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Published in: Adapting to the Future:
Carlos Jahn, Wolfgang Kersten and Christian M. Ringle (Eds.)
ISBN 978-3-754927-71-7, September 2021, epubli

An Approach to Analyzing Shippers' Transportation Management

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Purpose: *The purpose of this article is to present an approach to analyzing the organizational design of shippers' transportation management from a process perspective.*

Methodology: *The proposed analysis approach is based on a comprehensive literature review on transportation management. The literature is categorized by horizontal, vertical, and internal organizational design strategies as well as process levels.*

Findings: *The literature review reveals organizational design strategies and processes of transportation management. Furthermore, by transferring the results into an approach to analyzing the organizational design of a transportation management, it is shown that processes are shaped by organizational design strategies, which can lead to a variety of process variants. Each of these process variants, in turn, influences the performance of a transportation management organization.*

Originality: *The revealed organizational design strategies and processes contribute to explanation-oriented and design-oriented research in the context of transportation management. The proposed analysis approach further provides a methodological contribution for shippers dealing with the optimization of their transportation management.*

First received: 13. Apr 2021 *Revised: 29. Aug 2021* *Accepted: 31. Aug 2021*

1 Introduction

Transportation Management (TM) is considered an essential function to ensure seamless supply chain operations (Stank and Goldsby, 2000). From a shipper's perspective, TM can be defined as the combination of processes, organization and IT to plan and control transportation execution (Seiler, 2012). A shipper is a company that needs to move goods (Caplice, 2007). While in the past, many shippers owned a fleet to satisfy their transportation demand, today, physical transportation is often outsourced to carriers (Seiler, 2012). Carriers are logistics service providers (LSPs) that own transportation assets and whose main business is the transportation of freight (Caplice, 2007).

The study is inspired by the preparations for a project to analyze and optimize the TM organization of a globally operating automotive supplier, in which one of the authors was involved. From discussions with the practitioners, the question arose about how to analyze the TM systematically. This paper aims to answer this question by developing an approach to analyzing the organizational design of shippers' TM from a process perspective, based on a literature review on organizational design strategies and processes of TM. The focus here is on shippers who do not have a fleet and satisfy their transportation demand via the transportation market. The analysis approach supports shippers in identifying areas for process improvement and organizational redesign. Additionally, the literature reviewed to develop the analysis approach provides a comprehensive overview of the TM knowledge base and can be used as a foundation for future explanation-oriented and design-oriented TM research.

The remainder of this paper is structured as follows. The review methodology is described in Section 2. In Section 3, the review results are presented, and in Section 4, the analysis approach is developed. Finally, the paper concludes with a discussion on the research results and further research opportunities in Section 5.

2 Methodology

To achieve the aim of this paper, first, a systematic literature review was conducted to identify organizational design strategies and basic processes of TM as a basis for developing the analysis approach. For systematization, the guidelines for systematic literature reviews by Durach, Kembro and Wieland (2017) were followed. At first, the research topic was conceptualized, and the scope of the literature review was defined.

In the second step, inclusion and exclusion criteria for paper selection were created. Accordingly, only papers that contribute to processes or organizational design strategies in the TM of shippers without a fleet were considered for paper selection. Furthermore, all papers not written in English, which is regarded as the dominant language of supply chain and logistics research (Pan, et al., 2019), were excluded. To ensure a high quality of publications, the authors included only publications from journals ranked in the top quartile in at least one category in the Scientific Journal Ranking 2020 of SCImago Journal & Country Rank. An exception to this is the monographic publication by Seiler (2012). The monography was used to conceptualize the research topic as it provides a comprehensive overview of TM. Despite the violation of the defined quality criterion, the publication was included in the literature review not to neglect its contributions to TM processes and the design of TM organizations. However, the example shows that the selection criterion used carries the risk that some high-quality publications in other journals or specialized media were not included.

The next step was the literature search. For a broad search, papers in the Web of Science and the Business Source Premier database were searched for the keyword "transportation* management" in title, abstract, and keywords.

The inclusion and exclusion criteria were applied in the fourth step to reduce the sample of identified papers by irrelevant publications. First, all non-English language papers, papers that were not published in Q1-ranked journals, and all papers that violated thematic requirement criteria in the title or abstract were excluded. Subsequently, the remaining articles were subjected to a full-text analysis. For all articles that met the inclusion criteria, an additional forward and backward search was conducted. The procedure for eliminating irrelevant publications was retained. Figure 1 shows the results

of the paper selection process.

