A framework to support the selection of front-end and back-end solutions in omnichannel retailing

Giuffrida M.*, Mangiaracina R.*, Perego A.*

* *Department of Management, Economics and Industrial Engineering, Politecnico di Milano,*

Via Raffaele Lambruschini, 4b, 20156, Milan, Italy

Abstract: The goal of this paper is to address the operational challenges of omnichannel (OC) retailing, a popular model that merges online and offline channels to provide a seamless service experience to consumers throughout their customer journey. Embracing OC implies (i) deciding which shopping alternatives should be offered (front-end solutions), and (ii) designing appropriate logistics processes (back-end solutions). The study presents a framework supporting the configuration of omnichannel (OC) strategies through an empirical approach. After identifying possible front-end and back-end OC solutions, a series of OC retailing experiences were examined. These cases were mapped and positioned on two matrices (one for front-end and the other for back-end solutions) where product, network and service drivers were compared to derive insights on the type of retailers more likely to adopt each solution. OC drivers and alternatives were identified through a literature review; information about the cases was collected through direct interviews and secondary sources. Four front-end OC solutions (i.e. Click and Collect, InfoStore, InfoCommerce and InStore Support) and three back-end OC solutions (i.e. Store Picking, Warehouse Picking and Dropshipping) were identified. The front-end framework highlights six possible clusters based on product and network complexity. The back-end framework identifies three configurations, grouped by service and product complexity. This paper addresses a meaningful topic, as OC continues to disrupt operations management in most retail segments, from apparel to grocery. The studies in this area are increasing as a signal of growing interest in the theme. Still, most of the extant contributions either focus on logistics underlying OC or front-end aspects separately. This study originally contributes by jointly considering the double back-end and front-end perspectives of OC. This research is also useful for practitioners, as it aims to support retailers in the configuration of their overall OC strategy.

Keywords: omnichannel; logistics; front end; back end; retailing

1.Introduction

Over the past few years, retailing has undergone significant changes, mainly driven by the increasing diffusion of technology. While online retailing is not a recent phenomenon, the concept of using both online and offline channels and the way they are managed is experiencing a profound evolution. Initially, as e-commerce started growing in popularity, retailers developed multi-channel (MC) strategies. MC referred to the simple decision to add new channels, either online or offline, to the existing mix (Choi and Park, 2006). However, as the number of channels increased together with the customer journey's complexity, retailers started to rethink their strategies, leading to the advent of omnichannel (OC). This paradigm promoted a progressive integration between online and offline channels to offer a seamless purchasing experience to customers (Barnes, 2016).

OC requires integrated management of all the communication and trade channels between shoppers and retailers. Shopping activities can be influenced by information from many different sources, e.g. store, e-commerce website, mobile commerce website (Barnes, 2016; Giuffrida et al., 2019), and each phase of the purchasing process can happen at different locations (i.e. in-store or online). In this context, customer satisfaction does not depend on any single channel but is related to a unified and holistic brand experience (Hansen and Sia, 2015).

At the same time, the rising number of integrated channels adds complexity to the logistics processes: retailers need to anticipate and satisfy demand, manage inventory and minimise costs for each channel (Handfield et al. 2013). Effective supply chain planning is an essential requirement to enable coordination of warehousing and delivery in retailing and this is much harder in an OC context (Hübner et al., 2016a; Hübner et al., 2016b).

Managing the shift to OC retailing, therefore, implies taking a double perspective. On one hand, a seamless buying experience should be guaranteed in order preserve customer satisfaction along the multiple interactions with customers. We refer to these aspects as front-end OC. On the other hand, retailers need to understand how to develop and integrate consistent logistics activities to support the transition to OC. This is what we can call back-end OC retailing. This study covers these topics precisely, as our purposes are to (i) help investigate available front-end and back-end OC solutions and their characteristics and (ii) give directions on how retailers can select the best alternatives matching their product, network and service characteristics.

The study is organised as follows: section 2 presents a brief overview of current literature in OC retailing and clarifies the Research Questions (RQs). Section 3 describes the adopted methodology. Section 4 discusses results, while section 5 concludes.

