

Toward a three-dimensional framework for omni-channel

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Abstract

The omni-channel, as an emerging trend in retail, aims to coordinate processes and technologies across supply and sales channels. The evolution of this concept is still nascent. This paper develops a conceptual framework for omni-channel systems, configured by three dimensions of *channel stage*, *channel type* and *channel agent*. Integration and visibility are also explored and discussed as the main enablers, which support the implementation of omni-channel framework.

This research is built upon the empirical and secondary data. Multiple case studies and expert interview methods are employed for data collection to validate the recommended framework and to explore its applicability.

The framework proposed, along with the key integration and visibility enablers identified for the omni-channel, can be applied to a wide range of retail supply chains. It helps managers to develop, run and monitor omni-channel systems; it may also serve as a stepping-stone for development of the literature on omni-channel systems.

Keywords: omni-channel, channel integration, channel visibility, retail, supply chain.

1. Omni-channel: introduction and research motivation

Today, shopping channels and choices such as retail stores, home delivery, collection points, and digital/downloadable products form a diverse experience for consumers. Multiple channels collectively try to enhance customer value proposition and reach a larger and wider range of consumers (Zhang *et al.*, 2010a). However, Wilding (2013) argues that multi-channel systems usually consist of detached channels, developed by retailers in response to the rapidly shifting world of e-commerce and information technology (IT). When channels work independently of each other they create fragmented supply chains, and struggle to deliver a consistent and reliable consumer experience. Omni-channel retailing aims to address this issue by coordinating processes and technologies across all channels, to provide seamless, consistent and more reliable services for consumers (Verhoef *et al.*, 2015).

The retail and supply chain business has had a long journey through developing the ideas of marketing channel and multi-channel supply chains to reach the omni-channel era. The multi-channel phenomenon has been acknowledged in the literature for many years (e.g. Bartels, 1965). Through the advancement and expansion of e-commerce and IT-enabled marketing and supply chain management, over the past 20 years, scholars have built a notable body of knowledge exploring different aspects of the multi-channel retail (Van den Poel and Leunis, 1999; Agatz *et al.*, 2008; Lee and Park, 2014).

Operational aspects of the multi-channel shopping have been addressed in various studies on e-fulfillment (Tarn *et al.*, 2003), operations and marketing links in online channels (Boyer and Hult, 2005), marketing efficiency (Min and Wolfinbarger, 2005), the characteristics of multi-channel operations (Bendoly *et al.*, 2005), material flow performance (Metters and Walton, 2007), logistics services (Rabinovich *et al.*, 2007), reverse logistics (Rao *et al.* 2014), and capacity and order allocation across distribution channels (Xie *et al.*, 2014). The multi-channel literature indicates that in many cases, individual channels of a multi-channel system still try to work autonomously to optimize their own outputs, while consumers choose their preferred channel(s) based on technological, economic, or behavioral factors (Balasubramanian *et al.*, 2005). In effect, multi-channel systems are not usually designed to make synergy of parallel supply chains (Wagner and Alderdice 2006; Bhatnagar and Syam, 2014). Due to the independent activities of the channels, data-mismatch, product/order information inconsistency, and poor inventory efficiency are very likely to take place.

To enhance the consumer multi-channel experience, retailers have attempted to make the product and service information consistent across all channels (Müller-Lankenau *et al.*, 2006). These have been named cross-channel systems, which try to make data gathering and decision making easier for the consumer, so s/he receives uniform information via different channels. It also facilitates cross-selling and flexibility for retailers and manufacturers (Schoenbachler and Gordon, 2002).

Although cross-channel systems show major improvements, they still rely on the consumer to act as an integrator of the information. Moreover, in cross-channel systems, the supply chain does not benefit from a centralized product knowledge base to synchronize all channels. To achieve that level of maturity, the idea of the omni-channel has been introduced, where a holistic view of all channels is provided to the consumer and supply chain members (Cunnane, 2012). In such a system, consumers can easily switch from one channel to another in their

buying experience, where they may find a product in one channel (e.g. the manufacturer's website), place the order via another channel (e.g. an online retailer), and have the product delivery from a third channel (e.g. home delivery).