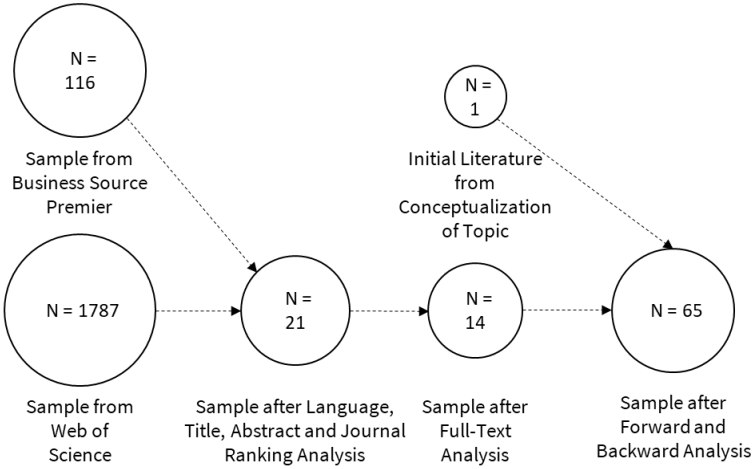

Figure 1: Paper selection process

Finally, the relevant literature was synthesized and used as a basis to develop the analysis approach. A coding scheme was used to extract data for synthesis. Literature was coded by author, year of publication, title, journal, contributions to organizational design strategies, and contributions to processes. Organizational design strategies were further divided into vertical, horizontal, and internal organizational design strategies based on the design dimensions introduced by Mason, Lalwani and Boughton (2007). Processes were differentiated according to strategic/ tactical and operational processes. The review results are presented in the following section.

3 Review Results

The literature review reveals three vertical, three horizontal, and three internal organizational design strategies. In addition, four processes were found in the strategic/tactical area, and seven processes were found in the operational area of TM. In the following, we present the review findings on the different organizational design strategies and processes.

3.1 Vertical Design Strategies

Vertical design strategies are business decisions about how the production of goods and services is organized. A basic distinction can be made between a "do" and a "buy" strategy (Mason, Lalwani and Boughton, 2007; Selviaridis and Spring, 2007).

3.1.1 Carrier Contract Strategy

Shippers without a fleet inevitably pursue a “buy” strategy to execute transportation. The “buy” strategy for transportation services can be further divided into sub-strategies depending on the form of contract used to govern carrier relationships. The literature distinguishes between contract relationships based on longer-term (annual or longer) contracts and transactional relationships based on contracts agreed on the spot market (Krapfel and Mentzer, 1982; Caplice and Sheffi, 2003; Caplice, 2007; Günther and Seiler, 2009; Seiler, 2012; Jothi Basu, Subramanian and Cheikhrouhou, 2015; Scott, 2015; Lafkihi, Pan and Ballot, 2019). According to Caplice (2007), the main difference between the two forms of contract is the type of carrier assignment and the type of carrier price. With spot contracts, carriers are selected on a load-by-load basis, and the price is agreed upon at the time of demand. In contrast, with longer-term contracts, carrier assignment and pricing are governed by standing contracts. Additionally, the author points out that a contract relationship strategy does not exclude spot contracting, as it is always possible that there is no contract rate for a transportation demand, or all contracted carriers have rejected a load.

While in the past, a transactional relationship strategy prevailed among shippers, today,

the contract relationship strategy dominates (Caplice and Sheffi, 2003). The importance of contractual relationships is underlined by literature, which reports several benefits that shows that longer-term contracts with carriers have become an essential tool for cost and service management in TM (Krapfel and Mentzer, 1982; Kleinsorge, et al., 1991; Walter, Allen and Rouviere, 1991; Lambert, Emmelhainz and Gardner, 1996; 1999; Caplice and Sheffi, 2003; Tyan, Wang and Du, 2003; Caplice, 2007; Fugate, Davis-Sramek and Goldsby, 2009; Günther and Seiler, 2009; Bø and Hammervoll, 2010; Chen, Yeh and Chen, 2010; Chan and Zhang, 2011; Li and Chan, 2012; Seiler, 2012; Monios and Bergqvist, 2015). However, the literature also shows various impediments and risks in implementing a contract relationship strategy (Caplice and Sheffi, 2003; Caplice, 2007; Jothi Basu, Subramanian and Cheikhrouhou, 2015; Scott, 2015).

3.1.2 Transportation Management Outsourcing Strategy

The TM outsourcing strategy primarily refers to the extent to which TM activities are outsourced. In the literature, however, there is no uniform understanding of the extent of TM outsourcing. While some papers indicate that TM activities are either fully outsourced or entirely performed in-house (Sheffi, 1990; Hsiao, et al., 2010), other studies provide a more differentiated view. These studies show that outsourcing is not an all-or-nothing decision and can involve individual activities or a bundle of activities ranging from more strategic activities such as rate negotiations to operational activities such as freight auditing (Dapiran, et al., 1996; Razzaque, 1998; Wilding and Juriado, 2004; Hung Lau and Zhang, 2006; Win, 2008; Seiler, 2012; Soinio, Tanskanen and Finne, 2012; Mehmann and Teuteberg, 2016; Hwang and Kim, 2019; Premkumar, Gopinath and Mateen, 2020).

