicated Services have certain account managers present on-site due to the customers' requests.

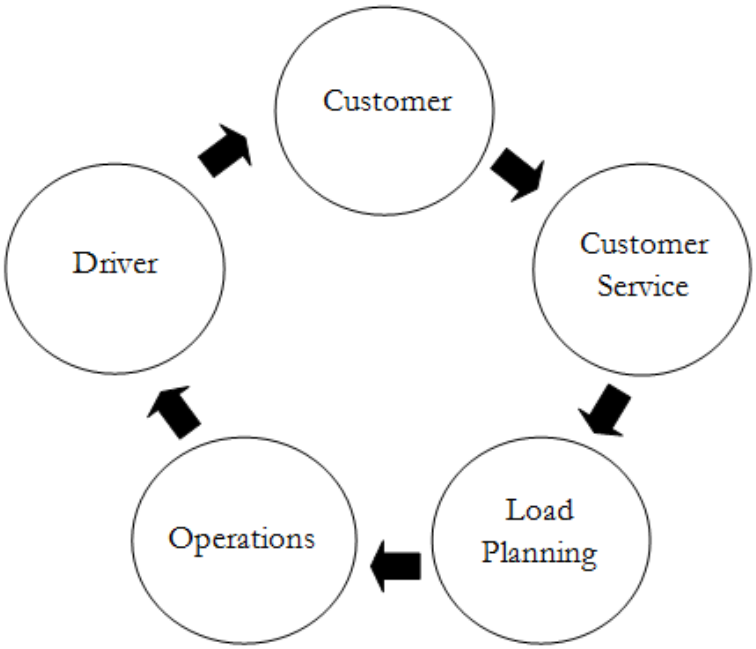

Figure 14: The Van Network Load Flow

5.3.1 The transport planning process

The following sector provides information gathered for the transport planning process within the Van Network. The transport planning process initiates with a customer order sent to the customer service manager handling that particular customer. Orders usually arrive through EDI directly into the system, but also through the customers' web portal, e-mails and phone calls. The customer service manager can then either accept the order in the system (when it is EDI) or manually add the relevant information into the system. The constraint regarding capacity is visualized in the system and the customer service manager can easily assess it. However, the customer service manager exemplified that the system cannot predict e.g. weather issues. This means that the customer service manager might have to inform the customer that it is impossible to perform a certain transport due to e.g. flooding. This is usually solved by re-scheduling the transport if the customer agrees to it. The customer service manager is the link between Werner and the customer. This means that all communication between Werner and the customer goes through the customer service manager. The shadowed customer service manager manages seven customers in one particular geographical area. One example of communication between the customer service manager and a particular customer can include information about a potentially late load. The fleet manager then informs the customer service manager who thereafter informs the customer. The shadowed customer service manager used a quote which incorporates the mindset of the role: "*let the customer know before they ask*".

This quote showcases what the customer service manager should aim for when satisfying a customer. If the customer asks where a certain truck is and the customer service manager has not informed that it is late, unnecessary trouble might arise. The responsibility for the customer service manager is then to manage, solicit, assist and maintain established customer base. On the more operational side, the customer service manager should aim to book an average of 55+ loads per day and put sufficient time into communicating with customers. The final part already mentioned includes managing on time service, customer commitments and daily capacity.

The next activity in the process is the assignment of loads to suitable trucks. The load planner is the role responsible for this activity. As evident in Table 2, the author spent 60 minutes shadowing a load planner within the Van Network. The shadowed load planner had the role of an area load planner. This means that the load planner solely focus on one particular area when assigning loads. These areas are defined by the density of goods. One area might at first glance seem small, but incorporates a large amount of goods. In the computerized planning system, the area load planner focuses on inbound and outbound goods within the area. The load planner can then assess if there is a balance within the zone

considering the inbound and outbound goods. Within the system, there is a function which gives the load planner a percentage of the balance between inbound and outbound. The system also provides the city of origin for a truck along with the city of arrival.

Shipments are different and are coded with IDs to ensure that the load planner assigns the appropriate truck to a shipment. These codes can for example imply hazardous material, JIT or 'lane participation'. The load planner then filters among the inbound truck drivers and discovers a truck driver which possesses the correct education. Or in the case of just-in-time it is important to ensure that the driver has enough driving hours and experience to make the appointed time. The last example is concerning if the load can participate in one of the pre-determined lanes that Werner utilizes for their network optimization or 'lane system'. These lanes are placed where there is a high density of goods that the lane can support. The driver then transports the goods on a lane, preferably around 250 miles to make sure that the driver can return home again. Loads are then swapped between drivers and ensure a return home for the drivers. Drop-and-swap operations are carried out on pre-determined drop yards or terminals.

Information from the load planner to the driver is communicated through the computerized planning system. Installed in the truck, a communication tool is inhibited which incorporates a GPS. This communication tool also monitors different needs such as: fuel consumption, speed and driving hours. These monitored factors are then visible in the computerized planning system and the load planner can assess it when assigning a load. In this case, it is the information about driving hours that is of the foremost focus. It is also important to mention that some trucks are equipped with a team of drivers. In this case there are two drivers in the truck, which consequently means more available driving hours. Furthermore, the driver can then communicate that he or she is ready for a load using a communication macro. Consequently, the load planner then assigns an appropriate load.

The computerized planning system also visualizes the drivers' home domicile. Overall in the U.S. there is a shortage of truck drivers and the driver retention is utterly important. Adequate home time is one of the factors which can help retain a driver. In the system, the driver can communicate a need of home time at a specific interval. This is presented as a countdown in days within the system. The load planner then acknowledges the need and ensures that the assignment of a load will not jeopardize the return to the home domicile. If the driver is somewhere far from his or her home domicile, it is important for the load planner to assign a load going in the right direction in the sufficient time before home time. Another option which the load planner can utilize is to match a swap of loads between two drivers. This is done to guarantee drivers home time or to ensure an on-time arrival if one of the drivers have encountered any problem. These drop-and-swap operations are performed at pre-determined drop yards or terminals. The area load planner has well-defined

responsibilities, such as planning an average of 50-100 loads per day and to manage KPIs. These KPIs are to increase production, decrease deadhead (empty miles). Also to manage on-time service, on-time to home-time and out-of-route miles.

The next role in the process is the fleet manager incorporated in the organizational part called operations. As mentioned before, the load planner assigns the load. However, the fleet manager dispatches the load. The fleet manager is the link between Werner and the driver. This consequently means that the fleet manager handles the communication with the driver. When the driver has received the load information, he or she sends a confirmation along with estimated time of arrival using the communication tool. In the subsequent step, the driver then communicates that the loading is completed and that he or she is ready for the next load. It is important to mention that the address for the loading destination and the delivery destination is inhibited in the system. Occasionally, the customer service manager needs to ask the customer about the address. However, the customer service manager adds the address and neither the load planner or fleet manager need to worry about it.

The fleet manager has well-defined working responsibilities. The shadowed fleet manager exemplified that a goal is to have drivers reaching 2500 miles per week. Additionally, the fleet manager needs to keep production up and retain the drivers. Every phone call with a driver needs to end with a small safety message as well, e.g. "drive safe". The shadowed fleet manager did express a small disappointment towards load planners. The load planners have an ability to instinctively optimize too much. A driver that expressively needs more miles can suddenly be forced to make a swap with another driver which in turn might result in less miles. The issue is apparent when the driver has complained to the fleet manager that he or she needs more miles. This is troublesome for the fleet manager and the chance of retaining that driver can be less probable.

It is also important for the driver to communicate the trailer number of the trailer he or she is using. The trailers are not equipped with GPSs, which means that the fleet manager relies on the driver to inform.

Figure 15 showcases Werner's transport planning process in the Van Network as described above. Nevertheless, the process is similar for the Dedicated Services with the exception that the account manager incorporates the role of customer service manager, load planner and fleet manager. Figure 16 depicts a model over the planning and control on the operational level at Werner. The figures undertake the identical construction as the ones for the European carriers.