Hence, the omni-channel system assures maximum information availability, visibility and consistency across multiple channels (Piotrowicz and Cuthbertson, 2014). This provides various benefits such as total sales growth, cost saving, extended trust, synergy, and differentiation through value-added service (Stringer, 2004; Kumar and Venkatesan, 2005; Tate *et al.*, 2007).

Despite the above, the academic research into omni-channel and its structure is only starting to emerge. Aside from the basic introductions and general characteristics of omni-channel, mainly provided by the retail business reports and magazines, there is a scarcity of omni-channel research work in the academic literature. Although, key activities such as online brand promotion (Hahn and Kim, 2009; Amrouche and Yan, 2012), understanding web consumer (Ganesh, 2004), target marketing (Duffy, 2004), and e-fulfillment (Agatz *et al.*, 2008) have been studied in the context of online business, recent pressures toward digitization and online/mobile presence have demanded further research to explore the various characteristics and requirements of the omni-channel and its supporting platforms and architectures (Plomp and Batenburg, 2010; Schramm-Klein, 2011; Bell *et al.*, 2014). Besides, the omni-channel's effectiveness and efficiency are not only a matter of technology application (Brynjolfsson *et al.*, 2013). Verhoef *et al.* (2015) also underline that the growing trend toward omni-channel should be conceptualized, and a structural view to omni-channel systems and their building blocks needs to be developed. Studies such as those of Berry *et al.* (2010) and Zhang *et al.* (2010a) worked on the conceptualization of multi-channel retail; however, they have limited views on the omni-channel and do not provide a structural view to omni-channel and its founding elements. Overall, the literature could not provide a satisfactory theoretical ground and a thorough characterization for various aspects of omni-channel systems and their distinctive features. This is critical because those aspects and features of omni-channel, if understood and formalized properly, can contribute to a broader retail and supply chain management theories,

Over and above those gaps, there are controversies in the literature, which necessitate the development of a more holistic framework for omni-channel. Concerning the scope of omni-channel, while some authors (e.g. Amrouche and Yan, 2012; Rigby and Kirby, 2011) mainly

focus on online shopping and its facility for buying anything/anytime, others (e.g. Dorman, 2013; Verhoef et al. 2015) try to address a wide range of touchpoints and channels for communication and transaction with customers. In the same way, some studies have stressed that omni-channel is all about the location of inventory and managing the online vs. store inventories (Wollenburg et al., 2016), while other studies are less concern about the inventory and more anxious about brand and customer management (Tate et al., 2005), and some others view omni-channel as a strategy to integrate promotions, make products consistent, and manage information properly (Berman and Thelen, 2004). The effects of channels on each other have been controversial too. Studies such as Blázquez (2014) and Lim et al. (2012) believe that higher synergy and more information make channels complement each other. But other studies share different views. Channel cannibalization has been indicated between traditional and self-service channels (Falk et al., 2007), between catalog and store channels (Pauwels and Neslin, 2015), and between manufacturer direct channel and traditional sales via retailers (Yan, 2011). There are various other divisive factors, neither cannibalizing nor complementary, addressed by the omni-channel literature. For example, perceived quality and risk of multi-channel shopping have been found to be affected by diverse factors. While Schoenbachler and Gordon (2002) emphasize the role of soft factors like customer digital literacy and brand recognition, Herhausen *et al.* (2015) find hard factors, such as channels integration, crucial for perceived quality and risk of shopping via multiple channels. In the same way, Hübner *et al.* (2016) address different factors, such as advanced logistics process(es), critical for omni-channel efficiency, while Verhagen and van Dolen (2009) identify a wider range of factors, including offline store service, merchandise, atmosphere and layout, influencing the omni-channel image of a firm.

Given the abovementioned gaps and controversies, this research aims to develop a conceptual framework for omni-channel systems. The main objective of this paper is to take the first steps to theorize the concept of the omni-channel by addressing two key questions: What are the main building blocks of omni-channel systems? What are the main enablers to operationalize the omni-channel system? Answers to these normative questions can help to understand the performance of omni-channel systems and their dynamics. They can also create a framework for future studies on the omni-channel, support more effective information and operations architectures for omni-channel systems, and contribute to both the theoretical and practical literature of omni-channel research.