Besides the decision on the outsourcing extent, another decision of the outsourcing strategy concerns the type of the outsourcing partner. Typically TM activities are outsourced to a nontransportation-asset-owning or an asset-owning LSP (Sheffi, 1990). In papers discussing different types of LSPs, LSPs that do not own transportation assets and provide a bundle of services to organize transportation are today often referred to as fourth-party logistics provider (4PL), while LSPs that do not meet these criteria are referred to as third-party logistics provider (3PL) (Selviaridis and Spring, 2007; Win, 2008;

Hingley, et al., 2011; Seiler, 2012; Soinio, Tanskanen and Finne, 2012; Hingley, Lindgreen and Grant, 2015). Furthermore, some contributions indicate that TM activities can be outsourced to a joint venture formed by a shipper and LSP (Lambert, Emmelhainz and Gardner, 1996; 1999; Hingley, et al., 2011; Hingley, Lindgreen and Grant, 2015). Additionally, Potter, Mason and Lalwani (2007) note that a shipper's suppliers may also perform TM activities on behalf of the shipper.

3.1.3 Inbound Control Strategy

Traditionally, the responsibility for transporting goods in a buyer-supplier relationship lies with the supplier. In some industries such as automotive and retail, however, there is an increasing tendency to vertically integrate the organization of inbound transportation. This strategy is referred to as factory gate pricing (FGP). (Mason and Lalwani, 2006; Mason, Lalwani and Boughton, 2007; Potter, Mason and Lalwani, 2007) Many studies on FGP show the benefits of this strategy. Potential benefits include more possibilities for shipment consolidation, improvements in freight rates and transportation service, rising transportation costs for competitors with the same suppliers and without FGP, and increased transparency in price negotiations with suppliers, as transportation prices no longer bias the purchasing price (Mason and Lalwani, 2006; Mason, Lalwani and Boughton, 2007; Potter, Mason and Lalwani, 2007).

3.2 Horizontal Design Strategies

Horizontal design strategies address business decisions regarding the extent to which shippers collaborate in TM. A fundamental decision in this context is, first of all, whether or not to collaborate with other shippers (Mason, Lalwani and Boughton, 2007). If collaboration is pursued, the scope of collaboration can be determined by the following strategies.

3.2.1 Shared Processes Strategy

One of the most important decisions concerns the assets to be shared in a shipper collaboration. These can be data, information, infrastructure (e.g., warehouses or hubs), carriers, market power, expertise, knowledge, and processes (Caplice and Sheffi, 2003;

Ergun, Kuyzu and Savelsbergh, 2007; Audy, D'Amours and Rousseau, 2011; Audy, et al., 2012; Audy, D'Amours and Rönnqvist, 2012; Jothi Basu, Subramanian and Cheikhrouhou, 2015; Pomponi, Fratocchi and Rossi Tafuri, 2015; Sanchez Rodrigues, Harris and Mason, 2015; Palhazi Cuervo, Vanovermeire and Sörensen, 2016; Allaoui, Guo and Sarkis, 2019; Basso, et al., 2019; Pan, et al., 2019; Ferrell, et al., 2020).

As the literature shows, shared processes often form the basis for sharing other assets. For example, a collaborative freight procurement process is used to increase market power and build a shared carrier base (Ergun, Kuyzu and Savelsbergh, 2007). Likewise, a collaborative network design process is executed to set up shared logistics locations, and transportation demand information is shared in a collaborative transportation planning process (Audy, D'Amours and Rousseau, 2011; Audy, D'Amours and Rönnqvist, 2012; Palhazi Cuervo, Vanovermeire and Sörensen, 2016).

3.2.2 Leadership Strategy

The leadership strategy is about deciding who performs collaborative activities on behalf of others (Basso, et al., 2019). Different forms of leadership are described and studied in the literature (Audy, D'Amours and Rousseau, 2011; Hingley, et al., 2011; Audy, D'Amours and Rönnqvist, 2012; Hingley, Lindgreen and Grant, 2015; Sanchez Rodrigues, Harris and Mason, 2015; Basso, et al., 2019; Pan, et al., 2019) A summary of the different leadership forms are presented by Audy, et al. (2012). The authors show that a collaboration can be led by one or a group of shipper(s), by one or a group of carrier(s)/ 3PL(s), by a group of shipper(s) and carrier(s)/ 3PL(s) or by a 4PL.

3.2.3 Collaboration Size Strategy

The collaboration size strategy deals with the decision on the number of collaborating shippers. A higher number of parties involved increases the chance of consolidating shipments and saving transportation costs by better utilizing the carriers' transportation assets (Mason, Lalwani and Boughton, 2007; Sanchez Rodrigues, Harris and Mason, 2015). However, recent studies show that the collaboration size must not become too large, as larger shipper collaborations are likely to fail due to coordination issues (Audy, D'Amours and Rousseau, 2011; Audy, et al., 2012; Basso, et al., 2019).

3.3 Internal Design Strategies

Following Mason, Lalwani and Boughton (2007) internal design strategies address the extent of internal integration in TM.