2. Literature Review and Research Questions

The front-end and back-end sides of OC retailing highlight how vital managing the interface between logistics and customer touchpoints is in this specific context. Many authors have stressed the value of a synergic approach to front-end and back-end OC issues, including a recent call for papers from the Journal of Operations Management in 2021. Existing papers point at the fundamental role that understanding the interrelations between these two worlds can play in several fields, including new product development (e.g. Pero and Lamberti, 2013), performance management and business process improvement (Mandal et al., 2020; Marchet et al., 2018). Nonetheless, contributions combining the two topics seem to lack. Nowadays, companies are starting to introduce an increasing number of tools and channels to interact with their customers. This reflects technological development and the consequent change in customer behaviour that allow retailers to innovate by digitalising their offering (Freitag, 2016). One of the main challenges, specifically tackling retailers selling physical products, is that customers tend to use a more tactile approach when buying (Cook, 2014). Therefore, a purely online strategy is not advisable. Instead, OC strategies are becoming the key turning point of the competitive retail scenario. Despite attractive, OC is not easy to embrace because it brings greater complexity in channel arrangement (Picot-Coupey et al., 2016). Among these challenges, Cao (2014) suggests that retailers need to optimise the product assortment, price, and communication policies across channels and work on the store layout to maximise customer experience. In this regard, a full understanding of the available configurations for front-end channels is very useful to the study of OC. This leads to the formulation of our first Research Question (RQ).

RQ1. Which are the main drivers affecting the choice among available front-end OC models, and how do they affect it?

Managing OC retailing adds further complexity to the business model also from the back-end operations viewpoint. Retailers have to deal with differentiated stock-keeping, packing, and shipping processes while facing more demanding consumers with different behaviours when switching from one channel to another.

The appropriateness of infrastructures and logistics management, commonly considered crucial for pure e-commerce initiatives (e.g. Giuffrida et al., 2017; Mangiaracina et al., 2016), become even more critical in an OC environment. More specifically, Hübner et al. (2015) pointed out that retailers operating multiple channels have to make a crucial decision, i.e., managing warehouses in a separated or integrated way across channels. An integrated approach can bring advantages for inventory pooling and generally enable a more extensive assortment (Hübner et al., 2015). However, it requires aligned picking processes for store and home deliveries and capacity management solutions (Lang and Bressolles, 2013). Besides, opting for an OC approach can have an impact also on city logistics. Home deliveries in e-commerce transactions indeed tend to increase the number of freight movements. However, if online customers' demand is satisfied from retail store inventories, rather than a distribution centre, as can be the case in an OC context, the freight movements should reduce, and this generally has an impact on lead times and costs (Savelsbergh, and Van Woensel, 2016).

Logistics management is increasingly considered an essential issue in OC retailing. Hübner et al. (2015) are among the first to identify and describe the different logistics system configurations supporting OC, and this is the main investigated area in the field. However there is not a full understanding of the decision variables affecting each back-end model. Therefore, we propose a second RQ as follows.

RQ2. Which are the main drivers affecting the choice among available back-end OC models, and how do they affect it?

Finally, what is still missing in literature, limited to the authors' knowledge, is an investigation of the criteria and drivers leading to select one back-end solution that is consistent with the adopted front-end solutions.

Based on this gap and the need to provide managers with tools and practices to reach an integration between back-end operations and front-end customer interactions, the objective of this paper is to present a comprehensive framework. This aims to support retailers' selection of the most appropriate front-end and back-end OC solutions, given their specific characteristics in terms of products, distribution network and required service.

Therefore, we formulate a third RQ as well:

RQ3. What are the consequences for companies willing to implement an OC strategy?

3. Methodology

The study was developed along three stages:

•stage I – Identification of OC solutions and drivers

•stage II – Analysis of OC cases

•stage III – Definition of a general framework

First (stage I), a set of possible front-end and back-end OC solutions was identified, based on available literature and secondary sources (e.g. OC retailers' websites and industry reports). Simultaneously, the literature review was useful to identify the possible drivers affecting the selection of front-end OC solutions (RQ1) and back-end ones (RQ2).

