THE CONFIGURATION APPROACH IN OMNI-CHANNEL-LOGISTICS RESEARCH – A STRUCTURED LITERATURE ANALYSIS

Stephan L.K. Freichel
University of Applied Sciences Cologne, Germany
E-mail: stephan.freichel@th-koeln.de

Johannes K. Wörtge
University of Applied Sciences Cologne, Germany
E-mail: johannes.woertge@th-koeln.de

Pia Rütten
University of Applied Sciences Cologne, Germany
E-mail: pia.ruetten@th-koeln.de

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Abstract

The configuration approach as the most current theory stream of situational management research has had a place in logistics research for considerable time. It offers the possibility of explaining the success or failure of logistics designs against the background of their respective contexts and is therefore also suitable for use in the relatively young research field of omni-channel-logistics (=OCL). This is advantageous for two main reasons. On the one hand, research on OCL has so far been dominated by empirical work, which has not yet been united under one theoretical canopy. On the other hand, the research field is characterized by its small-scale nature, since separate logistics subsystems are being investigated. Due to their interdependence, however, a holistic approach is recommended, which is made possible by the application of this theory. This paper analyses and synthesizes the current state of OCL against the background of the configuration approach. Addressed contextual factors and design options are identified and summarized. This forms an initial framework for further research in this direction and a corresponding starting point for the development of successful OCL typologies. Practitioners can use the results to inform and critically challenge their own design decisions.

Key words: omni-channel-retail, omni-channel-logistics, configuration approach, logistics typology

1. INTRODUCTION

The relevance of multiple channel retailing has been steadily increasing in retail practice as well as in academic research for years. Customer demands for a seamless shopping experience and superior customer orientation, as well as increasing competition, have led to major disruptions in recent years, not only at the level of the overall enterprise, but especially in associated subsystems such as marketing and logistics. While research in the former field already has a long tradition and a correspondingly extensive literature base (Neslin et al. 2006, Konuş et al. 2008, Herhausen et al. 2019), a relevant increase in research activities in the field of omni-channel-logistics (=OCL) has only been observed since 2013 and results are correspondingly scarce (Galipoglu et al. 2018, Melacini et al. 2018, Taylor et al. 2019). Previous approaches deal, for example, with the network design of omni-channel-retail companies, both in food and non-food retail (Hübner et al. 2016b, Marchet et al. 2018, Wollenburg et al. 2018), or the influence of multichannel retail strategies on individual logistics subsystems such as transportation (Hübner et al. 2016a, Castillo et al. 2018, Ishfaq & Raja 2018, Buldeo Rai et al. 2019, Schubert et al. 2020), inventory management (Chiang & Monahan 2005, Liu et al. 2010, Xie et al. 2014), warehousing (Freichel & Wörtge 2018, Kembro et al. 2018, Bell et al. 2018, Kembro & Norrman 2020), packaging (Freichel et al. 2020), or the information system (Kembro & Norrman 2019b). The topic of customer requirements for OCL is also being researched (Sousa & Voss 2006, Xing & Grant 2006, Murfield et al. 2017). Other research streams deal with performance measurement systems for OCL (Adivar et al. 2019, Bressolles & Lang 2019, Prabhuram et al. 2020) or the transformation of logistics over time from single to multi- and finally omni-channel-retailing (Hübner et al. 2016c, Davis-Sramek et al. 2020).

The fact that most of the research approaches rely on empirical methods and use mathematical (optimization) models, but that these results are not integrated into a superordinate theoretical framework (Galipoglu et al. 2018), is an indicator of the comparatively early stage of research in the field of OCL. Although much is already known about the design practice of logistics for omni-channel-retailers, the question of the "best design option" for individual retail realities remains open. It becomes clear that there is no "one size fits all" option for logistics. Hence, managers need to think about which situational characteristics determine their particular business reality and how they can best anticipate these in their logistics systems (Bell et al. 2014, Cao 2014, Marchet et al. 2018, Sorkun et al. 2020). Thinking in terms of "one size for each given situation" is the starting point of the configuration approach, a theoretical strain with a long tradition in organizational research (Mintzberg 1979, Miller & Whitney 1999, Donaldson 2001, Short et al. 2008). The search for configurations, "harmonious patterns" of context and design characteristics, has also been anchored in logistics for many years (Fisher 1997, Christopher 2000, Lee 2002, Neher 2005) and recently has also found its way into OCL research (Wollenburg et al. 2018, Lim & Srai 2018, Eriksson et al. 2019).

To the best of the authors' knowledge, this paper is the first to summarize and analyse the literature regarding the configuration approach in OCL. By means of a systematic literature review, the previous research results are collected, evaluated and

synthesized to identify contextual factors and design variables of OCL. Practitioners can find valuable suggestions for their respective logistics design. Researchers may use this as a basis for further typological or taxonomic investigations.

The rest of this paper is structured as follows. In the second chapter, the theoretical background is highlighted, both of omni-channel-retailing and associated logistics, and of the configuration approach in general and in logistics research in particular. In the following chapter three, the methodology, data collection and data analysis procedures are presented. In chapter four the results are outlined, followed by a brief conclusion in chapter five, giving a summary of limitations and further areas of research.