3.3.1 Strategy of Transportation Concept Planning

Transportation concepts can be described as rules for (de)consolidation and transportation between supply and demand points, considering the bundling effects of distinct locations and products and the available equipment types (Seiler, 2012; Martins, Amorim and Almada-Lobo, 2018). The planning of transportation concepts for inbound and outbound transportation flows can be either integrated or disintegrated. Martins, Amorim and Almada-Lobo (2018) illustrate that consolidation opportunities are limited by predefined replenishment or delivery frequencies in disintegrated transportation concept planning. This limitation, in turn, can reduce the potential for savings from shipment consolidation. In contrast to integrated concept planning, conflicting functional objectives between replenishment planning and transportation planning and delivery planning and transportation planning are not balanced. Relevant trade-offs to consider in integrated concept planning are transportation costs, inventory carrying costs, and delivery service (Ballou, 2007). The study of these trade-offs is the subject of many publications on transportation consolidation. Some of these publications show how consolidation planning affects transportation costs, inventory carrying costs, and delivery service (Jackson, 1980; Cooper, 1983). Furthermore, other publications present approaches to balancing these trade-offs (Hall, 1987; Martins, Amorim and Almada-Lobo, 2018).

3.3.2 Inbound-Outbound Organization Strategy

Another strategic design decision relates exclusively to shippers pursuing an FGP strategy and concerns the extent to which planning, and control of inbound and outbound transportation are integrated. However, there is little literature on this subject. Seiler (2012) states that some organizations have a strict organizational separation of inbound and outbound TM. The disadvantage of this separation is that it prevents the

consolidation of inbound shipments with outbound shipments (Stank and Goldsby, 2000). To counteract this, a joint point of control for inbound and outbound shipments is proposed (Mason, Lalwani and Boughton, 2007; Potter, Mason and Lalwani, 2007).

3.3.3 Centralization Strategy

Besides the decision to integrate inbound and outbound TM processes, shippers must decide on the degree of centralization of TM processes and thus on their geographical scope. Caputo and Mininno's (1998) survey findings on organizational logistics structures in the Italian grocery sector indicate that TM activities can be organized centrally or locally. However, there is little literature addressing the centralization decision. Walter, Allen and Rouviere (1991) provide one of a few insights into this topic. The authors use a case study to show that centralization in freight procurement is suitable for leveraging some of the opportunities arising from a contract relationship strategy and an FGP strategy. Potter, Mason and Lalwani (2007), as well as Mason, Lalwani and Boughton (2007), even suggest, in terms of an FGP Strategy, that it is not just the centralization of freight procurement, but a single centralized point of control that is most suitable to plan and control transportation. Concerning transportation planning, this assessment is also shared by Günther and Seiler (2009) and Seiler (2012), who emphasize that a central TM approach is generally needed to increase consolidation potential. However, to make central planning and control possible in the first place, enabling information and communications technology is required (Sheffi, 1990; Potter, Mason and Lalwani, 2007; Seiler, 2012).

3.4 Strategic and Tactical Processes

Based on Seiler (2012), strategic and tactical TM processes can be described as processes not directly involved in fulfilling a transportation demand.

3.4.1 Strategic Transportation Planning

According to Günther and Seiler (2009) and Seiler (2012), strategic transportation planning comprises all decisions that define the network structure, general transportation processes and desired service levels. However, it can be concluded from

the explanations of Seiler (2012) that the determination of the network structure is not a purely transportation-related task but an overarching strategic logistics task. Other authors refer to this process as network design rather than strategic transportation planning (Martins, Amorim and Almada-Lobo, 2018; Allaoui, Guo and Sarkis, 2019; Pan, et al., 2019). Caputo and Mininno (1998) separate this process into activities of choosing the number, location and type of warehouses and activities of selecting the mode of transportation. Following Stank and Goldsby (2000), strategic transportation planning can be described as part of network design that includes deciding on the modes of transportation that are appropriate for each material flow by location and product, considering consolidation opportunities, volume, frequency, seasonality, transportation requirements, and handling requirements. In this regard, particular importance is attributed to the planning of consolidation concepts, as several studies on strategic consolidation planning suggest (Jackson, 1980; Cooper, 1983; Hall, 1987). Stank and Goldsby (2000) further show that mode decisions in a transactional relationship strategy can also be made at the operational level, while in a contract relationship strategy, it is a prerequisite for selecting contract carriers in each relevant mode.

3.4.2 Strategic Freight Procurement

Shippers use the strategic procurement process to establish contractual relationships with carriers for the selected modes (Stank and Goldsby, 2000; Caplice and Sheffi, 2003; Caplice, 2007; Ergun, Kuyzu and Savelsbergh, 2007; Günther and Seiler, 2009; Seiler, 2012; Jothi Basu, Bai and Palaniappan, 2015; Jothi Basu, Subramanian and Cheikhrouhou, 2015). Accordingly, the strategic procurement process is only relevant to those shippers who want to pursue or are already pursuing a contract relationship strategy. The overall objective of strategic procurement in TM is to find the "best" assignment of carriers to traffic lanes within one's network (Caplice and Sheffi, 2003; Caplice, 2007; Jothi Basu, Bai and Palaniappan, 2015; Jothi Basu, Subramanian and Cheikhrouhou, 2015). For this purpose, reverse auctions are usually used and are typically conducted annually (Caplice, 2007; Seiler, 2012). Several studies address the freight procurement process with particular emphasis on auction design and methods of bid analysis and carrier assignment (Kleinsorge, et al., 1991; Caplice and Sheffi, 2003;

Caplice, 2007; Ergun, Kuyzu and Savelsbergh, 2007; Meixell and Norbis, 2008; Jothi Basu, Bai and Palaniappan, 2015; Jothi Basu, Subramanian and Cheikhrouhou, 2015; Lafkihi, Pan and Ballot, 2019).