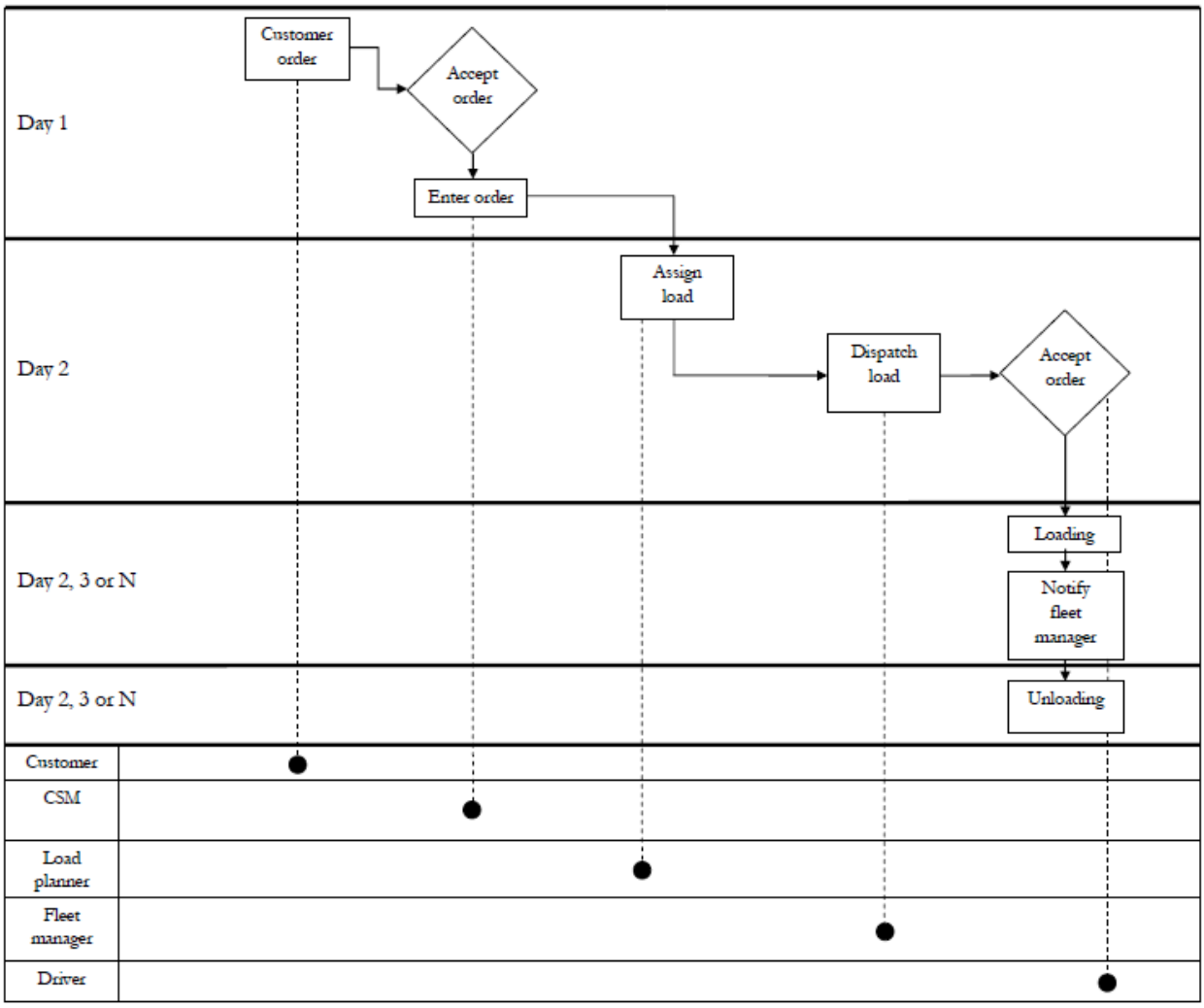

Figure 15: Werner's transport planning process

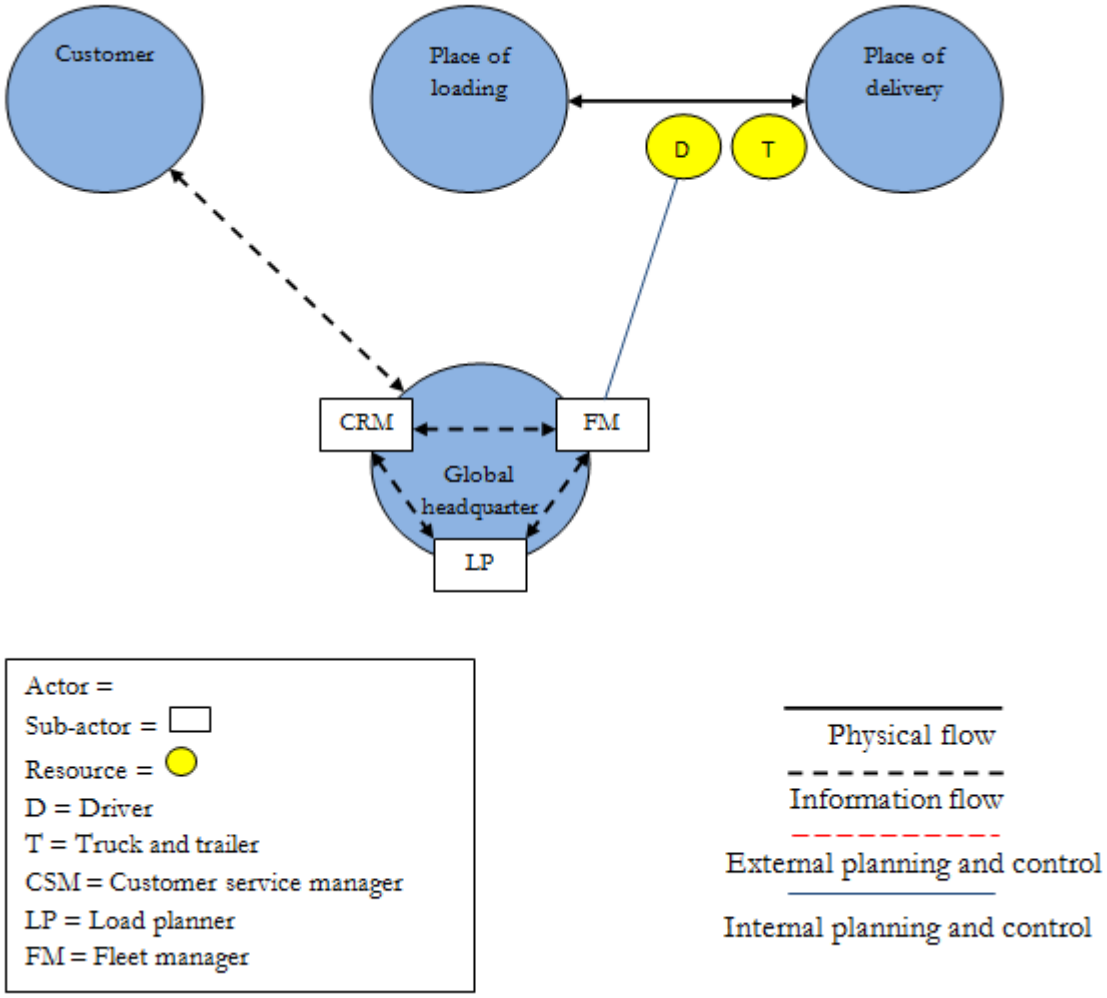

Figure 16: Werner's planning and control

5.3.2 Freight flow and empty positioning

The U.S. also has issues in imbalances in freight flow. Two examples voiced at Werner are Florida and California where it is difficult to locate sufficient loads in or out to compensate a deadhaul. Florida produces seasonally and California is an area of net consumtioning. However, Werner tries to solve this problem by prizing to compensate an eventual deadhaul. Werner does keep an eye on the spot market to find suitable loads if there is a risk for deadhaul. Nevertheless, the prices on the spot market are not very desirable. It is even though still better to drive for a cheaper price than to perform a deadhaul.