In view of the above aim and objective, the paper is organized as follows: the next section develops and presents the theoretical ground of the research, followed by the research methods in section 3. Section 4 formalizes the conceptual framework for omni-channel systems; then, section 5 explores channel visibility and integration as the main enablers of the omni-channel framework. The theoretical relevance of the recommended omni-channel framework is discussed in the penultimate section. Finally, section 7 presents the concluding remarks and future research directions.

2. Theoretical ground

To develop a conceptual framework for omni-channel it is important to understand omni-channel, as a phenomenon, through the lens of theory. As highlighted earlier, omni-channel has many elements, which need to interact with each other (e.g. in form of information and material flows). Those interactions change over time and face many uncertainties. Based on the common definitions of complexity (Anderson, 1999; Vasconcelos, and Ramirez, 2011), and complex adaptive theory (Miller and Page, 2009; Pathak et al., 2007) omni-channel can be recognized as a complex adaptive system. While the scale and scope of an omni-channel system and the interactions among its entities make it complex, the adaptation property of omni-channel helps it reconfigure itself - e.g. in terms of various stock-keeping points and flows of material and information via different channels. The retailing, marketing and supply chain management literature, where the omni-channel research is positioned, characterizes complex adaptive systems with some core elements and features, which can be summarized as (Choi et al., 2001; McCarthy, 2003; Nilsson and Darley, 2006; Wollin and Perry, 2004): agents, connectivity, emergence, and autonomy/control. The applicability of them in the context of omni-channel forms the theoretical ground of this research – as explained below.

Complex adaptive systems consist of agents (or entities) which are interdependent and interconnected with each other. An agent can be an organization or individual. In omni-channel systems various parties such as retailers, manufacturers and delivery companies are agents of the system. Those agents are not static and their role and connections should be viewed in relation to other agents and in various channels. To have a better understanding of the role and position of the agents in omni-channel, this paper needs to revisit the concept of *channel* first.

A thorough review of the omni-channel literature shows mixed interpretations and applications of the terms channel and multi-channel. To the dominant part of the literature, multi-channel

means bricks and mortar stores and Internet websites, or simply online and offline channels (Bilgicer *et al.*, 2015; Herhausen *et al.*, 2015). Some studies expand the channel's classification to mobile shopping (Fairchild, 2014; Wang *et al.*, 2015), and some emphasize multiple touchpoints and customer interactions as the core of the omni-channel (Dorman, 2013).

Tetteh and Xu (2014) stretch the omni-channel boundaries from customer interaction and order placement to order fulfillment channels, and Bell *et al.* (2015) add information acquisition (by the customer) to the omni-channel scope. There are also attempts to provide a more holistic view of the channels' structures. Baxendale *et al.* (2015) address different types of channel by studying the relationship between different demand touchpoints and brand considerations.

Overall, the literature is unanimous that channels refer to different ways to interact with customers, and different types of channel represent the way product or information is transferred. However, what is being overlooked and mixed up is that the channel types are different for different interactions with the customer during his/her buying process, and are managed by different agents. The buying process, which is known as the customer value-adding journey (Wilding, 2003), starts well before the point of sale and continues long after it. The value in this journey can be provided by agents or co-created by customers and agents (Kowalkowski *et al.*, 2012). The customer's value-adding journey can be primarily outlined in four main stages (Frambach *et al.*, 2007; Chaffey and Ellis-Chadwick, 2012; Lamb *et al.*, 2014): pre-purchase, payment, delivery, and return. As soon as a customer needs a product, s/he starts collecting some information about it. The more product-knowledgeable customer then needs some support for the purchase decision (e.g. what features/models/options to buy, and where to buy from). The customer's value-adding journey continues in the payment stage, where various methods of payment can make the purchase more/less convenient, secure, speedy, and flexible. The customer will receive the product afterward. Different ways of product delivery might have different kinds/levels of value for the customer. The customer may continue the value-adding journey even further when s/he decides to return the product. Again, different ways to return the product may have different kinds/levels of value for the customer, depending on their availability, convenience, cost or speed.