2. THEORETICAL BACKGROUND

2.1. Logistics in Omni-Channel-Retailing

The background and starting point of omni-channel-retailing is the increasing importance of e-commerce, which has put traditional brick-and-mortar companies under pressure. Customers appreciate the convenience, wide product selection and low prices offered by online retailers, which has enabled such providers to rapidly increase their market shares (Agnihotri 2015, Arora & Sahney 2017). After an initial phase of denial, former store retailers also began to build online channels to meet changing customer demands (Davis-Sramek et al. 2020). The two channels were initially managed separately, which is referred to as "multi-channel retailing" (Beck & Rygl 2015). Only in the further course were the channels then integrated with each other in order to offer customers the opportunity to switch seamlessly between them, giving the opportunity of combining the advantages of online purchasing (e.g. simple search within a broad product range, at any time, from any location) with the advantages of the offline channel (e.g. personal inspection of the selected goods) (Chen et al. 2019, Cortiñas et al. 2019). Specific omni-channel-services are the result, such as click-and-collect, click-and-reserve, return-to-store, or inventory availability displays in the respective other channel. Many customers appreciate this interconnection and reward it with higher sales and greater loyalty, so that an omni-channel-strategy represents a relevant competitive position against pure eCommerce players (Herhausen et al. 2015). Channel integration is not only beneficial from a sales perspective, but also from a physical distribution perspective, as it allows inventory to be integrated, demand to be pooled, and resources to be combined (Oh et al. 2012). Hence, not only the effectiveness of logistics activities can be increased, but also the efficiency of the entire supply chain. In order to leverage the benefits associated with a successful omni-channel-strategy, the entire logistics system must be critically examined and reconfigured.

The design of OCL is the focus of a number of research approaches, which experienced an increase from 2013 onwards. The literature reviews by Swaminathan & Tayur (2003), Agatz et al. (Agatz et al. 2008), Galipoglu et al. (2018) or Taylor et al. (2019) offer a comprehensive overview, which can only be briefly outlined at this

point. The first comprehensive analyses of the entire distribution system and related network design options can be found in the work of Hübner et al. (Hübner et al. 2016b), Ishfaq et al. (2016) or Marchet et al. (Marchet et al. 2018). In brief, the authors conclude that OCL can either fully separate, partially integrate, or fully integrate the store and end-customer delivery channels. Also, the store network can be more integrated into fulfillment and perform different functions as both a pickup and return location, as well as a standalone logistics network resource for handling end-customer orders.

Associated with this, design differences exist in the logistics subsystems, such as within the DCs, the cross-channel functional scope of the stores, the information system, the inventory management, the transportation system, or the returns handling. Regarding the DCs, different channel and inventory integration levels are investigated, and their impact on the DC layout, automation technology, warehousing system or picking is discussed (Kembro et al. 2018, Kembro & Norrman 2019a). In terms of the stores, it is questionable which stores should fulfil which functions in the network and whether there should be distinctions between them (Bell et al. 2014, Ishfaq & Raja 2018, Xu & Cao 2019). Due to the increasing complexity of the logistics network, adapted logistics information systems are required that support various functions such as flexible order allocation or real-time data transparency (Hübner et al. 2016c, Kembro & Norrman 2019b). The subsystem of inventory management is also being researched, for example the question of which inventories should be held in which network nodes (Gallino et al. 2017, Holzapfel et al. 2018). The aforementioned cross-channel services for customers are not only changing the replenishment system of the stores, for example through more frequent delivery cycles and the co-loading of click-and-collect deliveries (Buldeo Rai et al. 2019), but specifically the design of the last mile (Marchet et al. 2018, Lim & Winkenbach 2019, Schubert et al. 2020). Another stream of research is returns management, which poses challenges for many retailers, making it debatable how returns should be accepted, what the returns handling process should look like, and where it should take place (Bernon et al. 2016, Hübner et al. 2016b).

2.2. The Configuration approach in Logistics Research

Economic theories often hold thoughts and explanations that deal with the success and failure of businesses. Entrepreneurial success is based on building and defending success factors that allow to generate competitive advantage. For this, the right goals must be set and measures to achieve them must be initiated (Lebas & Euske 2004). From this premise, different theories in (strategic) management have developed. Porter's Marked-Based-View (=MBV) postulates that the focus should be on the right competitive positioning in the market. In order to be successful, it is necessary to look for an attractive industry and to build up a position there (Porter 1980). The chronologically following Resource-Based-View, on the other hand, states that the focus should be on building up success-critical resources within the company (Mahoney & Pandian 1992). In simplified terms, the two positions are dichotomously opposed to each other: the MBV promotes an orientation toward the external situation of a company, while the RBV promotes an orientation toward the company's internal

resources. However, both approaches are ultimately to be understood as complementary, since comprehensive success requires orientation to the market and also building up the resources to establish a competitive position in the relevant market. Systems theory approaches, which view companies as socio-economic entities embedded in supra-systems with corresponding interfaces, build on this basic principle (Möller 2006).

Already at the beginning of (economic) management theory, it was questionable how a company should be built up in order to be successful. While early representatives postulated a "one-size-fits-all" solution (e.g. the division of labor according to Taylor), it became clear in the further course, also against the background of the system-theoretical thought just described, that there is not only one solution to the success-oriented design question. The situational management theory developed, according to which there must be an adjustment of the enterprise's design to its environment (Gresov 1989, Venkatraman 1989). The contingency approach and the configuration approach can be identified as the two most current directions. The former postulates that for every situation there is only one adequate design that can bring success. The latter, on the other hand, responds that there is a certain design latitude in every situation and that, as a result, different designs in one and the same situation can have a similar measure of success (Scherer & Beyer 1998).