3.4.3 Tactical Transportation Planning

Tactical transportation planning is an essential link between strategic and operational planning. According to Seiler (2012), tactical transportation planning is performed regularly within a mid-term planning horizon of approximately 2-12 months. However, the author points out that tactical transportation planning is not common practice among all shippers. A review on solution methods for tactical planning is conducted by Martins, Amorim and Almada-Lobo (2018) in relation to retail distribution, highlighting current planning capabilities and limitations. In the planning process, material flows are assigned to corresponding transportation concepts, and transportation frequencies are determined for continuous material flows (Potter, Mason and Lalwani, 2007; Seiler, 2012; Allaoui, Guo and Sarkis, 2019). Consequently, consolidation rules set in strategic planning (Stank and Goldsby, 2000) are adjusted by tactical transportation planning based on more accurate material demand forecasts (Seiler, 2012). Results of the tactical planning process, in turn, provide a medium-term shipment forecast. In a contract relationship strategy, shipment forecasts are used at the tactical level to inform carriers of medium-term changes in planned shipment volumes so that they can adjust their equipment requirements (Tyan, Wang and Du, 2003; Chen, Yeh and Chen, 2010).

3.4.4 Transportation Controlling

The literature about transportation controlling is sparse. References to the process of transportation controlling can be found, especially in publications that describe the functional scope of IT systems for TM. Most authors, however, do not go into transportation controlling in detail (Sheffi, 1990; Helo and Szekely, 2005; Hisano Barbosa and Andreotti Musetti, 2010; Mehmann and Teuteberg, 2016). An exception is Seiler (2012). The author's description shows that transportation controlling includes freight cost controlling, carrier and location performance measurement and network controlling. From this list of controlling activities, most of the literature contributes to

carrier performance measurement (Kleinsorge, et al., 1991; Bhatnagar and Viswanathan, 2000; Caplice and Sheffi, 2003; Tyan, Wang and Du, 2003; Wilding and Juriado, 2004; Helo and Szekely, 2005; Chen, Yeh and Chen, 2010; Jothi Basu, Subramanian and Cheikhrouhou, 2015).

3.5 Operational Processes

Operational processes are the counterpart of strategic and tactical TM processes. They include all processes to fulfill a transportation demand (Seiler, 2012).

3.5.1 Transportation Order Generation

Transportation orders (Günther and Seiler, 2009; Seiler, 2012; Mehmann and Teuteberg, 2016), which are also referred to as shipments (Cooper, 1983; Stank and Goldsby, 2000; Martins, Amorim and Almada-Lobo, 2018), are a group of items that have the same origin and destination and can be transported as a single unit (Hall, 1987). Transportation orders are generated based on a triggered material movement (e.g., in an enterprise resource planning system) and serve as the input of operational transportation planning. (Günther and Seiler, 2009; Seiler, 2012; Mehmann and Teuteberg, 2016). Transportation orders can be generated by a transportation manager or directly by a supplier, plant, or distribution center (Seiler, 2012).

3.5.2 Operational Transportation Planning

Operational transportation planning includes order consolidation, mode and carrier selection with a horizon from a few hours to a couple of days (Seiler, 2012). Jackson (1985) was the first to provide insights into practices of order consolidation. Stank and Goldsby (2000) introduce different consolidation types and present a sequential and an integrated model for mode and carrier selection. The authors also show that contract relationships and adequate IT are required for integrated mode and carrier selection because service and cost information must be known in advance. Insights into IT-based carrier selection with contract carriers are provided by Caplice (2007). Günther and Seiler (2009) review different approaches to order consolidation and find that their cost functions often lack practical applicability because they do not work with shipper-

specific freight rates. Based on these findings, the authors present a planning approach to close this gap. Seiler (2012) takes up this approach and describes how the approach can be embedded in an operational planning process using a Transportation Management System (TMS). A TMS is a decision support and transaction processing system that covers various functions to support TM processes (Mason, et al., 2003; Helo and Szekely, 2005; Caplice, 2007; Potter, Mason and Lalwani, 2007; Günther and Seiler, 2009; Hisano Barbosa and Andreotti Musetti, 2010; Seiler, 2012; Mehmann and Teuteberg, 2016; Demir, et al., 2019) Using IT for transportation planning improves efficiency and effectiveness (McLaughlin, et al., 2003). However, most TMSs still have various limitations in planning, as Demir, et al. (2019) point out.

3.5.3 Load Tendering

A load is a group of transportation orders traveling in the same vehicle (Hall, 1987). After the operational transportation planning, all transportation orders that form a load are tendered to carriers for execution (Tyan, Wang and Du, 2003; Chen, Yeh and Chen, 2010; Seiler, 2012; Jothi Basu, Subramanian and Cheikhrouhou, 2015; Mehmann and Teuteberg, 2016). Caplice (2007), who provides a comprehensive description of load tendering, distinguishes between a sequential or "waterfall" tendering for lanes served by a contract carrier and a simultaneous tendering for lanes served by carriers from the spot market. In a sequential tendering process, a load is iteratively tendered to the next best alternate carrier until either a carrier accepts the load or the shipper escalates the search to a private or public exchange, which is used to access the spot market. At the spot market, tendering is simultaneous, as the shipper sends out an "offer" to multiple carriers at the same time. Depending on the shipper's preferred assignment rule, the first response or the best bid wins the load. Based on data from a large shipper, Scott (2015) found for the truckload spot market that the earlier an "offer" is sent before pick-up, the better the pricing.