Therefore, agents in omni-channel are defined in the context of the channel type(s) they represent or perform in, while channel types are defined based on the stage(s) of the customer value-adding journey they refer to – note: this multi-layer or multi-dimension view to omni-channel is mainly missing in the literature. Notably, channel types and agents in each stage of

the customer value-adding journey are not the same. For example, in the pre-purchase stage, a customer can collect information about the products via different channel types such as social media, price comparison websites, catalogs and stores, and the payment stage can occur via phone, store cashier, or online channel (each is a different channel type and each may be handled by a different agent). This view to the omni-channel systems helps in understanding their channel agents and types more precisely:

***Notion 1:** Identity and role of the agents in the omni-channel (as a complex adaptive system) may vary, depending on the channel type(s) they manage or perform in.*

***Notion 2:** Different types of channel in omni-channel systems should be identified based on the stage of the customer value-adding journey in which they occur.*

***Notion 3:** Agents in omni-channel systems should be defined with two key attributes: channel type, and the stage of the customer value adding journey that the agent (and channel type) belongs to.*

Complex adaptive systems include constant and dynamic connectivity and interactions (e.g. information interchange) among the agents internally and with the surrounding environment. The resulting impacts of those interactions on other agents are usually non-linear. Hence, in the omni-channel system, continuous communication and coordination among the channel agents are crucial (without it the system might remain multi-channel). Beck and Rygl (2015) emphasize the role of the agent “who triggers the channel interaction?” (e.g. retailer and/or customer). The interaction and communication type may vary for different products, customers, services and operations, and the coordination level may change over the value adding journey stages and channel types. Accordingly:

***Notion 4:** Connectivity and interactions among the agents in omni-channel systems should be defined based on the channel type and the stage of the customer value adding journey that the agent belongs to. This implies that:*

***Notion 5:** The connectivity and interactions among the agents in omni-channel systems should ultimately connect multiple channel types and stages of the customer value- adding journey.*

Another key feature of complex adaptive systems is emergence. It is known as a collective outcome of the agents' behavior, performance and interactions, which are arranged dynamically and flexibly. In omni-channel systems, retail shop, internet retail website, or delivery people may behave differently or provide different service level for different customers. This creates several organizations for the goods, information and finance flows in the omni-channel system, and makes the whole system less predictable.

Another key feature of complex adaptive systems is known as autonomy and control – of the agents' actions and behavior. The higher level of autonomy gives freedom to agents and introduces a higher level of uncertainty to the system as a whole. On the contrary, more control, in forms of audits/inspections, legislations, or restrictions make the system more predictable. In omni-channel the leading role of the focal company, which might be the retailer, manufacturer or brand owner can determine the control over other agents in different channels. But in many cases a dominant focal company does not exist or the control level is not dictated by one party. The position, role and particular situation of agents against other agents, or the business environment and customers may form the degrees and mechanisms of control. Further to the earlier discussions on the role and position of agents, channel types, and stages of customer value-adding journey in omni-channel systems, it can be stated that:

***Notion 6:** The emergence and autonomy/control in omni-channel systems needs a clear definition and understanding of the agents, channel types and stages of customer value-adding journey.*

And finally, notions 1 to 6 can be deduced as:

***Research Proposition:** Omni-channel systems can be conceptualized in a framework of three dimensions: (i) customer value-adding journey (i.e. where the channels are located), (ii) type of channel, which represents the way the product or information is transferred and may vary in each stage of the customer value-adding journey, and (iii) agents – i.e. the responsible(s) for each channel, which may be different for each stage of the customer value-adding journey and each channel type.*

The research proposition will be explored and validated in section 4 (based on the methods that are explained in section 3), and the results' relevance and compatibility with the complex adaptive system theory will be discussed at the end in section 6.