Second (stage II), 29 different cases of OC retailers were analysed to observe the front-end and back-end OC strategies implemented and detect possible relationships between the identified drivers and the selected solutions (RQ1 and RQ2). Cases were selected through preliminary desk research to identify OC experiences related to different industries and product categories. Information about the values assumed by the decision drivers in each case study was collected through various sources, including interviews with company managers, company websites, annual reports, press releases, or empirical measurement (in case of physical characteristics, e.g.

product volume or weight). Since both qualitative and quantitative drivers were identified, and their measurement units differed across industries, a scoring system was introduced. According to the scoring method, the drivers' values were standardised on a 1 to 5 scale to make them comparable across cases. Each score corresponded to a qualitative evaluation of the driver's intensity, ranging from low (driver score = 1) to high (driver score = 5). After converting each diver's values into scores, drivers belonging to the same category (i.e. product drivers, network drivers or service drivers) were combined and weighted to derive a unique quantification of product complexity, network complexity, and service complexity for each case. In this process, the weight to attribute to each driver within its category was determined through the preference matrix method.

Third (stage III), a general model was built to represent the relationship between drivers and the selected solutions. This framework combines insights derived from the overall cases and can be used as a reference to support companies in the selection of the best front-end and back-end OC strategy (RQ3).

4. Results

4.1. Identification of front-end solutions

The presence of multiple front-end solutions is due to the combination of (i) the specific phase of the purchasing process and (ii) the place where this phase is accomplished. As for the phases, a purchasing process mainly consists of four steps, namely communication and pre-sale, sale/purchase, order delivery/collection, and post-sale; as for the places, they can either be physical, i.e. stores, or virtual, i.e. websites, social or mobile sites. By matching these two dimensions, at least four front-end strategies, represented in Figure 1, can be identified.

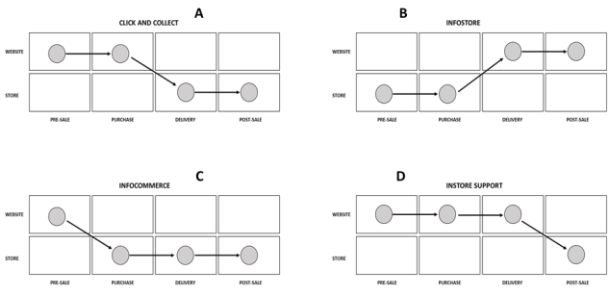

Figure 1: Front-end models

Click and collect (C&C) implies the product is searched and purchased online, but then collected in the store directly by the customer (figure 1A); on the contrary, the InfoStore (IS) has the pre-sale and sale phases happening in the store (figure 1B). In this context, the store is used to gather information about the product and to order it. Delivery and post-sale then happen online because the product is home delivered, as typical of e-commerce settings. This model has started to spread thanks to the increasing digitisation of stores (e.g., using interactive totems and mobile devices by salespeople) and the increasing diffusion of smartphones as a shopping tool. In the third model, InfoCommerce (IC), only pre-sale happens online (figure 1C). The customer can retrieve information about the product features on the retailers' website and understand whether the product is available at one of the physical stores. In this case, the purchasing process continues offline with the customers going to the store to buy, collect the product and eventually manage post-sale activities. The InStore Support (ISS) implies using the store just to manage the post-sale phase, including returns management or other services to the customers (figure 1D). All the previous phases are conducted online.

4.2. Drivers affecting the selection of OC front-end models

A retailer that needs to decide which type(s) of solutions to offer to its customers will be influenced by a series of drivers that we have tried to identify, relying on extant literature. The drivers that we consider for our framework are described below:

• **Value density:** it represents the ratio of the product's monetary value (e.g. expressed in euro) and its weight (e.g. expressed in kilos). Depending on the value density of a product, customers have different expectations. More precisely, the higher the value density, the higher the customer experience's expectations (Picot-Coupey et al., 2016). Therefore, we expect a positive impact on solutions such as IS IC and ISS, which aim to improve customer experience and provide additional services to which the customer pays attention, especially if the product has a high value density. In the C&C case, the effect is conversely rather ambiguous. On one side, having the possibility to collect the product in the store is an additional service for customers, possibly increasing their satisfaction. On the other hand, this is not strictly related to the value density of the product. Indeed, C&C is often used for convenience reasons and products with low value density.