This paper examines research approaches in the OCL research field which explicitly or implicitly make use of the configuration approach. This theoretical lens is the most recent stream of situational organization and management research, whose origins lie in the attempt to identify different organizational characteristics, to justify their existence and to explore why some of them were more successful than others (Miller & Mintzberg 1983, MEYER et al. 1993). Accordingly, the question is how companies or their subsystems should behave in specific situations in order to be successful. If it is possible to achieve an appropriate alignment between the situation-determining context factors and the design variables, this is referred to as "fit" (Drazin et al. 1985, Venkatraman 1989). The identification of mutually compatible patterns of context factors and design variables is the goal of configuration-oriented research. Configuration-oriented researchers understand companies and their subsystems as complex, networked entities that are in constant exchange with their environment and must adapt to it in order to be successful (Miller 1981, Van De Ven & Drazin 1985). Hence, it is not isolated factors that are the reason for a company's success or failure, but the entirety of its configuration: *"Configuration, in short, is likely to be a far greater source of competitive advantage than a single aspect of strategy"* (Miller 1996 p. 509 f.).

Configurations can be both empirically "discovered" and theory-driven "developed," reflecting the methodological dispute of recent decades over whether the source of knowledge is in intellect or in experience (MEYER et al. 1993, Scherer & Beyer 1998). Empirical configurations are assigned to the taxonomic, theory-guided configurations to the typological research strand. It is worth noting that, despite the debate over which approach is superior to the other, ultimately the two are interrelated and mutually beneficial (MEYER et al. 1993). Taxonomies are based on methods of empirical social research and aim to examine real-world objects of study in terms of their naturally occurring variable bundles and interrelationships and to compare them

with each other (Scherer & Beyer 1998). Typologies are developed intellectually and aim at forming ideal types of context-design pattern combinations that are as coherent and different from each other as possible (Miller 1996).

In recent years, the configuration approach has been transferred from organizational and management research to many other research fields. In logistics, too, a number of works have appeared over the past few years that implicitly and explicitly promote a configuration-oriented approach. Among them the much considered work of Fisher (Fisher 1997): "What Is the Right Supply Chain for Your Product?", which is called by some authors the starting point of configuration-oriented work in logistics. Fisher argues that logistics must be adapted to the product being distributed, so that an efficient supply chain must be designed for functional products, and a responsive supply chain for innovative products. The work of Christopher (2000), Mason-Jones et al. (2000) and Childerhouse & Towill (2000) is also deeply rooted in logistics research to this day, addressing the design of "lean", "agile" and "leagile" supply chains. A number of works related to the configuration approach have also appeared in German-speaking countries, including the works of Klaas-Wissing (2009), Rümenapp (Rümenapp 2002), Gehring (2004) and Placzek (2007).

In conclusion, it can be stated that the configuration approach as a whole and especially in logistics is suitable to investigate and explain the complex, multifaceted and different reality. Logistics for omni-channel-retailing is a complex matter, and not every design is suitable for every situation, as stated by Bell et al. (2014 p. 45.) *"While all retailers need to effectively and efficiently manage fulfilment and information provision [in omni-channel retail], there are important nuances to how this happens – depending on where and how the retailer got started and what kinds of improvement create the most leverage"*. However, since logistics in particular is critical to the success of an omni-channel-strategy (Xing & Grant 2006, Murfield et al. 2017, Yumurtacı Hüseyinoğlu et al. 2018), configuration-oriented work can be beneficial both for deriving and testing hypotheses and theories, and for recommending actions for retail practice.

3. METHODOLOGY

In order to identify and structure the literature already available in academia, a systematic literature review approach (SLR) was taken. A SLR aims to *"identify all empirical evidence that fits the pre-specified inclusion criteria to answer a particular research question or hypothesis"* (Snyder 2019 p. 334.) by means of a systematic process, minimizing bias and heightening reliability (Tranfield et al. 2003). SLRs have a long tradition in medical sciences and management research (Tranfield et al. 2003, Snyder 2019) and were already used to synthesize the literature in the field of OCL Research (Agatz et al. 2008, Galipoglu et al. 2018, Taylor et al. 2019).

3.1 Data Collection

The research process consists of several steps. Tranfield et al. (2003), for example, breaks it down into the three phases of "planning", " conducting", and "reporting" with a total of nine individual steps. Seuring et al. (2005), in contrast, distinguishes between the four individual steps "Material Collection", "Descriptive Analysis", "Category Selection" and "Material Evaluation". This paper follows the approach of Watson et al. (Watson et al. 2018), which is based on Tranfield et al. (2003) and divides the investigation into the phases "Searching", "Screening" and "Extraction and Synthesis".

- ***Searching:*** In the search phase, the relevant studies, in the case of this paper peer-reviewed journal articles and conference proceedings, are identified. For this purpose, a search string (see figure 1) was formed, which combines relevant terms that are compatible with the research objective. These terms must be included in the title, abstract, or key words of an article to be considered relevant to this paper. The database used for this work was Scopus, which is a leading database and includes one of the largest collections of scientific articles on the market. After the initial search, 857 potentially relevant articles were identified.