In order to handle the fleet of 24,000 trailers, one department is only focusing on the repositioning of trailers. If a fleet manager, load planner or account manager notices a shortage of trailers in a desired area a communication channel is set up to voice the need with

the repositioning department. Since Werner puts large efforts into utilizing drop-and-hook operations it is important to have information about where trailers are located. As mentioned earlier, newly purchased trailers have GPS but not the older ones. Therefore, it is up to the driver to communicate which trailer he or she uses. If the fleet manager notices that the driver has not communicated which trailer is used, a simple macro can be sent to enable the driver to send the trailer number.

Werner does perform international transports to Canada and Mexico. However, the regulations for cabotage are different compared to Europe. Drivers are allowed to haul an international transport to Canada, but not haul any domestic transports in Canada. This means that it is important to find loads going straight back to the U.S. in order to minimize the risk for deadhauls. Mexico is different for Werner where it is common to drop and swap trailers at terminals or dropyards close to the border and have a driver on the Mexican side perform the haul.

5.3.3 Drivers

The general shortage of truck drivers in the U.S. is apparent and it is evident that Werner put lots of efforts and resources into recruiting and retaining drivers.

Foremost, one department is solely focusing on recruiting drivers. The recruiting department is divided between recruiting student drivers or experienced drivers. Werner sponsors driving schools as an effort to recruit the best performing truck driver students. During the company visit it was apparent how important the driver is. Every day during the company visit, the author would hear that the company was founded by a truck driver and that the biggest asset is the driver. Additionally, one department is focusing on driver replacement. Drivers might get changed life circumstances and therefore wants to change the account they are assigned. The driver replacer has the responsibility for a certain amount of customers and has to ensure capacity. Suppose that one customer needs 20 trucks to accommodate a certain volume of goods, it is the driver replacer that has to fill these spots. The driver replacer also has an important responsibility to retain drivers. Instead of a driver switching truck companies, the driver replacer can move a driver to another account. Naturally, this is only possible of there is a need for a driver in a certain account. However, one department is solely focusing on the driver relations. A driver relations specialist can be seen as a re-recruiter, life coach or an impartial mediator. Incoming calls include everything from a driver complaining about his or her fleet manager to financial issues. The role of the driver relations specialist is then to listen and advice. When needed, the driver relations specialist acts and involves the necessary role. During the shadowing it was evident that the driver relations specialist did listen and wanted to reach to the root cause of a certain complaint. One example is when the driver relations specialist got a phone call from a driver that was not

satisfied with the fleet manager. However, the real issue was that the driver was working in an account not desired. The driver relations specialist then created a conference call and added a driver replacer. This outcome of this particular interaction was successful.

Drivers are divided into different segments. First of all, drivers are divided into students and experienced. Students are not allowed to drive solo, which means they need to drive with a trainer for a certain amount of time. These trainers are specially trained to teach student drivers and get an extra monetary compensation. Students are not allowed to drive between 00:00 – 06:00. Teams can also be made up by two experienced drivers. Naturally, the fleet also incorporates solo-drivers. As mentioned earlier, the different driver segments are something that the load planners need to consider.

As mentioned before, the drivers aspirate a large amount of miles. This in turn generates a larger salary which in fact increases the driver satisfaction. The fleet manager can try to influence the load planning by adding certain information in the system. When a fleet manager notices that a driver has been complaining lately about e.g. too few miles, consequently the fleet manager tries to influence the load planner by adding a small note in the system. It is evident that the load planner foremost considers the loads along with the working responsibilities. The load planner never talks to the driver, which means no relation is created. Nevertheless, the fleet manager builds a close relation with the driver. However, the home time for drivers also increase their satisfaction and thereby the probability to stay at the company.

Every fleet manager picks a 'driver of the week' within their certain fleet. The motivation for being granted 'driver of the week' can be e.g. most miles or least accidents. The prize also involves a monetary compensation.

5.3.4 Planning parameters and measurements

The driver regulation in driving hours is a constraint that the load planner needs to assess when assigning a load. As mentioned earlier, the system provides the information about the remaining driving hours. However, it is important for the driver to exactly monitor for how long he or she has been off-duty, sleeping, driving or on-duty (e.g. loading). The monitoring is performed through the communication tool and is essential for the driver to keep track of. The system also visualizes how many hours the driver has left before a longer break is needed.

The area load planner in the Van Network plans in a highly dynamic environment in compared to the account manager in the Dedicated Services. The account manager usually gets orders in advance and can plan the transports several days ahead. This means that the

drivers know their schedule in advance and can plan better. Since the account manager also has other working responsibilities than just load planning, it is important to find time for other administrative issues.

As mentioned before, during the transport planning process it is essential for the transport planner to acknowledge the different shipment IDs. Additionally, the load planner has to keep track of empty miles and make sure that it is as low as possible. Either by help from the system or by visualizing which driver is closest and has the sufficient time left to drive.

Werner works consistently with different KPIs to measure and monitor their processes. However, the Associate Vice President of Operations the Van Network exemplified the importance of not comparing team drivers with solo drivers or teams with students. KPIs on drivers in the Van Network are fuel performance, late deliveries, empty miles and if the driver is idling a lot. The Dedicated Services department added internal KPIs, which are profit, insurance cost, driver retention, operating ratio, insurance cost/mile, accidents/mile, out-of-route miles, miles/truck, revenue/truck and idling/truck.

Werner also monitors external KPIs in which the customer specifically demands. Examples of these are cost, service level, utility, safety scores (CSA), stops and backhaul revenue. External KPIs differs a lot between customers and it is up to the customer to inform Werner regarding what they want to measure.

All the U.S. hauliers are measured by the Federal Motor Carrier Safety Administration (FMCSA). Compliance, Safety, Accountability (CSA) is designed to monitor and evaluate hauliers and drivers according to seven basics. These seven basics are unsafe driving, controlled substances and alcohol, driver fitness, hours of service compliance, vehicle maintenance, hazardous material compliance along with crash indicator. An example is that Werner can get a 'point' on unsafe driving if a driver is violating the basic. Since Werner have 7000 trucks it is important to keep the score as low as possible since customers can choose to not use a haulier due to bad safety scores. Therefore, Werner monitors the CSA individually for drivers as well. This can be used for training and employment decisions. The CSA score also affects the probability of Werner hiring a driver, since the record is in the database for three years. If a driver has a bad CSA score, Werner can decide not to hire that particular driver.

Werner employs different meetings regarding the different KPIs. Supervisors have weekly follow up meetings with their respective teams and at least bi-weekly the Directors are involved. During these meetings discussions regarding all the KPIs and the wins and areas that need improvement are performed. Additionally, there's a monthly meeting where the Vice President, Director and Supervisor meet to discuss the KPIs and financial performance

of each business unit. From a customer perspective, quarterly business reviews to go over the KPIs that the customer has set for Werner takes place. Moreover, the management team for the divisions meets weekly to discuss Werner KPIs that include business opportunities, sales, financial performance and any other hot topics at that particular time.

5.4 Personal communication with Professor Peter Klaus

The following sector provides information gathered through personal communication with professor Peter Klaus at Friedrich-Alexander-Universität Erlangen Nürnberg. Professor Peter Klaus together with four German trucking industry members visited ten large truckload companies in the U.S. during November 2015.

According to Professor Peter Klaus, many of the top 20 FTL operators in Europe are diversified global forwarders, such as DB Schenker, DHL, DSV and Kühne & Nagel. The FTL operations are traditionally managed through decentralized structures in these companies. Pricing, planning, dispatching, and customer service are performed in fragmented manners at the local level.