• **Contribution margin:** it can be defined as the amount by which revenues exceed variable costs, thus balancing recurring fixed costs and creating profit. This driver has an important meaning for both customers and retailers. From a customer perspective, higher contribution margins usually reflect more valuable or higher quality products. From a retailer perspective, the contribution margin is the amount of "profit" missed consequent to a lost sale. Both perspectives lead to the consideration that as the contribution margin increases, solutions aimed at improving customer experience and reducing lost sales will be pursued. Among available alternatives, IS is more apt to decrease lost sale (as consumers gather in advance information about product availability); therefore, we can assume a positive effect exists between this driver and IS solution.

• **Product replaceability** represents how easily a product can be substituted by an alternative one and increases with the decrease of customisation needs. For the least replaceable products, the retailer may be more concerned with offering solutions that allow buying the desired product directly in the store to facilitate interaction.

• **Returns** represent the sold products given back to the company due to some general problems (e.g. defects, errors, or a simple change of mind of the customer). Literature has widely debated how returns are generally higher in an e-commerce context that in a traditional setting since customers do not see or touch the products before buying (Mandal et al., 2020). In an OC environment, however, retailers can rely on their network of physical stores. As the returns rate increases, we can assume there will be a higher propensity to adopt ISS solutions.

• **Number of stores** owned by the retailer: This indicates the proximity to the customer. As the number of physical stores increases, the average distance a customer needs to travel to reach it decreases. With a higher number of stores, it is reasonable to hypothesise an increasing adoption of C&C.

• **The ratio of online selection to store selection** can be seen as a proxy of the probability that a product searched on the online channel is also available in the physical store. As this probability decreases, it is possible to assume that IS and IC solutions are more useful as they can reassure customers about the product's availability or give them the possibility to order the product in case customers are already inside the physical store.

Given the single product drivers, it must be noted that the way they affect customer behaviour is highly dependent on the type of goods/industry. For "convenience goods", generally characterised by low value density, low price, and high standardisation, customers look for the purchasing process's immediacy and tend to minimise the time spent on pre-sale activities. On the other hand, "speciality goods", characterised by high value density, high customisation and often subject to impulse buying behaviour, usually require a long time for the selection, and customers are more demanding in terms of the overall buying experience.

4.3. Identification of OC back-end solutions

Three leading back-end solutions can be identified according to literature, as described below:

• **Store picking:** it is used when the picking of online orders is conducted within the store. With this term, we refer to both the case when the picking zones are isolated from the exhibition area and the case when the picking zones are not separated. In the latter case, the picker is likely to be obstructed in his movements and activities by the customers in the store. Therefore, the picking process will be less efficient because the items are not stored following a picking policy but are positioned as per commercial needs. In case of picking from isolated zones, there is the need to turn part of the back of the store into a warehouse destined to the performance of picking activities to fulfil orders. In this case, products can be stored following picking dynamics, therefore increasing the efficiency along the process although storage costs tend to increase. Store picking can be used to bridge some network deficiencies and increase market penetration, as it allows traditional retailers to offer advanced services such as same-day home delivery (Fenie et al., 2008).

• **Warehouse picking** implies the picking is conducted within a warehouse. In this case, we can distinguish when the warehouse dedicated to online orders is separated from the warehouse replenishing physical stores and the case where the same warehouse is shared for online and offline orders. Using dedicated warehouses allows greater customisation of the operations with consequent better performances in process efficiency and effectiveness. On the downside, retailers may lose the possible synergies caused by shared warehouses. As such, dedicated warehouses are generally adopted when online demand is high enough to justify a dedicated investment. Using shared warehouses conversely allows minimising storage costs while balancing fluctuations in demand from the two channel types. However, shared warehouses are not configured to fulfill customer orders most efficiently (Giuffrida et al., 2019). Plus, distribution costs and cycle times tend to increase with respect to dedicated warehouse picking or store picking, due to longer distances between shared warehouses and delivery points.