Figure 1. Search String used for data collection

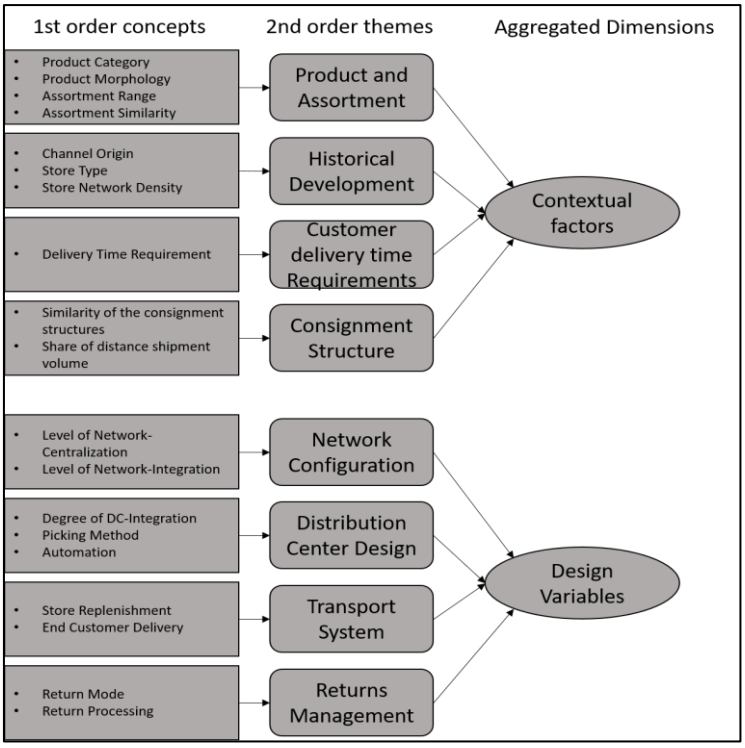
```
TITLE-ABS-KEY("Omni-Channel" OR "Omni Channel" OR "Multi-Channel" OR "Multi Channel" OR "Cross-Channel" OR "Cross Channel" OR "Bricks-and-Clicks" OR "Bricks and Clicks" OR "Clicks-and-Mortar" OR "Clicks and Mortar") AND TITLE-ABS-KEY("Logistics" OR "Supply Chain" OR "Fulfilment" OR "Fulfillment" OR "Distribution") AND TITLE-ABS-KEY("Configuration*" OR "Contingency" OR "Design" OR "Context*")
```

Source: Own figure

- ***Screening:*** In the screening phase, the identified contributions are further narrowed down to the field of study based on inclusion and exclusion criteria. Typical examples of such criteria are year of publication, research field, or language. The 857 identified articles were evaluated using the criteria of year (articles from 2009 onwards were included), article format (journal articles and conference papers were included), research field (articles from medicine, natural sciences, and engineering were excluded), and language (English-language articles were included). Thus, the data set could be narrowed down to 126 contributions. These were then subjected to manual title, abstract and content review. Only articles that explicitly referred to the configuration approach or referred to contextual factors, design variables and their interdependencies, hence implicitly dealing with configurations, were included. The final data set included 12 articles.

- ***Extraction and Synthesis:*** In the final phase of SLR, the final dataset is transferred to an Excel spreadsheet and sorted according to the methodological and thematic criteria. This provides the basis for a descriptive analysis of the dataset (presented in Chapter 3.2). In a second step, the content of the identified contributions was summarized and synthesized. We followed a deductive-inductive approach (Schreier 2012, Kuckartz 2018), as we already knew, that we were searching for contextual factors and design variables. Inductively, we searched and coded both within the articles with the tool MAXQDA (Miles & Huberman 1999, Rädiker & Kuckartz 2019). Afterwards, the authors searched for overarching themes within the codes, building up 1st order concepts and second order themes (Gioia et al. 2014). We ended up with 19 1st order concepts, which we grouped in eight 2nd order themes under the two aggregated dimensions of contextual factors and design variables of OCL. This gives the guideline for presenting the results in chapter 4. Figure 2 gives a graphical overview of the coding scheme.

Figure 2. Overview of the coding scheme

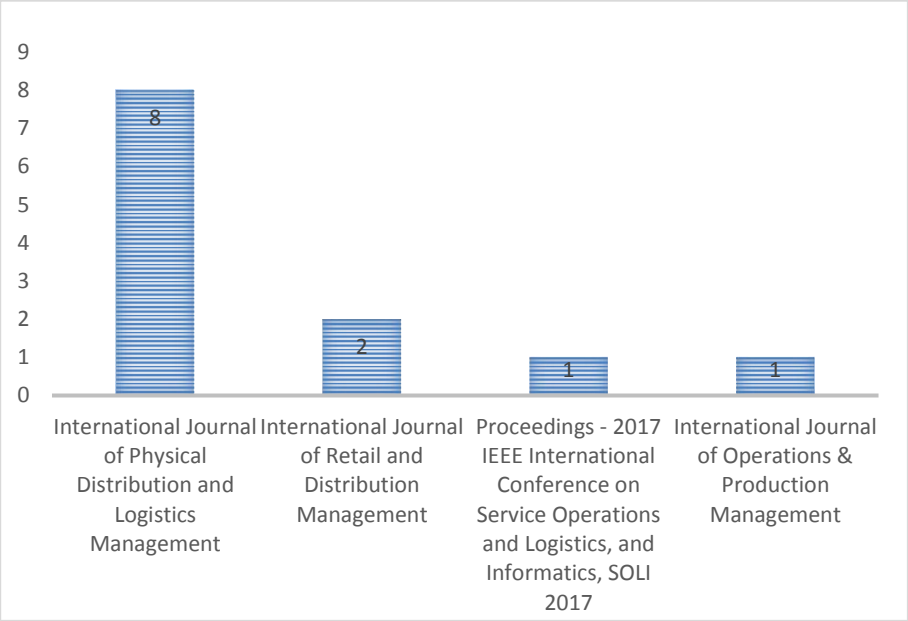


Source: Own figure

3.2. Descriptive Data Analysis

The identified dataset consists of 12 articles spanning 3 journals and one conference proceedings (see figure 3). It can be observed that the majority of the articles accumulate in particular in the journal "International Journal of Physical Distribution and Logistics Management" (7 papers). On the one hand, this is because it deals explicitly with logistics and supply chain management, and on the other hand, because a special issue on retail logistics was published in the IJPDLM in 2016.