3. Methods

Due to the lack of relevant theoretical frameworks underpinning omni-channel research, an exploratory research is undertaken to investigate the concept, structure and performance of the omni-channel. This has materialized through a configuration approach, which aims to develop “multi-dimensional profiles to describe organizational, strategy, or process type” (Bozarth and McDermott, 1998). The exploratory research of this paper has three main features, adapted from Stevenson and Busby (2015), as follows:

- It is inductive and grounded, aiming to build a theory and make a proper ground for further theory building and testing. This matches the emerging nature of the research around omni-channel.
- It employs case study as a research strategy, supporting exploratory research, where the research phenomenon is still forming with no well-established variables, elements or dimensions.
- It collects qualitative data from case studies, in form of both secondary and primary data. Recent attempts toward omni-channel by the retail sector have provided this research with a number of real-life secondary data which are used to understand and form the dimensions of the omni-channel framework. Subsequently, primary interview data are collected to study the applicability of the recommended framework. Availability of the secondary data and their objectivity are great supports for exploratory research (Calantone and Vickery, 2010), while combining them with primary data make the research more profound and thorough.

Following the recent leading approaches to develop conceptual frameworks in marketing and operations disciplines (Benassi et al. 2016; Sheth and Sinha, 2015; Velmurugan and Dhingra, 2015), this paper employs the exploratory research in three steps: developing the conceptual framework (based on the knowledge extracted from the literature), validating the conceptual framework (based on seven case studies), and operationalizing the conceptual framework by exploring its enablers (based on industry experts interviews). These three steps are described as follows:

Step 1. It starts with a literature review which focuses on two main areas: (a) business literature, where the latest omni-channel ideas and actions are shared, and (b) academic literature relevant to the omni-channel systems. This step supports the research notions (section 2) and forms the omni-channel conceptual framework (section 4).

Step 2. The recommended framework is then supported and validated by seven case studies. The criteria for selection of the cases are driven by the research objective rather than random sampling (Yin, 2008). The cases are picked from the UK market, since it is the world's leading markets for omni-channel systems (LCP, 2014). Preliminary review of the omni-channel practices identifies two categories of companies: (i) companies which have manufacturing as the core function, but try to connect with the consumer directly or more effectively and be present in the market via various channels; and (ii) companies with retail as the core function which try to expand their services for customers via more channels. Two cases are selected from the first category including Westbridge Furniture and Wren. The second category includes two groups: First, conventional brick and mortar retailers who attempt other channels than physical presence in the market (three cases are selected from this group: Argos, John Lewis, and Tesco; among them Argos is mainly known as a catalog retail, with no show room); and Second, purely online retailers which have been developed based on the Internet platform, and try to enhance their visibility and efficiency for customers via multiple channels (two cases are selected from this group: Amazon UK, and Ocado). The selected cases are all leading companies in their fields, and represent good attempts toward omni-channel systems in the retail and manufacturing sectors. In the manufacturing category, Westbridge is a major furniture designer and manufacturer in the UK which sells its products directly in the market and also supplies a wide range of British retailers such as Debenhams, John Lewis, M&S, Next, Made and Tesco (Mintel 2015a). The second manufacturing case of this research, Wren, is the fastest growing kitchen designer and manufacturer, which has also expanded into other home markets including bedrooms, bathrooms, and free-standing furniture. In addition to its regular product lines, it provides made-to-order products for customers via direct contact with them in its several stores and showrooms (Mintel, 2016b). Both manufacturing cases have a number of sites and use multiple channels to sell and deliver their products. In the retail category, Tesco is the UK's biggest grocery retailer with the largest market share (IGD, 2016); John Lewis is the UK's department store market leader with the highest market share and a continuous multi-channel expansion over the last ten years (Mintel, 2016a); and Argos is the UK's largest high street retailer online with annual website visit of 430 million (Argos, 2016).

Two other retailers, which perform purely online are Amazon, the biggest online retailer in the UK with 16 percent share of the online retail market (Ecommerce News, 2016); and Ocado, the world's largest dedicated online grocery retailer by turnover (Intel, 2015b). Amazon and Ocado both lead multi-channel online retail successfully.

The cases have been studied between 2013 and 2016. In each case, the company's operations to fulfil and support customer journey in product search, purchase decision, and receiving/returning the product are investigated. Choosing the same operational context in all cases support crosscomparative analysis. The use of multiple case studies, with different business and operations models, assists triangulation of the results to some extent. Table 1 illustrates the main omni-channel activities of the selected cases and shows their suitability for this research. The companies' profiles are provided in Appendix A, and analyses of the case studies are provided in section 4.