• **Dropshipping** implies the suppliers fulfil all the retailers' orders who, consequently, save storage costs and transfer product obsolescence risk upwards the supply chain. Through dropshipping, retailers can also increase product selection for the customers. On the downside, retailers transfer part of their margins and control over logistics processes to the supplier. For the relationship between suppliers and retailer to be advantageous, contracts specifying service level agreements and delivery costs must be in place (Agatz, et al., 2008). This solution is suitable for non-perishable products managed through a make to stock or make to order policy. High-value products mainly fit with this solution (Chopra, 2003).

4.4. Drivers affecting the selection of OC back-end models

Similarly to the front-end models, some drivers possibly influencing the presented logistics alternatives' choice have been detected.

• The **ratio online to store selection**: it has the same definition as the front-end case. In a back-end context, as this ratio increases, the probability of being unable to fulfil the order from the store increases. As such, for higher values of this driver, dropshipping or warehouse picking will be preferred.

• Similarly to the front-end case, **value density** is expressed by the ratio of monetary value of a product to its weight. Light products with a high value can easily absorb distribution costs which will have a very slight impact on sale price. Also, this type of products generates higher storage costs. Consequently, as value density increases, stock centralisation will prove more convenient. As such, store picking will not be likely to be adopted in favour of one of the two alternative back-end configurations.

• Third, **physical density** is the ratio of weight to volume of a given product. High physical density facilitates the distribution and storage processes. Conversely, products with limited physical density increase logistics complexity, which could be mitigated through centralisation (i.e.

warehouse picking and dropshipping). Therefore, as the physical density increases, the adoption of store picking solutions will be favoured.

• **Obsolescence** is defined as the product tendency to lose part of its value over time or become unsaleable. In the case of food products, this term is often referred to as perishability. As obsolescence/perishability increases, effects on logistics are not univocal; for perishable products, inventories are usually located nearer served markets, and faster transportation means are adopted. On the other hand, an inventory centralisation policy is usually preferred in case of obsolescence because centralising inventories allows mitigating obsolescence risk.

• **Volume** impacts the easiness to handle products. For high volume products, it is hard to pick in the store due to lack of adequate equipment, risk of causing danger to customers nearby, and the increase of space occupied by the products. As volume increases, it is reasonable to assume an increasing adoption of warehouse picking and dropshipping solutions.

• **Cycle time** is defined as the period between the issuing of a customer order and its delivery. Cycle time is made of three main components: time for order reception, time for order preparation (i.e. picking, packing, consolidation, loading) and transportation time. As the cycle time decreases, OC retailers may avoid the last mile problem by adopting solutions that transfer the delivery burden on the customer, as in the case of C&C with consequent store picking as a back-end model.

• **Frequency** is defined as the average time between two consecutive purchases of similar products by the same customer. Given this definition, this time often coincides with the product lifetime under standard use conditions. The back-end solution best suitable for low-frequency products is dropshipping, as the customer typically accepts the longer cycle time.

• **Timeliness** refers to the ability to conform to the promised delivery time. When timeliness gets more important to the customer, it is reasonable to assume that C&C will be adopted as a front-end solution. This typically translates into a store picking policy as a back-end model.

• **Flexibility** refers to the possibility to cancel or modify the order within a defined timeframe. Flexibility is important for those product categories where it is easier to make errors in estimating the quantity or typology of needed goods, as it may be, for instance, in the grocery industry. To guarantee higher flexibility, the picking time should be postponed to the latest moment; therefore, we can assume that flexibility positively affects store picking adoption.

4.5. OC cases

To develop a framework suggesting how retailers could select their front-end and corresponding back-end OC solutions, the experience of 29 OC retailers has been observed. The above-described drivers' values have been calculated for each retailer and the numbers have been converted into a 1 to 5 scale to have homogeneous and comparable values to use in the framework. Table 3 below summarises the characteristics of the analysed cases.