3.5.4 Transportation Documents Generation

For loads to be processed, transportation-related documents and labels are created and issued (Helo and Szekely, 2005; Seiler, 2012). Documents generated by the shipper in this

process are, e.g., the delivery note (Mehmann and Teuteberg, 2016), the shipping manifest, the packaging list, the commercial invoice, the airway bill (Tyan, Wang and Du, 2003), and the advance shipping notice (Mason, et al., 2003).

3.5.5 Dock Scheduling

Dock scheduling is mentioned in the selected literature only by Seiler (2012), who describes dock scheduling as a process for planning the arrival times of vehicles at a location to avoid long waiting times before loading and unloading. However, as Fugate, Davis-Sramek and Goldsby (2009) show, every shipper does not perform this process.

3.5.6 Transportation Event Management

Transportation event management (TEM) can be roughly described as a process of identifying and resolving exceptions of a transportation plan (Tyan, Wang and Du, 2003; Chen, Yeh and Chen, 2010; Seiler, 2012). It can be divided into two subprocesses: management of changes in a tendered load and management of transportation exceptions.

Load changes can occur for various reasons, e.g., due to supply shortages affecting transportation volumes (Seiler, 2012). Several authors describe the subprocess of identifying and resolving changes in a load. Tyan, Wang and Du (2003) and Chen, Yeh and Chen (2010) focus on carrier involvement, while Seiler (2012) considers the impact on operational transportation planning.

Management of transportation exceptions addresses any critical disruptions that occur during transportation execution (Seiler, 2012). One essential task of the management of transportation exceptions is the tracking of transportation statuses. As shown in literature, tracking can be done either manually with extensive use of the phone or through a milestone or real-time based tracking system (Bhatnagar and Viswanathan, 2000; Mason, et al., 2003; Tyan, Wang and Du, 2003; Kärkkäinen, et al., 2007; Mason, Lalwani and Boughton, 2007; Seiler, 2012; Harris, Wang and Wang, 2015; Mehmann and Teuteberg, 2016). The second essential task of the management of transportation exceptions is to respond to an event that has been assessed as a critical deviation during

monitoring. If a critical event occurs, a rule-based escalation process is usually triggered (Seiler, 2012).

3.5.7 Freight Settlement

After the physical transportation is completed, freight settlement takes place. Two standard process variants exist, freight auditing and self-billing (Seiler, 2012). Freight auditing activities are addressed in several studies and include invoice collection, invoice check, resolving invoice discrepancies and transmitting payment information to accounting (Sheffi, 1990; Walter, Allen and Rouviere, 1991; Mason, et al., 2003; Tyan, Wang and Du, 2003; Kärkkäinen, et al., 2007; Chen, Yeh and Chen, 2010; Seiler, 2012; Mehmann and Teuteberg, 2016).

However, literature on the self-billing process is scarce. The only contribution in the selected literature that describes this process in more detail can be found in a case study by Mehmann and Teuteberg (2016) on transportation processing in the agricultural sector. In the case study, the self-billing process includes checking the successful completion of the transportation, creating the credit note based on the agreed terms and conditions and sent it to the carrier for usage.

Furthermore, the literature suggests that freight settlement may also include the billing of transportation costs to the customer (Mehmann and Teuteberg, 2016) and the sharing of transportation and leadership costs of a collaborative planning process (Audy, D'Amours and Rousseau, 2011; Audy, et al., 2012; Audy, D'Amours and Rönnqvist, 2012; Pan, et al., 2019; Ferrell, et al., 2020).

4 Analysis Approach

To analyze the identified processes, taking into account the organizational design strategies identified and underlying the processes, we propose a two-step approach. Figure 2 outlines the individual steps of the approach within a phase model for TM optimization. The phase model is adapted from the phase model introduced by Klasen (2019) for business transformation. In the first step, the as-is design of the current TM organization from a process perspective is determined together with process experts involved in the shipper's TM, using established data collection methods such as interviews or workshops (Bach, et al., 2017).