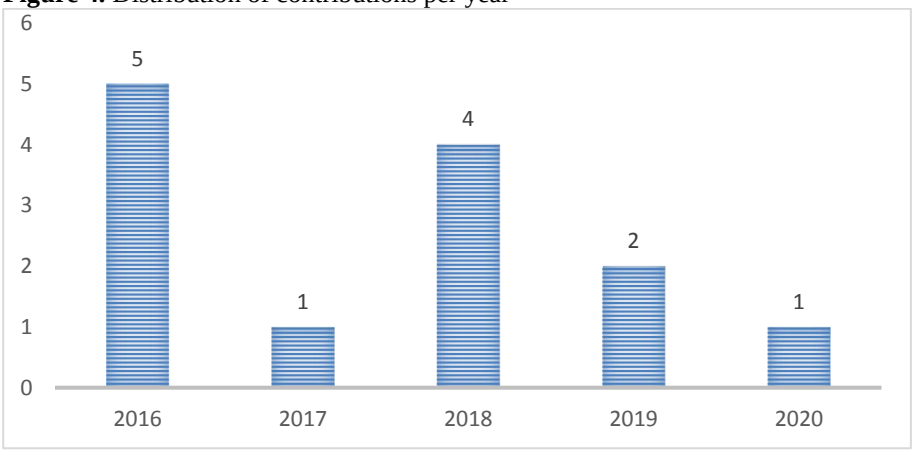
Figure 3. Distribution of contributions in Journals and Conference Proceedings



Source: Own figure

Regarding the distribution of contributions over time (see figure 4), it should be noted that the accumulation in 2016 can also be explained by the Special Issue of the IJPDLM. The low numbers in 2020 can be explained by the fact that the literature search was conducted in May 2021 and thus possibly not all contributions from 2020 were officially published, as well as only the first half of 2021 can be included.

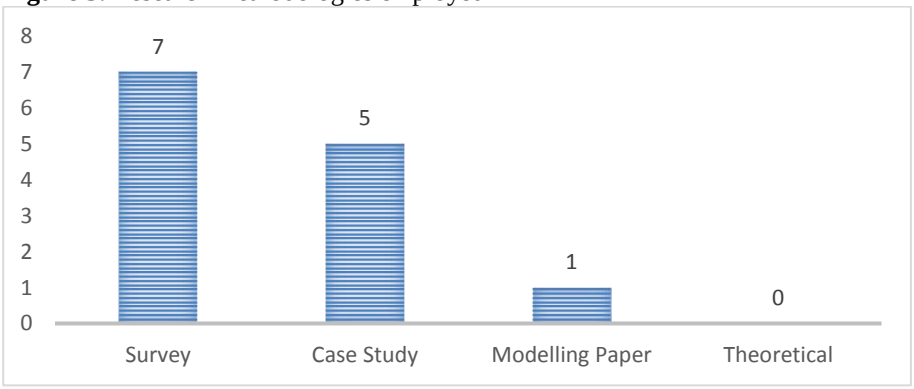
Figure 4. Distribution of contributions per year



Source: Own figure

Analogous to Seuring and Müller (2008), as well as Seuring et al. (2005), a distinction is made between (1) Theoretical Papers, (2) Case Studies, (3) Surveys, (4) Modelling Papers, and (5) Literature Reviews with respect to the methodology used. Looking at the methodology used in the identified contributions (see figure 5), it is clear that there is an excessive amount of empirical papers with Survey (6 articles) and Case Study (5 articles) methodologies. This underscores the relative youth of the OCL research field and the need to embed the empirically obtained data in a theory-driven framework (Galipoglu et al. 2018).

Figure 5. Research methodologies employed



Source: Own figure

4. FINDINGS

Following Klaas-Wissing (2009), the contributions can be divided into those that explicitly refer to the configuration approach, respectively the historically preceding contingency approach, and those that implicitly refer to it by identifying contextual factors and design variables, as well as postulating interdependency relations between them. Of the 12 articles identified, four papers (Wollenburg et al. 2018, Lim & Srai 2018, Eriksson et al. 2019, Kembro & Norrman 2020) explicitly refer to the configuration approach, the remaining 8 implicitly. In this section, the different contextual factors (4.1) and design variables (4.2) are synthesized.

4.1. Structured synthesis of identified contextual factors

In the following chapter, the contextual factors mentioned in the respective contributions are worked out and compiled thematically. A total of four interdependent context dimensions were identified: "Products and Assortment“, „Historical development", "Customer delivery time requirements" and "Consignment structure”.

4.1.1. Product and Assortment

The characteristics of the products and assortments offered by a company are probably the most significant factors influencing logistics. This is probably also the reason why many contributions distinguish design options based on the trade sector. A closer look at the articles analyzed identified four underlying contextual factors:

- *Product category:* The corporate decision to sell a specific product category is already associated with some logistical design options, while others are excluded. The product categories "food" and "non-food" can be used as dichotomies, which differ fundamentally in terms of their logistical requirements: *"characteristics of OC non-food networks can only be applied to OC grocery networks to a very limited degree"* (Wollenburg et al. 2018). By fixing on a product category, logistics is not only influenced directly (e.g. by requirements for temperature-controlled structures and processes), but also indirectly by influencing other context factors (e.g. the shipment structure).
- *Product morphology:* The second contextual factor is product morphology, which describes the size and weight of the products offered. Bulky, heavy products are more difficult to store, reflect in the warehouse processes and send via the standard parcel network than light, small products, simply because of the space required in the warehouse and the goods handling requirements. On the other hand, retailers who deal with large products find it easier to utilize the transport system to full capacity. This is indeed necessary, because the larger and heavier the product, the more difficult it becomes for customers to pick it up on their own from stores. Accordingly, adjustments are required in the last mile logistics and

the relevance of the store channel is decreasing, at least from a logistics perspective.