Case	Industry	Front-end solution	Back-end solution
1	Grocery	C&C	SP
2	Grocery	C&C	SP
3	Grocery	C&C	SP
4	Grocery	C&C	SP
5	Do-it-yourself	C&C + IS	WP + SP
6	Do-it-yourself	No OC	WP
7	Do-it-yourself	C&C + ISS + IC	WP + SP
8	Fast Fashion	C&C + IC	WP
9	Fast Fashion	C&C + IS + ISS	WP
10	Fast Fashion	C&C + IS + ISS + IC	WP
11	Fast Fashion	C&C + IS + ISS + IC	WP
12	Fast Fashion	C&C + ISS	WP
13	Fast Fashion	C&C + IS + ISS + IC	WP
14	High Fashion	ISS	WP
15	High Fashion	IS	WP
16	Sportswear	C&C + IS + ISS + IC	WP + SP
17	Sportswear	No OC	WP
18	Sportswear	IS + IC	WP + D
19	Beauty	C&C + IC + ISS	WP
20	Beauty	ISS	WP
21	Furniture	C&C + IC	WP + SP + D
22	Furniture	C&C	SP + D
23	Publishing	C&C	WP + SP
24	Publishing	C&C	SP
25	Luxury	ISS	WP
26	Consumer electronics	C&C + ISS	WP + D
27	Consumer electronics	C&C + IC	WP + SP
28	Consumer electronics	C&C + IC + IS	SP + D
29	Consumer electronics	C&C + ISS	WP

Table 1: OC cases

4.6. Front-end framework

Figure 2 shows the positioning of the case studies on a matrix that pairs product complexity and network complexity on the axes. Both product and network complexity are computed based on the correspondent drivers highlighted in section 4.2. and the quantification approach explained in the methodology. Product complexity is determined by drivers that go from "value density" to "returns". The network complexity depends on the online/offline selection and the number of stores:

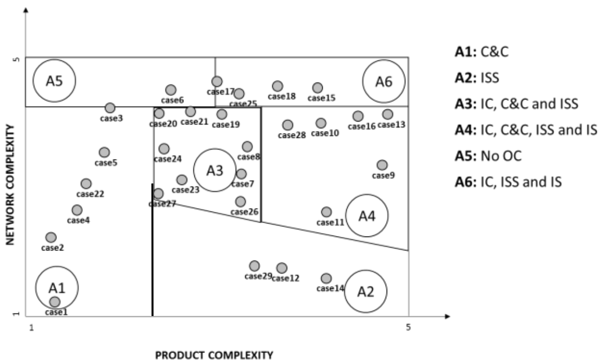

Figure 2: Front-end framework

From the figure above, six different sections can be identified suggesting how companies can select their front-end OC strategy based on their network and product complexity.

<u>**Area A1**</u> is characterised by a low product complexity and a low to medium-high network complexity. This is the category of convenience goods. Customer expectations are not high but purchase immediacy is important. The most typical front-end solution in this cluster is C&C.

<u>**Area A2**</u> groups companies with medium-low network complexity and high product complexity. Typically, retailers operating in this area use the online channel to replicate the experience of the offline stores. Online and offline selections are almost identical. Customers use the online channel to save time and increase comfort. ISS is mainly adopted in this case.

<u>**Area A3**</u> is characterised by medium product complexity and medium-high network complexity. Differently from

Area A1, customers are willing to spend more time in the product search phase, since products are more complex. Also, higher network complexity implies customers are likely to travel higher distances to reach stores and the probability not to find a product in the store increases. This is why there is the tendency to offer an IC solution. This can be used together with C&C and ISS.

Area A4 has the same network complexity, but higher product complexity than Area A3. This implies customer expectations tend to increase, therefore also the IS solution, together with the other ones, is adopted. Players in this category implement models that adhere the most to the concept of OC, as they tend to use all the considered front-end solutions.