During the tour, three specific questions constituted the core of the discussions:

- What kinds of business models are followed by the leading, successful US FTL companies? What are the drivers of profitability perceived among these, their views on key strategic challenges and on expected changes in their markets and competitive environments in coming years?
- How are the everyday core processes of order processing, fleet planning, dispatch and pricing being managed? What is seen as best practice in this context?
- More specifically, which current and future developments with regard to use of information and communication are foreseen?

Regarding the kinds of business models utilized by successful US FTL companies and which is directly related to Werner is "Asset-based Dry Van". Professor Peter Klaus references back to Corsi and Grimm (1987), Lane (1987) along with Müller and Klaus (2009) and it is possible to acknowledge certain features:

- A diverse, but geographically balanced customer base
- Standardized, mostly owned fleet
- 1:3 tractor and trailer equipment ratio to maximize drop and hook operations
- Centralized dispatching with comprehensive, real-time visibility of fleet positions, loading states and shipper demand

- Mobile communication and information technology for real-time vehicle location, interaction with drivers, optimized fleet- and route planning and control, paperless order processing and invoicing
- Fleet operating bases strategically located across the service geography for easy and efficient on-route supplies of fuel and maintenance, also suitable to support relay operations and layover stays by drivers
- Proprietary fleet capacity complemented by brokerage operations for meeting peak capacity demands and selling excess capacity

Professor Peter Klaus along with the four German trucking industry members observed best-practices in the FTL operations which are not generally familiar in European FTL operators. The U.S. FTL operators focus on maximizing the number of "no-touch" and "perfect order" transactions. Examples of activities in the process of "order-to-payment" are:

- *EDI load acceptance message*, where only the customer service representative intervenes if necessary.
- *Load planning* through a IT-supported process which considers fleet availabilities in the respective region, identifies suitable capacity and locates "best" match between load and available drivers/trucks.
- *Communication with driver* (message to driver and confirmation from driver)
- *Physical pickup* and trip start message
- *Physical load delivery* and securing of "proof of delivery"
- *Driver communication and exception alerts:* through Qualcomm and Peoplenet tools

Another observation of best practice is the monitoring to predict, manage, balance and smoothing the daily freight flows. Different tools and best practices within this is the following:

- The aptitude to forecast demand through DAT Trendlines, company specific for region-by-region, lane-by-lane, weekly and monthly.
- Segmenting of long-distance truck routes with the use of a relay- and intermodal network to optimize equipment and driver rotations.
- The ability to selectively share capacities between the Dedicated Services and the Dry Van Segment where appropriate.

6. Analysis

The following chapter depicts the analysis between the different cases through the lens of the literature review and the theoretical framework. The sub-chapters are divided into the two formulated research questions in order to present the analysis in a well-defined manner.

6.1 RQ I. What are the differences how the U.S. hauliers are planning their trucks compared to how European hauliers do it?

The transport planning process varies between the continents, but also within the respective companies as depicted in the empirical findings. The European road transport sector is in fact highly fragmented and contains many layers of decision as explained by Müller and Klaus (2009), Walther (2010) and Sternberg et al. (2013a). In the case of DHL in Helsingborg, 90% of the drivers belong to different sub-contracted hauliers. Even though DHL in Helsingborg decides which loads should be handled by which truck and driver, there is still an external haulier who forwards the orders and controls the process. DB Schenkers notion of utilizing partner fleets with the same logo and IT-system highlights another planning and control issue where the haulier receives orders but plans the transport internally.

Utilizing the extended framework for transport planning and control based on Stefansson (2004), Stefansson (2006) and Sternberg et al. (2013a) depicted in Figure 6, enables a the visualization of DHL, DB Schenker and Werner. It is clear that Werner fits within the simple constellation with their internal transport control, proprietary fleet and employed drivers. Even though a small degree of owner-operators are hired, they can still be seen as employed drivers due to the standardized communication tools utilized. Additionally, the owner-operators are also controlled internally by Werner. However, DHL and DB Schenker constitute more complex constellations. The case of DHL as a LSP in Helsingborg makes use of sub-contractors containing their own fleets and drivers. The interviewed DB Schenker haulier is part of a partner fleet in a cooperative transport control where the DB Schenker haulier plans the loads internally. However, DB Schenker can be seen as external controller and planner since the orders are distributed from them. The complex constellation inhibited in DHL and DB Schenker leads to what Sternberg et al. (2013a) elucidate in a fragmented control and planning due to the fact that road hauliers' vehicles pertain to small fleets. Figure 17 visualizes DHL, DB Schenker and Werner by positioning the different constellations.