- *Assortment range:* The range of products is defined as the breadth and depth of the product line offered by the company. Customers are increasingly demanding more extensive assortments, which translates into a higher number of stock keeping units (SKUs) that have to be distributed by logistics. This, coupled with requirements for high product availability within a short delivery time, represents a major challenge for the logistics system and significantly determines its design.
- *Assortment similarity:* Directly related to the range of assortments is the similarity of assortments in the distance and store channels. Whereas the store channel is limited in terms of the range of products that can be offered due to space constraints and economic considerations, a much broader assortment of products can be offered in the distance channel due to inventory pooling and relatively low storage costs. Accordingly, some companies use this effect to sell products that are rarely sold exclusively via the distance channel. This asynchrony has the advantage that a much broader product range can be offered to customers at low cost. The disadvantage is that it can frustrate customers if they cannot examine and buy products they see in the online channel directly in the store. It also makes it more difficult to integrate the stores into the distribution of end customer deliveries.

4.1.2. Historical Development

Retailers usually do not start directly as omni-channel-retailers, but have an origin in the distance or branch channel. This background is linked to existing infrastructure and business processes, which cannot be converted in the short term due to tied-up capital and a lack of liquidity. Instead, it is used as a competitive factor. Here, two contextual factors can be identified:

- *Channel Origin:* Whether a current omni-channel-retailer has evolved from the distance channel or the store channel significantly determines how it manages its omni-channel-strategy. While former distance retailers generally do not establish a full-fledged store channel (but instead operate with showrooms or pop-up concepts) in order not to undermine the cost advantages of the centralized logistics concept, retailers with a store background have to operate with existing stores and distribution centers designed to replenish them. The articles identified in this analysis, as well as most of the literature on OCL, deal exclusively with retailers from a retail store background.
- *Store Type:* Different store concepts are used depending on the origin of the retailers. In addition to showrooms, which are not covered in the articles analyzed and are of particular interest to retailers with a distance channel origin, a distinction can be made on the basis of store size. The larger a store is, the more difficult it is to maintain it economically in a city center location. Accordingly, large stores are more likely to be found on the outskirts of the city, while small stores are more likely to be found in central locations. The size of the stores also

determines the range of products and inventory levels that can be offered in the stores, as well as the amount of space available for logistics activities. Hence, retailers who maintain large stores are more capable of integrating the stores and their inventories into end customer distribution than those who operate small stores.

- *Store Network Density:* The density of the store network indicates what proportion of potential customers are within reach of the stores operated by the company. The higher this density, the easier it is for customers to visit the store; the lower, the more time and effort it takes. Directly linked to the store density is the attractiveness from the customer's point of view of using the store and its (OC) services. Simply put, customers will only use click-and-collect or return-to-store concepts if there is also a store within close reach.

4.1.3. Customer delivery time requirements

Customers' logistics expectations are largely determined by the products and ranges they buy. Overall, it can be seen that requirements are increasing, especially with regard to delivery times. The shorter the delivery time has to be, the geographically closer the logistics infrastructure has to be to the customers and the faster the logistics order processing processes have to work. Also, with shorter delivery times, innovative transport systems must be built, as traditional parcel service providers are limited by their structures and processes to next-day delivery at the earliest. To be able to offer a short delivery time, the store network could be utilized, presuming that store inventories can also be reserved for distance customers. Accordingly, retailers must consider what delivery time customers require from them and how they implement this in the logistics design.

4.1.4. Consignment Structure

A retailer's consignment structure specifies which types of goods flows are distributed in which volumes by the logistics system. Omni-channel-retailers are confronted with two types of output flows, store supply and end customer supply. Combining these two very different flow structures effectively and efficiently is the fundamental dilemma that makes OCL a complex problem. Two contextual factors in particular can be distinguished here:

- *Similarity of the consignment structures:* Store replenishment deliveries are usually distributed in large volumes, with different SKUs in high quantities on pallets or large boxes according to a fixed, regular schedule. In contrast, end customer orders include far fewer SKUs and shipments are correspondingly smaller, but a large number of these are ordered daily to different delivery locations with high delivery requirements, especially in terms of time. While this basic pattern fits many retailers, there are others whose store replenishment deliveries are also high frequency and small in quantity. This is especially true when the stores themselves are small. For such retailers, it is much easier to

efficiently integrate the logistics structures and processes for both shipment structures.

- *Share of distance shipment volume compared to total shipment volume:* Another contextual factor, which is particularly noticeable when looking at the historical development of omni-channel-retailers, is the share of distance shipments in the total shipment volume. If the share is low, the influence on logistics is small. Uneconomical processes for distance shipments can be endured if additional investments can be suspended for this purpose. As volumes in the distance channel increase, structures and processes must be adapted accordingly to keep logistics design effective and efficient. Looking at today's retail sector, it is clear that almost all retailers are confronted with high proportions of distance shipments or at least with high growth rates. Hence, from a company's future perspective, it makes sense to gear logistics to a significant level of distance volumes.

4.2. Structured synthesis of identified design variables

After highlighting the contextual factors, the next chapter focuses on the design variables of OCL. A total of four interdependent design dimensions were identified here: "Network Configuration", "Distribution Center Design", "Transport System" and "Return Management".