Area A5 shares the same product complexity as Area A1, however network complexity is higher. In this case, retailers are not able to combine online and offline stores into an OC strategy. As such, they most typically are only able to offer pure e-commerce services. These however are not integrated with physical stores and the two channels are rather kept separated. Players in this area might see the use of e-commerce as a simple way to reach a wider and further audience, not as a mean to provide superior experience to the customers through the implementation of OC solutions.

Area A6 clusters companies with the same network complexity but higher product complexity than Area A5. The expectations deriving from this product complexity are met by offering the solutions IS, IC and ISS. Retailers operating in this cluster have a double objective: on one hand they aim to best serve local customers through OC; on the other hand, they adopt pure e-commerce similarly to retailers in A5 in order to reach more geographically distant customers.

4.7. Back-end Framework

With a similar approach, a framework representing the positioning of the case studies was reported considering the back-end OC strategies. This time, the axes of the matrix refer to product complexity (related to drivers ranging from value density to volume) and service complexity (determined by the remaining drivers, e.g. cycle time, timeliness).

Results of this process are displayed in figure 3.

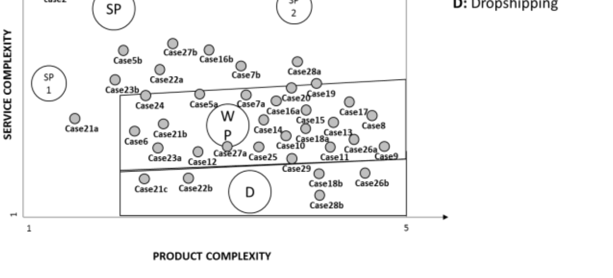

Figure 3: Back-end framework

In this case, three areas can be identified, one for each back-end solution:

Store Picking Area (SP 1 and SP 2): Store picking is generally most suitable for cases characterised by low product complexity and high service complexity. Indeed, the multiplication of inventory-filled nodes (i.e. stores used as picking points) in the network provides increased service to the customer and is not excessively costly due to low product complexity. However, two additional sub-areas emerge to be suitable for store picking policies, respectively called SP1 and SP2 in the above framework. Sub-area SP1 is characterised by lower product complexity than SP2. Therefore, SP1 is populated by retailers that use the store as a picking and order fulfilment point to offer advanced services such as same-day delivery. As product complexity increases (SP2) store picking is adopted to offer OC services such as C&C.

Warehouse Picking Area (WP): This area is characterised by medium service complexity and a medium-high product complexity. Players in this area respond to increasing product complexity by centralising logistics processes. At the same time, increased service requirements do not make transferring risks and control to suppliers (i.e. adopting dropshipping) advisable

Dropshipping Area (D): This area is characterised by medium-high product complexity and low service complexity. Companies tend to adopt this solution for complex products such as white goods or products sold in small quantities, often on reservation, where customers are willing to accept longer delivery time.

As can it be noted from the back-end and front-end frameworks, the same cases present different product complexity (can be positioned differently on the horizontal axis) when switching from one framework to the other because the drivers considered to determine such complexity are different. Moreover, some cases present "hybrid" logistics solutions in the back-end model (meaning that they adopt more than one solution simultaneously. This mainly happens when retailers manage different product families that necessitate differentiated picking policies. Such instances have been marked by adding a letter (i.e. a, b) to the number indicating the specific sub-case.

As a final step of the study, six additional case studies, different from the ones used to derive the frameworks, were analysed to test the solidity of the proposed classification frameworks. By calculating the value of the drivers for each case and converting them according to the scoring method previously described, the front-end and back-end strategies suggested by the models were compared with the ones implemented by the companies and we found a match between the two outcomes.

5. Conclusion

This paper aims to propose a framework to guide the selection of OC solutions by taking as a reference the decisions made by retailers already running OC initiatives. Both front-end and back-end solutions are analysed to provide a holistic view of how logistics aspects (back-end) and customer touchpoints (front-end) should be simultaneously managed in an OC context. The main theoretical contribution of this work is the combination of the front-end and back-end perspectives, which was the main literature gap in this field. From a practical viewpoint, the suggested models can be a reference point for retailers willing to embrace OC. This research can be further improved by testing the suggested framework via a quantitative optimisation-based study.

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