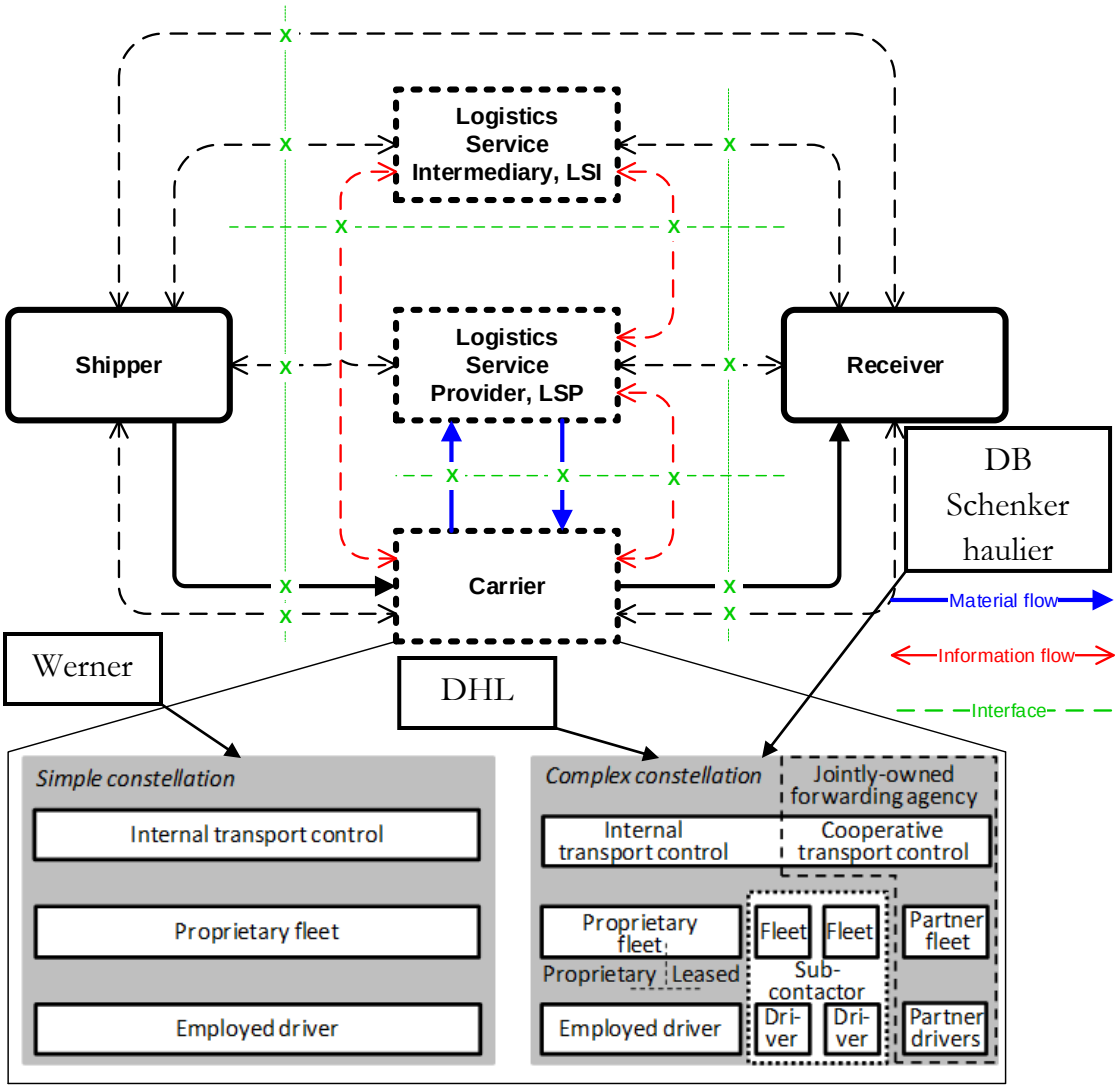

Figure 17: Constellation analysis by cases

When deeply examining the transport planning process, the customer orders play a particularly important role. Tjokroamidjojo et al. (2006) stipulated the inherent need of advance load information to enable pre-planning. Consequently, it would benefit drivers' job satisfaction for drivers and lower idle times. This goes hand in hand with the notion to plan for capacity and thereby handle the received orders. Personal communication with Peter Klaus directed the conversation to the U.S. hauliers ability to forecast demand through DAT Trendlines. Thereby enabling prediction of capacity needed on certain lanes, regions, monthly and weekly. Werner also has a function incorporated in the IT-system to visualize capacity for the customer service manager when entering an order. However, as overheard by the shadowed customer service manager; the system cannot predict or sense weather issues. In that case, the human factor plays an important role. Seemingly, the European hauliers have issues predicting demand and Respondent A, B and C altogether explained an issue in

increased orders. Directly connected to what Tjokroamidjojo et al. (2006) explains is the incentive for shippers to reveal demand beforehand which in turn could ease the transport planning process.

Werner plan and control their transports in a centralized manner in Omaha, Nebraska as predicted prior to the company visit through reviewing e.g. Lane (1987), Corsi and Grimm (1989) and Müller and Klaus (2009). Contrariwise, the studied European carriers plan and control their transports in a de-centralized way. This creates a situation with many layers of decision and what Respondent C explained regarding finding the right person involved in the transport. Respondent B did surprisingly express a suggestion of planning transport in a more centralized manner. It easily happen that transport planners solely focus on their own region and the involved loads. Werner does in the regional planning however control on a regional basis where the system visualizes inbound and outbound goods.

Another noteworthy difference is the usage of transport management systems. Contrariwise to the European carriers, Werner heavily rely on planning systems inhibiting necessary information. Sanchez Rodrigues et al. (2008) stipulates directly related uncertainty within the transport management system and what Morash and Clinton (1997) adds about the absence of flexibility in terms of delivery frequency, time, location and product. Nowadays, transport management systems are more developed as visible at the company visit at Werner. The transport planning process between DHL and Werner is essentially quite similar when it comes to acknowledging inbound and outbound goods. However, the difference lays in how the information is stored and utilized. DHL utilizes 'booking tickets' in paper form, in contradiction the information is stored and used through the system at Werner. In fact, lots of information is stored in the transport planners' brain at DHL, as undertaken by Powell et al. (2002) and Crainic et al. (2009).

Within the scope of the transport management systems is the communication with drivers which affects the transport planning process. As depicted by Respondent A and B, time and quality can suffer through the additional step needed when communicating through different channels and non-standardized manners. An investment of advanced and standardized communication tools falls within what Crainic and Laporte (1997) names the strategic planning level. However, the operational planning level is undoubtedly affected by it. Werner and the DB Schenker haulier utilize a standardized communication tool to inform and handle drivers. Mason and Lalwani (2006) strain the need for information about position of trucks and drivers. The DB Schenker haulier and Werner utilizes GPS in the truck, but DHL uses GPS on the trailer. This is hardly surprising since DHL utilizes sub-contractors, it is more convenient to have a GPS on the trailer.

According to Mason and Lalwani (2006) along with McKinnon and Ge (2004) an absence of drivers can, hardly astonishing, cause delays in the transport process. This automatically leads the analysis towards the recruiting of drivers and the notion of retaining drivers. The DB Schenker haulier has not encountered any issues regarding recruiting or retaining night shift drivers. However, recruiting and retaining draymen is an apparent issue. Respondent C believes that the drivers stay due to habits and satisfying lanes. Respondent A and B did not have much to add to the question, since it is out of their working responsibilities. Respondent A and B exemplified when drivers try to influence the load planning in order to end their day close to home.

Nevertheless, driver retention is an ostensibly large issue for U.S. hauliers and is usually solved through keeping drivers close to their home domicile (Taylor et al., 1999, Taylor et al., 2001, Taylor et al., 2006, Taylor et al., 2009, Vergara and Root, 2013). In the case of the DB Schenker haulier which performs transport on pre-determined lanes, it is evident that the lanes are too extensive to incorporate a return to the home domicile after completing the journey. The DB Schenker haulier then needs to pay allowances, even though it is smaller due to the owned apartment. Taylor et al. (2009) stipulate the must regarding a maximum of ½ - 1 day of one-way delivery and to emphasize load circuity. A separate department at Werner handles the network optimization aiming to manage the lanes. The author was not able to shadow a load planner optimizing the lanes, however, a general overview was provided by the shadowed region load planner.

Respondent A expressed an issue in drivers trying to influence the transport planning by acknowledging a need to return to the home domicile. In the IT-system utilized by Werner it is possible to find suitable drop-and-swap locations between drivers to either eliminate late deliveries or to return drivers to their home domicile if needed. This contradicts what Taylor et al. (2006) explains about utilizing regional fleet dispatching instead of having to develop drop and swap locations. However, Vergara and Root (2013) discovered that a relay network to utilize drop and swap locations eliminates the need for excessive hubs. What is needed is a location to drop and swap trailers and collaboration with that particular location to ensure safety and monitoring. Seemingly, DHL utilizes a more 'craft-type', as named by Walther (2010), when it comes to enabling drivers return to their home domicile since the need is not communicated through an IT-system but may arise as a surprise seemingly close to the need.

Choy et al. (2006) along with Naim et al. (2006) expressed the need for information sharing in a collaborative manner between carriers to decrease integration and collaboration issues. Information is widespread in the utilized IT-system at Werner to incorporate the necessary information to plan transports. However, as expressed by Respondent A and B, the preliminary load planning usually gets foiled due to new information arising. Not being able

to directly monitor driving hours is causing large problems making Respondent A and B unable to plan in a more efficient manner.

Crainic and Laporte (1997) do acknowledge the time factor to be important within the operational planning level. Respondent A and B do express a stressful working environment with many different working responsibilities. At Werner, the dividing of working responsibilities into customer service, load planning and operations is seemingly eye-opening. However, as interpreted by the shadowed fleet manager it exists a risk of sub-optimization between the different responsibilities. When the fleet manager works towards retaining drivers and keeping production high a load planner might perform a drop and swap operation with a driver needing more miles to retain. The author actually got the question from a fleet manager if the load planner sees the messages they try to incorporate into the system, making the author believe that the dividing between working responsibilities in fact might not be as optimal as it seems.

Corsi and Stowers (1991) exemplified quantitatively a larger utilization for ATLFs compared to owner-operator firms. In the case of Werner, naturally the company wants to keep their trucks moving and utilize them as much as possible. This goes hand in hand with the driver satisfaction as well since pay is determined due to miles driven. The same goes for the DB Schenker haulier which proprietary owns 15 trucks, but drivers paid a fixed monthly salary. Respondent A and B naturally explained on-time delivery and pick up as the most important compared to the drivers. This is hardly astonishing since DHL hires hauliers for capacity and is not responsible to ensure that the trucks are utilized in an optimal manner. The responsibility therefore permeates through another layer into the owner of the haulier. Thereby, the haulier has to ensure that the proprietary trucks are utilized in a well-defined manner.