4.2.1. Network Configuration

Logistics networks consist of nodes, stock-carrying storage points or stockless material handling points, which are connected to each other via edges, corresponding transport segments. Since the transport system is introduced as an individual design dimension, the focus here is initially on the network nodes. Typically, it is questionable which types of network nodes are present and in which quantity. This is expressed with the degree of centralization, which is introduced as the first design variable. As a second design variable, the degree of integration of the network is employed, which expresses whether a joint or a separate logistics system is used for the respective channels.

- *Level of Centralization:* In OCL, different network nodes can be integrated and used for goods distribution. A distinction is made between centralized distribution centers, decentralized distribution centers and stores. In centralized structures, there is either only one, or at least very few, central distribution centers through which the shipment flows pass. This is advantageous because economies of scale and bundling can be leveraged, which reduces costs. The disadvantage is that long delivery routes have to be bridged, which can result in longer delivery times. This is the opposite with decentralized structures, in which the shipment flows are handled via several decentralized distribution centers in the network. Shorter delivery routes, shorter delivery times and regional specialization effects are the beneficial outcome, which comes at the price of higher costs due to a lack of

bundling and economies of scale. As an omni-channel-specific, highly decentralized solution, stores can also be integrated as logistics network nodes, which either tranship or dispatch products themselves.

- *Level of Integration:* As OCL requires dealing with two consignment structures, logistics managers can decide to either set up two dedicated networks, each of which is then only responsible for one channel, or to operate a joint network for both channels. Seperation has the advantage that the logistics structures and processes can be adapted to the respective channel, which allows the respective distribution to be designed efficiently. The disadvantage is that this may be at the expense of overall efficiency, as separated networks cannot leverage bundling and economies of scale, for example through shared inventories or shared resources. This is the advantage of an integrated network; by merging, inventories can be pooled, resources shared, costs reduced and product availability increased. In return, the processes are more complex and locally less efficient.

4.2.2. Distribution Center Design

The cornerstone of OCL are the distribution centers that are utilized. While these were classically designed in separate structures to either supply end customers or replenish stores, in integrated structures they must be able to handle the differences between the two consignment flows. There are a multitude of possible options relating to the technology used, the layout and the processes. Of particular importance is the decision on the degree of integration of the warehouse itself, the picking methods applied and the degree of automation.

- *Integration of the DC:* If a retailer chooses to use an integrated logistics network, it can still segregate physical zones, processes and resources for each channel within the DC. The advantage is that no separate network structure has to be set up, economies of scale and bundling can be achieved to a certain extent, and processes can still be specialized to the requirements of the respective channel. For this, there must be enough space in the warehouse to accommodate a separate structure and the coordination between the two warehouse areas is complex.
- *Picking Method:* With integrated DCs, picking is done for both channels, so there must be methods and regulations for how this can be done without friction. Retailers can choose to set specific time periods for the channels, or pick for both channels in parallel. The former has the advantage that employees from the different channels do not get in each other's way, thus harmonizing processes. However, there can be workload peaks and troughs, and the changeover can be tricky for employees. If a parallel picking approach is used, a decision must be made as to whether employees should process one or more orders completely at a time (batch picking), or whether processing should take place in multiple stages (SKU extraction). Batch picking has the advantage that direct sorting to sales orders takes place during picking. However, this can create a bottleneck in the process. SKU extraction avoids this bottleneck during picking, but requires downstream sorting processes.

- *Automation:* Automation technology is increasingly used in distribution centers. Although it is quite expensive to install, it can help to increase operational efficiency. Automation technology can be used in all areas of the DC. For example, in the form of conveyor technology, for sorting goods, order picking or automated packaging. The respective implementation is very retailer-specific, so that no general delimitations can be made. However, it can be stated that considerably more automation will be used in the future.

4.2.3. Transport System

As already mentioned, a logistics network consists of nodes and edges. The edges represent transport routes that connect the respective nodes. In the case of OCL, these are in particular the replenishment deliveries from the stores and the end customer deliveries.

- *Store Replenishment:* Stores are typically supplied in larger volumes according to a fixed schedule. This is often done in Full Truck Load (FTL), depending on the volumes, the shipments to several stores are bundled in one truck, which then drives off and delivers to the stores in the sense of a milk run. Retailers can decide how frequently they want to make these deliveries. With high frequency, the delivery volumes become smaller, but there is the option of co-loading customers' click-and-collect orders. This means that expensive parcel shipments to stores can be avoided.
- *End Customer Delivery:* With regard to end customer delivery, design options in the delivery mode can be differentiated. In omni-channel-retailing, customers have two options - either they have the products delivered to their home or to a location of their choice (home delivery) or to a store of their choice (click-and-collect). Click-and-collect can be further refined if it is possible to reserve products in a store, this is referred to as click-and-reserve. While home delivery is very convenient and simple from the customer's point of view, it involves high costs for parcel shipping, which are often covered by the company rather than the customer. This is the reason why retailers try to convince customers of pick-up concepts. Here, the receipt of goods is free of charge, customers can inspect the goods directly in the store, clarify problems personally and return the goods. From the retailer's point of view, there is the possibility of cross-selling or upselling in the store. In addition, depending on the design of the replenishment transport system, the costs for the last mile may be significantly reduced by pick-up concepts.

4.2.4. Returns Management

The fourth area of design can be identified as the handling of returns. Returns rates are rising and returns processes are expensive, which is why managing them is becoming an increasingly important issue. From a logistics design perspective, a differentiation must be made between the returns mode and returns processing.