*** Insert Table 1 here ***

The case studies' data are collected from secondary sources, which provide good supports for the configurational and exploratory approach of this research. The secondary data sources include: (a) the companies' reports or documents on their retail, delivery logistics, or supply chain operations, (b) press releases on the companies' retail operations, and multi-channel/omni-channel practices, and (c) specialist reports on omni-channel retail and electronic commerce, developed by some leading research and consultancy firms. Table 2 shows the breakdown of citations, found for each case study from different sources of secondary data. These sources provide us with an extensive range of information, but have particular biases and shortcomings too. The company's reports are generally a direct reflection of the latest decisions and practices of the company. They have up-to-date information about the retail performance of the company, but usually tend to highlight the success stories more and address the failures or challenges less. They also mostly share the results and keep the internal procedures and processes that motivated those results restricted. The press releases have more independent and sometimes thorough views, but they typically remain general and lightweight about omni-channel and its implementation. Specialist reports try to provide both information and analysis. Although the information provided by specialist reports is valuable, their analyses are typically

descriptive. Given the pros and cons of these three main sources of secondary data, overall a proper combination of them has supported the current research very well.

*** Insert Table 2 here ***

Step 3. With a view to operationalizing the multi-dimensional structure of omni-channel, the paper extends the omni-channel conceptual framework by exposing its main enablers. The key enablers are first extracted from the literature, and then discussed and explored further through a number of interviews. Given the novelty of the subject and recommended framework, the expert interview is an appropriate method to ensure the research depth (Meuser and Ulrike, 2009). Moreover, in order to achieve a proper breadth in understanding the enablers, the research needs a proper diversity in studying sectors (i.e. retail and manufacturing) as well as omni-channel/multi-channel practices. Therefore, interviews are made with the UK industry/business experts from two retailers (one grocery and one non-grocery retailer), one wholesaler (of food sector), and two manufacturers (of food sector); where all except one retailer are different from the case studies of Step 2. All companies are market leaders in their own business sector and largely involved in application, expansion or introduction of omni channel systems (further information about these companies are kept confidential, but are available upon request from the authors).

The interviewees (one or two in each organization) are order-fulfillment, sales, supply chain, and logistics managers. They are particularly knowledgeable about *integration* and *visibility* practices (as the main omni-channel enablers, which will be highlighted later in this paper) in their business. The interviews intend to find the retailers'/manufacturers' comment on the developed conceptual framework and their views to omni-channel enablers. To avoid bias in the interviews and research outputs as much as possible, the questions are designed open-ended and non-leading. In general, four types of questions are included in each interview: (a) opening questions to find about the company's retail and/or logistics operations in general, (b) general questions around the company's information management practices in an omni-channel context, (c) detailed questions around the interviewee's comments on the developed omni-channel framework (in *Step 2*) and its enablers, and (d) follow up questions to find about wider implications of omni-channel and its enablers

The interview guide (as provided in Appendix B) is developed accordingly and validated by two academics. During the interviews, neutrality is maintained and the researchers made every effort to not impose their own views. These support the explorative nature of the research (Meredith *et al.*, 1989; Reichart and Holweg, 2006).

All interviews are tape-recorded (with permission) and transcribed; the interviews' contents are then analyzed and the outputs are discussed in this paper. To analyze the interviews, open coding and axial coding methods are employed by the authors, all with retail logistics and supply chain background (Ellram, 1996). In the open coding stage, key quotes relevant to omni-channel enablers, particularly *integration* and *visibility* (as explained later), are noted and linked with different dimensions of the recommended omni-channel framework. Validity of the open coding process is tested by cross comparison and adjustment of the coded interviews. In the axial coding stage, the individual coding of the enablers are merged into a master table which shows how the recognized integration enablers are linked with each other in the omni-channel framework. A similar approach is used to cross map different types of visibilities against integrations. The results of this process can be seen in Table 3 and Table 4. Their details are explained later in section 5.

4. A conceptual framework for omni-channel systems

To develop a holistic conceptual framework for omni-channel systems, different aspects or dimensions of the channels should be understood in detail. This needs the focus to be expanded from the sale function to network-wide processes (e.g. product data management, transaction management, product delivery, and return).