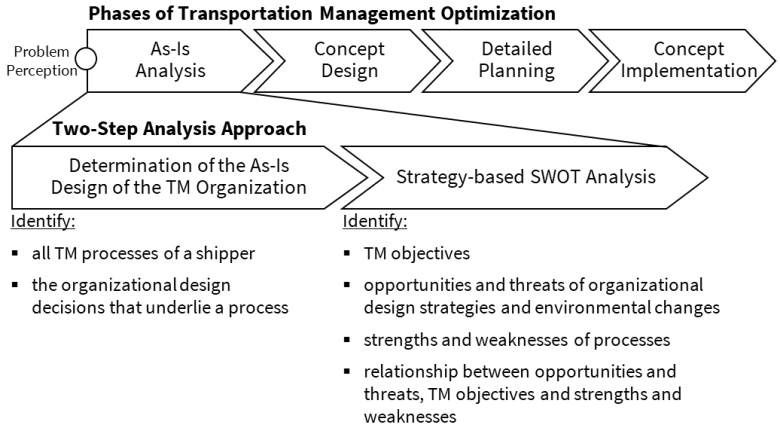

Figure 2: Steps of the analysis approach embedded into a phase model for TM optimization

This step involves identifying the different processes in a TM organization and relating them to the various organizational design strategies to identify the strategic decisions that underlie a process. For process identification and distinction, the processes and process variants found in the literature review can serve as a frame of reference. If necessary, processes must also be divided into sub-processes if there are changing

responsibilities within the process. This is the case, for example, when individual activities of a process are outsourced.

For identifying the strategic decisions that underlie a process, a record form has been developed. Figure 3 presents this record form using the load tendering process of a fictitious shipper as an example. In the record form, the following process characteristics are collected for each identified process: name and type of the responsible organizational unit, the assigned inbound and outbound transportation flows, the flow owner, and flow specifics. An explanation of what information is to be recorded under the individual characteristics can be found in Table 1.

(Sub-) Process ID	(Sub-) Process Name	Responsible Organizational Unit		Assigned Transportation Flows		Flow Owner	Flow Specifics	Flow-specific Carrier Contract Strategy	Strategy of Transportation Concept Planning*
		Name	Type	Inbound (Location Name)	Outbound (Location Name)				
7.1	Waterfall Tendering	Central Dispatching	Internal Department	L1, L2, L3	L1, L2, L3	Fictitious Shipper	Sea, Air Flows	Contract Relation-ship	./.
				./.	L4	External Shipper 1	All flows		
7.2	Simultaneous Tendering	Central Dispatching	Internal Department	L1, L2, L3	L1, L2, L3	Fictitious Shipper	Road Flows	Spot Relation-ship	./,

*Only applies to tactical and strategic transportation planning

Strategic Transportation Planning	Strategic Freight Procurement	Tactical Transportation Planning	Transportation Controlling	Transportation Order Generation	Operational Transportation Planning	**Load Tendering**	Transportation Documents Generation	Dock Scheduling	Transportation Event Management	Freight Settlement

Figure 3: Completed record form using the example of a load tendering process

Table 1: Explanation of process characteristics

Process Characteristic	Explanation
Name of the responsible organizational unit	Indicate who is responsible for a process
Type of the responsible organizational unit	Indicate whether the responsible unit is an internal, external, or joint department and, in the case of non-internal departments, further specify the players (e.g., 4PL or external shipper department).
Assigned inbound transportation flows	Indicate for which inbound transportation flows of which locations a process is performed.
Assigned outbound transportation flows	Indicate for which outbound transportation flows of which locations a process is performed.
Flow owner	Indicate the shipper (analyzed shipper, external shippers) on whose behalf a process is performed for a transportation flow.
Flow specifics	Specify the transportation flows in the process scope (e.g., mode-related)

Figure 4 shows how organizational design strategies are reflected in the process characteristics and thus underlie the various processes as strategic design decisions. In addition, in the record form, each process is related, via its assigned flows, to a carrier contract strategy that is followed to execute transportation for the assigned transportation flows. The assignment helps in the subsequent analysis to determine the opportunities and threats of the carrier contract strategy on a process-specific basis. Since carrier contracts govern the execution of transportation and consequently must be taken into account in the planning and control of transportation, it is to be expected that the respective carrier contract strategy shapes the processes of TM. Processes such as

strategic freight procurement and variants of carrier selection and load tendering, which are dependent on carrier contract strategy, reinforce this expectation. Furthermore, the record form is used to determine directly and flow-specifically the strategy for transportation concept planning. According to the strategy scope, this is done for the processes of tactical and strategic transportation planning.

① Outsourcing Strategy (Extent of TM outsourcing)	reflected in →	the type of the responsible organizational unit assigned to the respective process IDs, which have no external shipper as flow owner.
② Shared Processes Strategy (Processes shared in a shipper collaboration)	→	the respective process IDs with at least one external shipper as flow owner.
③ Leadership Strategy (Leader(s) of shared processes)	→	the type of the responsible organizational unit assigned to the respective process IDs with at least one external shipper as flow owner.
④ Collaboration Size Strategy (Number of shippers in a collaboration)	→	the number of different flow owners assigned to the respective process IDs.
⑤ Inbound Control Strategy (Extent of integration of inbound transportation flows)	→	the specific inbound transportation flows of the locations assigned to the respective process IDs.
⑥ Centralization Strategy (Geographical scope of TM processes)	→	the specific inbound and outbound transportation flows of the locations assigned to the respective process IDs.
⑦ Inbound-Outbound Organization Strategy (Extent of integrated inbound and outbound TM)	→	the specific inbound and outbound transportation flows of a location that are or are not assigned to the same process ID.