- *Return Mode:* Analogous to the delivery mode, returns can also be made either via parcel service providers or via the stores. Return via service provider has the benefit that many return points are available. The disadvantage from the customer's point of view is that it takes longer to refund the money and returns may not be accepted. Also, the return costs are not always covered by the retailers. From the retailer's point of view, returns are generally unfavorable because costs have to be incurred for the forward and backward processes and, depending on the case, double parcel shipment costs occur. Retailers therefore try to encourage customers to drop off returns at the store. Parcel shipping costs are eliminated, problems with the product can be addressed directly in person, customers get their money back faster and may spend it directly on other products.
- *Return Processing:* With regard to returns processing, three options can be identified. Processing takes place either in downstream distribution or returns centers or directly in the stores. In the case of returns via parcel service providers, the goods are generally sent back to a distribution center, where they are processed and put back on offer. In the case of particularly high return rates or complex returns processes, the retailer can also utilize dedicated returns centers that focus exclusively on processing these returns. Due to the additional transport routes, this involves longer times until the goods are returned to inventory. When goods are returned via stores, it is possible to send them to DCs or RCs for processing as well. However, it is also feasible for items to be processed and sold directly at the store as well. Since they are not designed for this in the same way as DCs, this process is more expensive, but transport costs are saved.

Figure 6 shows an overview of the identified articles and indicates which contextual factors and design variables are primarily addressed by the contributions.

Figure 6. Overview of identified contributions, considered contextual factors and design variables

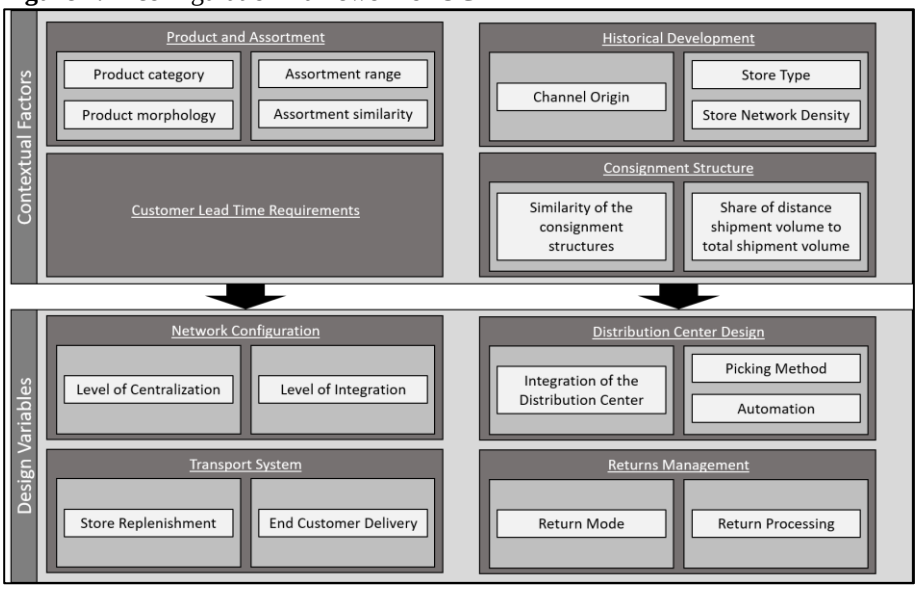
	Contextual Factors mentioned				Design Variables mentioned			
Contribution	*Product and Assortment*	*Historical Development*	*Customer Expectations*	*Consignment Structure*	*Network Configuration*	*Distribution Center Design*	*Transport System*	*Returns Management*
Distribution systems in omni-channel retailing	X			X	X		X	X
Retail logistics in the transition from multi-channel to omni-channel		X			X	X	X	X
Realignment of the physical distribution process in omni-channel fulfillment		X		X	X		X	
Online retail returns management: Integration within an omni-channel distribution context	X	X						X
Last mile fulfilment and distribution in omni-channel grocery retailing: A strategic planning framework	X				X	X	X	X
Logistics in omni-channel retailing: Modelling and analysis of three distribution configurations					X			
From bricks-and-mortar to bricks-and-clicks: Logistics networks in omni-channel grocery retailing	X	X	X	X	X	X	X	
Business logistics models in omni-channel: a classification framework and empirical analysis	X				X	X	X	X
Build touchpoints and they will come: transitioning to omnichannel retailing		X			X	X	X	X
Contextual adaptation of omni-channel grocery retailers' online fulfilment centres	X		X	X		X		
Which future path to pick? A contingency approach to omnichannel warehouse configuration	X		X	X		X		
Examining the anatomy of last-mile distribution in e-commerce omnichannel retailing	X		X		X		X	

Source: Own figure

5. CONCLUSION, LIMITATIONS AND FURTHER AREAS OF RESEARCH

This paper identified and summarized the current state of implicit and explicit application of the configuration approach in the academic literature. Beyond that, the context factors and design variables used were elaborated and described, and initial approaches of interdependency relationships were outlined. The result is a framework of four context and four design dimensions (see figure 7).

Figure 7. A configuration framework of OCL



Source: Own figure

This paper follows the call of Galipoglu et al. (2018) and Wollenburg et al. (Wollenburg et al. 2018) to fit research in OCL into a theory framework and to consider it more holistically. The configuration approach is used as a proposal, which has already been explicitly addressed in recent works, but otherwise only implicitly. The evolved framework can help future researchers to ground research efforts theoretically and structure their empirical work. Practitioners can find approaches to inform or challenge their own logistics design decisions.

This article has limitations that provide room for further research. First, only papers that explicitly or implicitly address the configuration approach were included in the analysis. In further research a more extensive body of articles should be included, which refer to individual design areas or influencing factors of logistics. The framework can be extended and deepened with these realizations accordingly. The focus should also be on concisely delineating the individual context and design features in terms of their characteristics. Only then is a comprehensive analysis of the interdependency relationships between the factors and thus also a further development of a typology of OCL possible.

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