Based on the recommended research notions and proposition (section 2) and by combining academic and business views on multi-channel/omni-channel (e.g. Bahn and Fischer, 2003; Boyer, *et al.*, 2003; Berman and Thelen, 2004; Rabinovich and Bailey, 2004; Sharma and Mehrotra, 2007; Agatz *et al.*, 2008; Cassab and MacLachlan, 2009; Fernie *et al.*, 2010; Klaus and Nguyen, 2013), it is possible to distinguish three dimensions in omni-channel systems:

(i) *Channel stage*: refers to the value-adding journey (pre-purchase, payment, delivery, and return), where each stage may include numerous channel types and agents – (ii) and (iii) below.

(ii) *Channel type*: refers to various ways or mediums available in each *stage* of the value-adding journey to provide the product/service and information. They may include stores,

websites, social media, emails, ads, catalogs (for pre-purchase); cash, cards, coupons, loyalty cards (for payment); stores, home delivery, collection points (for delivery); post, stores, and drop-off points (for return).

(iii) *Channel agent*: refers to the entity/firm that manages the *channel type* in each *channel stage* (e.g. manufacturers, digital retailers, physical retailers, logistics providers, price comparison websites, and credit institutions).

Figure 1 illustrates the recommended three-dimensional framework of this paper for omni-channel systems. The channel stages are reflected in four graphs starting from the pre-purchase stage. The channel types in each stage are shown on the vertical axis of each graph. The channel types further from the center suggest some indicative higher levels of flexibility or convenience for customers. The channel agents are shown on the horizontal axis of each graph, and indicate the main players (i.e. manufacturer, retailer, and third-party) in all stages. In each stage of the value-adding journey in Figure 1, one, few, or many channel types and agents can contribute to the omni-channel system. Ideally, by definition, in omni-channel systems customers should be able to switch seamlessly between the channels' stages, types and agents. Having the holistic view of the recommended framework in Figure 1 is very helpful to achieve the omni-channel objectives.

The case studies (shown by the numbers in Figure 1) fit to the framework very well. They validate the framework and show how well the framework is applicable to different retail supply chains.

The first case, shown by “(1)”, illustrates the case of Argos. By following “(1)” in the pre-purchase graph, it can be seen that information about Argos products can be collected from various types of channel (vertical axis), including Argos stores, friends and families, catalogs, advertisements, email, online and social media. The horizontal location of “(1)” indicates the providers (agents) of the product's information (e.g. hard-copy catalogs, made available by Argos stores). Similarly, the horizontal and vertical locations of “(1)” in other graphs show various channels involved in the payment, delivery and return stages of Argos products. For example, the payment can be made online (i.e. channel type), where it is handled by the argos.co.uk secure payment system or credit card companies (i.e. channel agent). The delivery can be made to the customer's home address (i.e. home delivery as a channel type) and can be

handled by an Argos delivery van (i.e. channel agent). Similarly the returns can be made to local Argos stores (i.e. channel type) where they handle the returns (i.e. channel agent).

Compared to the case of Argos, the physical store has a much wider role, as in the case of John Lewis - case number “(2)” in Figure 1. John Lewis provides a wide range of pre-purchase, payment, delivery, and return services to customers via its 46 stores across the UK. In addition to the direct sale, John Lewis stores support other channel stages, types and agents. Customers who have seen a product online (on the John Lewis’ website or other websites) can go to one of the stores to see the product, collect more information about it, and buy it. The stores also provide Internet access points and WiFi, which help customers to buy the product online if a specific product they are looking for is not available in the store. The online purchased items can also be collected from and returned to John Lewis stores.

Unlike the bold role of stores in the case of John Lewis, two other retailer cases, Amazon and Ocado (cases number “3” and “5”) do not have stores, and fully focus on online and mobile sales. Their omni-channel model helps them to centralize the product stock and reduce supply chain costs. However, to keep a high service level for their customers, they need to invest in automation, technology, and optimization solutions, as well as a total logistics network, to provide an efficient product delivery and return. The last retailer case, Tesco (cases number “7”), is involved in all those activities, mentioned above, across the channel stages, types and agents.