6.2 RQ II. How can the U.S. planning models be applied in Europe?

In order to create the foundation of reducing the layers of decision and the fragmentation within the European road transport sector it is beneficial for the hauliers to emphasize the different constellations as depicted in Figure 6. The following sub-chapter will thereby analyze potential U.S. planning models and their applicability to the European hauliers.

The two vastly different constellations pose different challenges. As evident from research question one it is possible to identify both the DB Schenker haulier and DHL as incorporated within the complex constellation. Figure 6 does pose a motivating point-of-view concerning collaborations needed. Collaboration, as explained by Stefansson (2006), becomes according to the author extra important within the complex constellation in order to gain competitive advantage and plan transports efficiently.

This in turn leads us to the first step concerning the collaboration with shippers. Tjokroamidjojo et al. (2006) does express the advantage of enabling pre-planning for carriers. According to Walther (2010) and Corsi and Stowers (1991) ATLFs builds their competitive foundation upon securing high-density freight on long term. This was also complemented during the company visit at Werner. Being able to forecast demand and in real-time visualize capacity can be utilized through enabling pre-planning by shippers revealing their demand. Since the European road-freight sector is highly fragmented and the shipper has many different options to choose from it harms the carrier negatively concerning the transport planning. The foundation for being able to incorporate the U.S. planning models does require an amount of collaboration with customers to reveal information. Furthermore, orders come through different channels in Werner, DHL and DB Schenker. A possibility lays in standardizing the order processing by creating incentives for the shippers.

Collaboration also involves contracted hauliers utilized. As explained by Lane (1987), Corsi and Scheraga (1989) along with Müller and Klaus (2009) the transport planning in ATLFs are managed in a centralized manner. This involves Werner as well as notable at the company visit. According to Walther (2010) a more centralized planning would enable more resourceful operations and economies of scale. On the other hand, if de-centralized a collaborative joint pool of loads could be beneficiary (Walther, 2010). This poses an opportunity for European carriers to incorporate and assess. As visible in the case of DHL, the different regional transport planners experience issues for sub-optimization within the regions not overlooking possibilities to collaborate.

In order to fully incorporate the planning models in the U.S. there is a need for investing in a central integrated transport planning system. Baumgartner and Léonardi (2004), Andersen et al. (2009) along with Sternberg et al. (2013a) do as well express concerns within the European road-freight sector and the need for integrated and advanced planning technologies. Neither Respondent A nor B utilizes a transport management system for planning transports. Respondent C utilizes a transport management system, however it does not incorporate all the necessary parts such as the location of trucks, fuel-consumption and orders. Three different systems are utilized for this. According to Corsi and Grimm (1989), one of the reasons to the success of ATLFs was improved dispatching technology. Werner utilizes a main frame for planning transports containing the necessary information for dispatching trucks efficiently. Respondent A and B physically put a puzzle using different booking tickets and have an enormous amount of information allocated in their brains making it extremely difficult for anyone to do their job. This in turns makes DHL sensitive for eventual absence of employees. Contrariwise, by utilizing a central integrated planning system it would ease the reliance on certain key transport planners and their competence. However, suppose that advance load information and more pre-planning would be enabled for Respondet A and B, the late information about driving hours still pose a threat. A central integrated transport planning managing the information about driving hours is highly desirable.

However, the question is how the European hauliers overcome the barrier of not standardized communication tools. As elaborated by Respondent A and B, issues can arise when it takes excess time to schedule a transport when communication is an issue. This is directly related to Fowkes et al. (2004) notion of delays affecting driving time regulations and random arrival times. All information flows through a communication tool within both Werner and DB Schenker. Nevertheless, DHL relies on communication through different channels with drivers. Since 90% of the drivers are handled by an external transport planner, an e-mail has to go through first and then a text message. An incentive for sub-contracted hauliers to utilize a standardized communication tool integrated with DHL has to be developed.

Respondent C explained issues in unexpected increases in orders and out-of-route miles making the author believing there is a need for re-assessing the lanes length and scope. Several mathematical models in the U.S. have been developed during the years with the aim to increase utilization and to manage home time for drivers (Taylor et al., 1999, Taylor et al., 2001, Taylor et al., 2006, Taylor et al., 2009, Vergara and Root, 2013). Werner also has a relay network built upon terminals and drop yards which also enable maintenance as communicated with Peter Klaus. As evident by interviewing European hauliers, the home time for drivers is not that prioritized on the agenda. The DB Schenker haulier does handle it

by utilizing fixed schedules and lanes. However, at DHL it is managed by a 'craft type' as Walther (2010) would express it. In order to incorporate the transport models utilized in the U.S. the information and the infrastructure are crucial. DHL has plentiful terminals to utilize for drop and swap locations; however the challenge lies in utilizing the proper strategy. It is tough for the transport planners to manually handle these operations.

Werner also utilizes more KPIs to acknowledge need for improvement and to ensure that the proper path is allocated towards maintaining utilization and profit. Neither Respondent A, B nor C did express a need to know about the performance when planning transports since it goes hand in hand. However, since Respondent B explained that the follow up meetings regards the performance in total and it is not easy to visualize what the transport planner can improve on.

7. Conclusions and discussion

The concluding chapter firstly presents the conclusions from the analysis of the empirical findings and utilized theory. Thereafter a discussion in regards to the society and the research community is performed. Lastly, a discussion regarding the methodology utilized followed by suggestions for future research.

7.1 Conclusions

Since the purpose of the study is *to improve European transport planning* the following conclusions summarizes the most important findings in order to create the foundation:

- Fragmentation and many layers of decision in the European road-freight sector make it difficult to plan and control transport services in an efficient manner compared to the U.S. ATLFs.

- The U.S. carriers act in more simple constellations with large proprietary fleets compared to the European carriers with large amounts of hired sub-contractors. This is exemplified using the self-developed extended framework for planning and control where Werner undoubtedly fits within the simple constellation. Additionally, the DB Schenker haulier and DHL are depicted as within a complex constellation.

- Centralized planning utilized by U.S. carriers to utilize economies of scale and resourceful operations compared to the de-centralized manner in Europe.

- The centralized planning at U.S carriers is incorporated with a central integrated transport planning system managing the required information to plan transport efficiently. The in-hand thesis has acknowledged the need for a central integrated transport planning system by examining two European carriers. The DB Schenker haulier does utilize a system integrated with DB Schenker. However, two other systems are needed to manage other sufficient information.

- The U.S. carriers utilize advanced transport models to inhibit large resource utilization and to service home time for drivers. In order for European carriers to utilize the transport models more information and advanced technology are needed.

- Non-standardized communication tools make it difficult for European carriers to communicate with drivers and an incentive is needed to find a win-win situation.

7.2 Discussion

The in-hand thesis has contributed to the dissertation written by Walther (2010) and the book by Müller and Klaus (2009), acknowledging the need to examine more than the German TL segment. The author has contributed by widen the span into the Swedish TL segment. Moreover, by categorizing the U.S. and European carriers in the self-developed extended framework of planning and control further strengthens the argument of the constellations. The author also examined the operational planning level in a more in-depth way by mapping the transport planning process. By mapping the process from order to execution it has been possible to draw conclusions on a more operational planning level contributing to the field of research. Moreover, the drawings of Werner, DHL and the DB Schenker haulier concerning planning and control have showcased more external planning and control inhibited within the European road-freight sector. This conclusion goes hand in hand with the extended framework of planning and control showcasing the constellations.

The excessive amount of information gathered from the three different cases did ensure the possibility to conclude beforehand reviewed literature to correspond to the situation in the European and U.S. road-freight market. The applicability of the ATLF-model in Europe is in fact suitable with adjustments as explained by Müller and Klaus (2009) along with Walther (2010). However, the author believes the need is stronger than the applicability. Extremely large investments would be required to incorporate the full ATLF-model, making the author deem the process of converting to be too extensive monetary wise. On the more bright side, European carriers can in small sequences incorporate parts in order to create more efficient planning operations. What first comes to the author's mind is the engagement in transport management systems and standardized communication tools. Evidently, the absence of these components co-creates poor planning operations and difficulties for transport planners. We cannot omit the vulnerability within European carriers where much information is stored within the transport planners' brains. The European carriers cannot neglect the competition by U.S. carriers entering the European road-freight market by acquiring firms either.