Figure 4: Relationship between organizational design strategies and process characteristics

The next step is to analyze the current TM organization. The analysis principle is based on the SWOT analysis, in which the strengths and weaknesses of a company are contrasted with opportunities and threats (Gathen, 2014). Unlike the original SWOT analysis, however, the opportunities and threats are not only considered from environmental developments (Gathen, 2014) but also from strategic design decisions.

For an objective-oriented analysis of the opportunities and threats, the objectives of the TM are defined first. Subsequently, the strategic decisions underlying the respective processes or sub-processes and TM relevant environmental developments (e.g., changes in the transportation volume of a location or the expiry of maintenance contracts for a TM software) are analyzed on a process-by-process basis for opportunities and threats to the identified objectives.

This is followed by an analysis of the recognized processes and subprocesses. The strengths that promote the exploitation of opportunities and the elimination of threats are analyzed, and the weaknesses that inhibit the exploitation of opportunities and the elimination of threats are analyzed. The strengths and weaknesses do not necessarily need to relate to the opportunities and threats of the underlying design strategies. Strengths and weaknesses can also relate to opportunities and threats that arise from the strategic design decisions in other TM processes (e.g., weaknesses in the operational planning system that inhibit consolidation opportunities arising from design strategies in tactical planning).

In addition, there may be opportunities and threats to which no strengths and weaknesses from the basic TM processes can be assigned so that the scope of the analysis must be expanded (e.g., contractual strengths and weaknesses to mitigate opportunism in outsourcing). Furthermore, there may be process strengths and weaknesses that are unrelated to identified opportunities and threats but also impact the defined objectives. These strengths and weaknesses must also be identified and presented. As a result of this second step, a shipper has visibility into opportunities and threats, strengths to be maintained or enhanced, and weaknesses to be reduced. For supporting the analysis of processes, Bach, et al. (2017) present several suitable and proven methods that can be used.

5 Discussion and Future Research Opportunities

Inspired by a practical problem, this paper proposes a two-step approach to analyzing shippers' TM organization. The basis of the method design was a systematic literature review. A total of 65 peer-reviewed journal articles from 1980-2020 were systematically

selected and analyzed based on their contributions to organizational design strategies and processes of TM. The literature review reveals nine organizational design strategies and eleven TM processes (Figure 5).

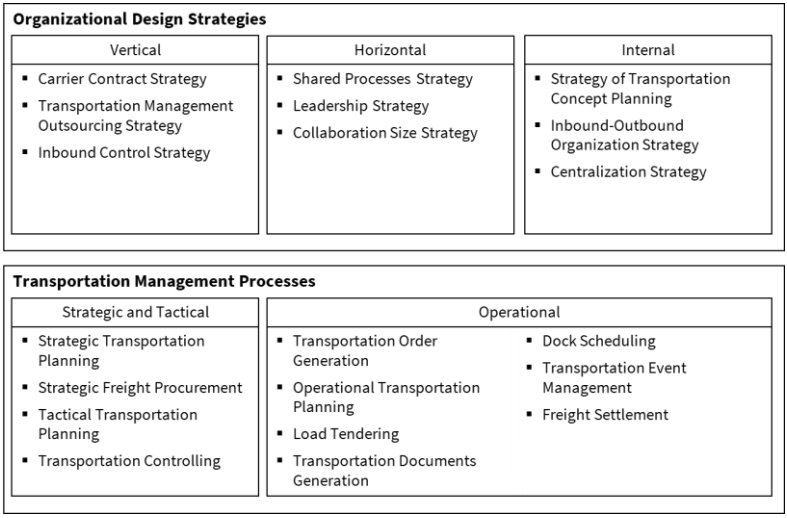

Figure 5: Organizational design strategies and processes of TM

In addition, the literature review shows that there is little research on some processes and organizational design strategies. Furthermore, the analysis of the papers reveals that only a few articles contribute to a holistic view of TM by addressing several processes or organizational design strategies or both.

However, a holistic TM view in research is especially valuable for practitioners to help them increase excellence in TM more systematically. This paper contributes to this need by identifying organizational design strategies and processes of TM and integrating them into an approach with which shippers can record and analyze the as-is design of their TM organization. Furthermore, the approach shows how organizational design strategies shape processes and how the linkage between design strategies and processes affects the performance of a TM organization.

Future research opportunities arise both from addressing the identified shortcomings in the study of TM processes and organizational design strategies and the limitations of this work. At first, the literature review neglects all papers from non-Q1-ranked journals in the Scientific Journal Ranking 2020. In addition, forward and backward searches reveal that a literature search using only the keyword "transportation* management" excludes many relevant papers. Expanding the search space to include more sources or adding more keywords provides the opportunity to confirm, correct, or expand the literature review results. A second limitation is that the utility and quality of the presented analysis approach have not yet been demonstrated. Accordingly, additional research is needed to confirm its practicality. When applying the model, a particular challenge may be identifying the opportunities and threats of a design strategy at the process level and the strengths and weaknesses in the processes in relation to these opportunities and threats. Future research could help to recognize these opportunities and threats, as well as strengths and weaknesses, more easily.

Acknowledgements

The authors would like to thank HELLA GmbH & Co. KGaA and all involved colleagues for their support.

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