The author does believe the ATLF-model being the next step for the European road-freight market. With increasing awareness from the society of the environmental impact caused by the trucking industry, there evidently is a need to plan transport better. Not only for the result of increasing profit, also to decrease the environmental consequences caused due to poor planning. The quality of life on the road is considered to be low and several thousands of drivers live in their trucks for months. This in turn creates a pressure on European carriers to eliminate poor planning and for shippers and customers to re-consider their policies of purchasing transport.

The notion of monitoring the U.S. hauliers and truck drivers by CSA-scores showcases an effort towards increasing safety and control. This brings an interesting point of discussion to the European road-freight sector, since neither the employer nor customer have any information regarding safety aspects of their utilized haulier or driver. Efforts in Sweden regarding YKB have been implemented to enhance the notion of responsibilities and skills in drivers. However, the next question regards if it is achievable to monitor the European hauliers in the way the U.S. hauliers are. The author believes this might be one of the next discussion points towards making the complex European road-freight sector more transparent and safe.

7.3 Critique of methodology used and limitations

The author is aware of the manifold studies and researchers utilizing mathematical modeling and simulation to quantitatively measure and streamline the transport planning process. Firstly, the plan was to examine potential in efficiency and utilization for European carriers by simulating the U.S. transport models in European carriers. However, this was not possible due to the unwillingness of the U.S. and European carriers to reveal sufficient data. It is therefore not possible to acknowledge any efficiency enhancing differences by incorporating transport management systems or to utilize the U.S. transport models. The author can therefore only incline on previous research incorporating quantitative methods to draw certain conclusions.

Noteworthy, the company visit at Werner naturally provided interesting and resourceful information. However, since Werner was aware of the author's arrival there is a tiny risk that the shadowed individuals might have presented a glorified image. This is however only a speculation, but noteworthy to mention. The author did naturally put emphasis into the issue; nevertheless the data gathered during the shadowings will be difficult to gather once again due to the fact that the same phone calls will never occur again. Interviews performed at Werner were not allowed to tape record, which in turn created an issue in analyzing the data afterwards. At the same time, the legal restrictions did not make it possible to do it in another manner.

The author did only examine one case in the U.S. which weakens the conclusion that the exact same process of transport planning is carried out throughout the continent. The same goes for the two European carriers. Correspondingly, the amount of goods utilized in LTL at European carriers was astounding and made it difficult for the author to compare and segment.

7.4 Suggestions for future research

The author suggests further research to inhibit European carriers utilizing a proprietary fleet with a large amount of trucks. Additionally, U.S. carriers acquiring European carriers to enter the European road-freight market pose an interesting challenge to research. An obvious example would be to study XPO Logistics.

Furthermore, to quantitatively assess the U.S. transport models applicability and efficiency enhancing progress to the European carriers could bring more value. The application of the ATLF-model in Europe in comparison to the monetary investment needed also pose an interesting subject.

A need for a comparison with other continents cannot be neglected. Asia as an extremely transport-oriented continent can be the next continent to examine.

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10. Appendices

10.1 Literature review

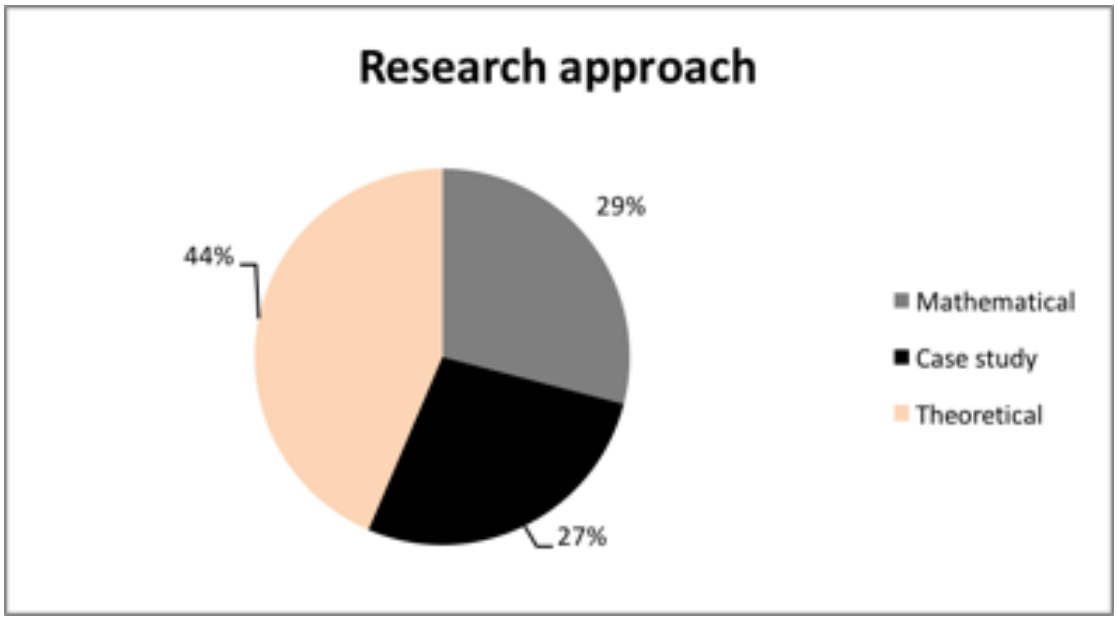

Figure 18: Research approaches of articles

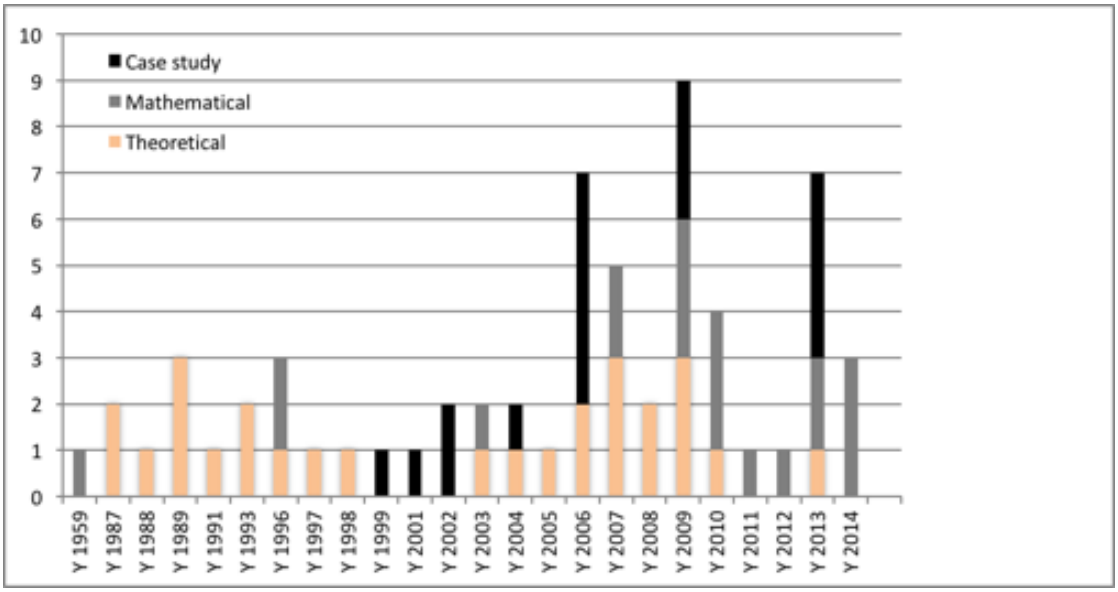

Figure 19: Research approaches over the years

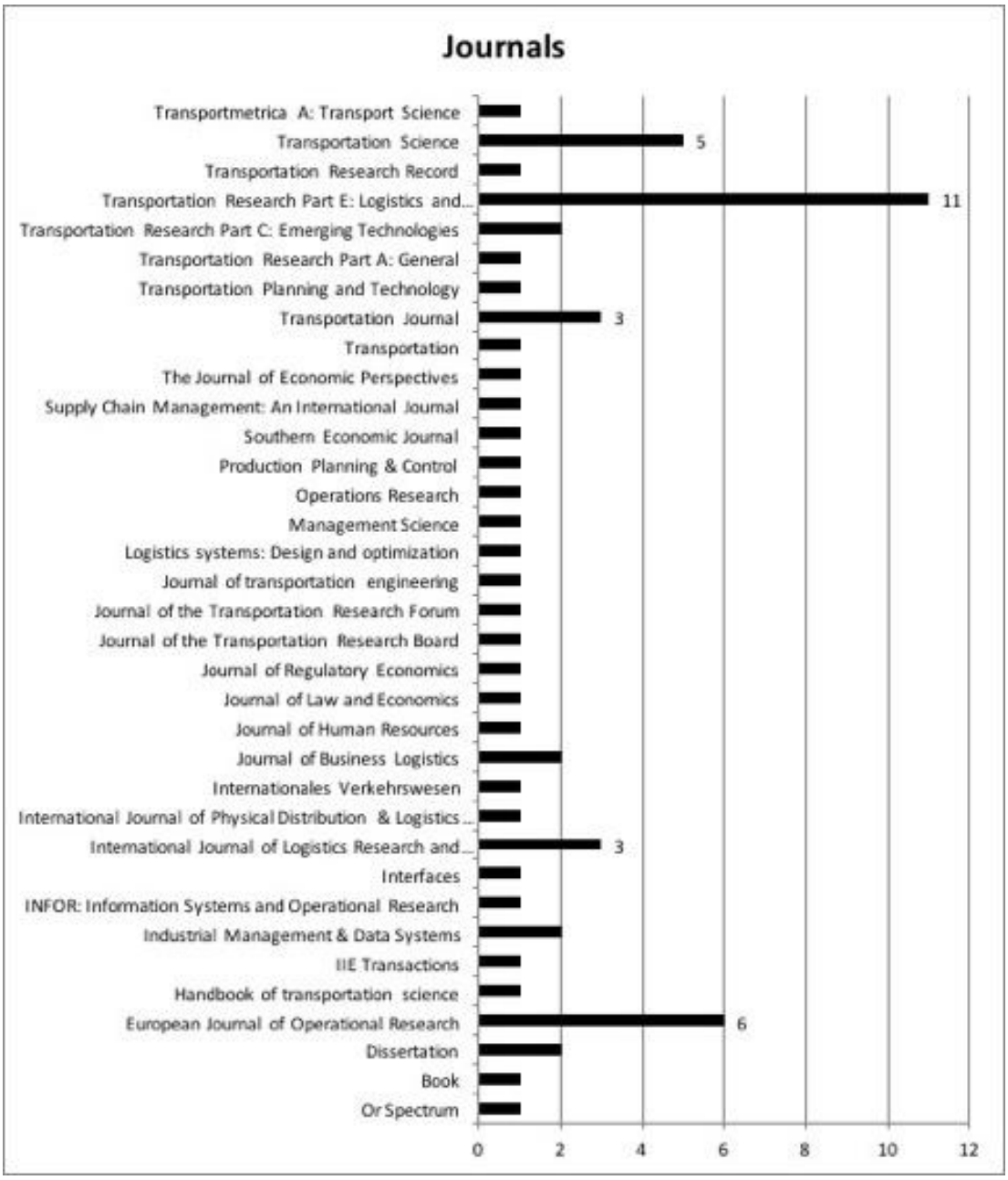

Figure 20: Number of reviewed articles in journals

10.2 Interview guide

General questions

- What are your title and working responsibilities?

- What is your background? How long have you worked in the company?

- Can you guide me through a normal working day?

- How many trucks and drivers have you got the responsibility for?

- How does the distribution between own trucks, owner operators and sub-contractors look like?

- How does the collaboration between you and subcontractors look like?

- How do you choose which sub-contractor to use?

- What does the distribution of jobs look like? Contracts, spot market etc.

The transport planner role

- How would you define a transport planner?

- Which parameters do you consider when you plan a transport?

- Are there parameters you cannot control?

- Can you describe the major 'problem' that you face in your every day work?

Transport management systems

- Do you utilize any fleet management systems or planning systems? Do you use any systems for drivers? Do you use any applications?

- Do you utilize any alternative dispatching? (Zones, hubs, regional, lane, pipeline, relays)

- KPIs? How do you measure your performance? (E.g. driver utilization or empty movements) Do you have any follow-up meetings regarding it?

The transport market

- Describe the road freight market in the U.S./Europe. How do you perceive it?

- Have the U.S./European transport market changed during the years when you have been involved? If it has: how?

Drivers

- Is driver retention something that you regard as important? In that case, how do you make sure that drivers stay at the company? How does the driver retention rate look like at the company?

Freight flow

- How does the resource utilization look like for drivers and trucks? How do you make sure that you maximize them?

- Have you noticed any imbalance problems? I.e. that you have to send something to an area where there is less chance of getting a 'backload'? How do you handle that?

- How do you consider empty movements? How do you handle allocation of empty trailers?

The transport planning process

- Order entries? How do you decide if you can take an order or not?

- Can you describe the transport planning process from order to execution?

10.3 Consent form

Berörda parter

Viktor Åkesson, Lunds universitet

Jag, …… samtycker till att medverka i en forskningsstudie i Service management, logistik för Lunds universitet.

Studiens syfte och vetenskapliga natur har förklarats för mig muntligt och/eller skriftligt. Jag medverkar frivilligt.

Jag tillåter att min intervju med Viktor Åkesson spelas in.

Jag förstår att jag har rättighet att när som helst dra mig ur studien.

Jag förstår att medverkan inkluderar fullständig anonymitet och att min identitet och diverse företagsnamn kommer att benämnas vid kodnamn i studien.

Jag förstår att utdrag från min intervju kan komma att citeras i studien om tillåtelse ges nedan:

(Var god kryssa i en ruta)

Jag tillåter att utdrag från min intervju citeras	[ ]
Jag tillåter INTE att utdrag från min intervju citeras	[ ]
Signatur [respondent]…….	Datum:……
Signatur [forskare]…..……	Datum:……

10.4 Werner agenda

Werner Enterprises, Inc.

Akesson Training Agenda

Corporate Headquarters
Omaha, Nebraska

Day	Start Time	End Time	Topic
Wednesday, April 20, 2016	9:00	11:00	Welcome / Introductions Corporate Headquarters Tour Company Overview
	11:00	12:00	Vice President of Recruiting
	12:00	13:00	Compass Event Lunch Vice President of Werner Global Logistics
	13:00	14:30	Recruiting Department Job Shadow
	14:30	15:30	Manager of Driver Relations and Driver Resources
	15:30	17:00	Driver Relations Department Job Shadow
Thursday, April 21, 2016	9:00	10:00	Senior Vice President of the Van Network
	10:00	12:00	Van Customer Service and Load Planning Department Job Shadow
	12:00	13:00	Lunch
	13:00	14:00	Vice President of Werner Global Logistics
	14:00	16:00	Werner Global Logistics Department Job Shadow
	16:00	17:00	Associate Director of ITS
Friday, April 22, 2016	9:00	10:00	Vice President of Dedicated Services
	10:00	12:00	Dedicated Services Department Job Shadow
	12:00	13:00	Lunch
	13:00	15:00	Safety Department Overview and Job Shadow
	15:00	17:00	Van Network Operations Department Job Shadow

WETEC

Figure 21: Werner agenda