The manufacturing case examples (cases number “4” and “6”) show how manufacturers, directly or indirectly, manage multiple channel stages, types and agents. Different levels of involvement of the two cases of Westbridge Furniture, and Wren in pre-purchase, payment, delivery and return, and how they are supported by other channel types and agents, are good examples of omni-channel systems from the manufacturer’s perspective.

*** Insert Figure 1 here ***

Given the comprehensive literature review, multiple case study approach, as well as the following expert interviews, the recommended conceptual framework is triangulated. Consequently, the next step is to find enablers which make the framework operational. As expected from the enablers (Grewal *et al.*, 2004), the factors enabling the framework help to both establish unique aspects of omni-channel systems and understand the types of competency needed to make this approach to retailing unique. The following section explores the key enablers of omni-channel systems.

5. Main enablers of the omni-channel framework

Omni-channel systems may need various enablers, including broadband Internet accessibility, well-located and well-designed distribution centers, efficient and extensive logistics network, cross-channel integration, customer analytics, omni-channel visibility to customers, and product digitization (Chatterjee *et al.*, 2002; Grewal *et al.*, 2004; Levy *et al.*, 2005; Fathian *et al.*, 2008; Cortiñas *et al.*, 2010). Review of the literature as well as the interviews conducted in this research underline integration and visibility as two essential enablers of omni-channel systems (Gulati and Garino, 2000; Bahn and Fischer, 2003; Berman and Thelen, 2004; Tsay and Agrawal, 2004; Neslin *et al.*, 2006; Agatz *et al.*, 2008; Cassab and MacLachlan, 2009; Oh *et al.*, 2012; Brynjolfsson *et al.*, 2013; Verhoef *et al.*, 2015). Some supporting quotes from the interviews are provided as follows:

Retailer: "... ultimately omni-channel is all geared towards making sure the customer has an easier, slicker experience so if we have some level of assurance on integration and visibility that it's going to improve that experience, that it's going to improve the quality of product, that it's getting out to market, then as I say it's particularly important for us in the on-line world and click and collect service."

Retailer: "I think if we have a higher level of confidence with the data that we have on our system is aligned to that of the supplier it will allow our supply chain to become more efficient, ... so making sure that information is aligned and all the data that we have on our system is correct will benefit our supply chain because it means we can flow products more effectively and also understand what that product actually is."

Retailer: "We have an increasing number of products which are being rejected at our depot either because the information is incorrect or it's not aligned [for example] with the

case size that we were expecting. So if we were to have a central location where we could validate our data against on a regular basis that would be beneficial.”

Manufacturer: “... [we]’re pushing good data through and [we]’re pushing good product through but if Tesco or Sainsbury’s or whoever, if they’re not receiving that information or product in the right way then it does not work, so you actually want both sides to be compliant.”

Manufacturer: “... retailers asking suppliers to take more responsibility to data integrity.”

Manufacturer: “We have a large number of products get updated, sizes change, marketing campaigns change, so whether we get anything wrong or the retailer gets something wrong, we tend to get a bad reputation around master data, so anything that can reduce the amount of errors will only help the relationship and take some of the noise out of the system”

Without total integration and visibility, multiple channels across all three dimensions of the omni-channel framework do not really form a proper omni-channel system. Integration makes all physical and information flows consistent, and visibility makes the customer and other stakeholders aware of the whole purchase and order fulfillment processes. Integration and visibility together can ensure a single view of products in terms of technical, stock, location, dispatch and delivery information across the supply chains. They make the flow of material within and between channels possible, improve resource utilization, avoid conflicts between channels, and ultimately improve the consumer experience of an omni-channel system (Venkatesan *et al.*, 2007). Zhang *et al.* (2010a), Cao (2014), and Verhoef *et al.* (2015) explore the synergies achieved through integration and visibility across channels including sharing market information and decisions, leveraging resources and physical assets, cross-channel promotions, cross-channel consumer interaction, and wider product and price comparisons.

Integration and visibility enablers of omni-channel systems are compatible with Cao and Li’s (2015) customer- vs. firm-centric view to cross-channel. While integration is seen as the omni-channel attempt to coordinate its members’ decisions and operations, visibility is the customer expectation of the products and services provided by the omni-channel. The following sub-

sections explain the implementation mechanisms for integration and visibility in omni-channel systems.

5.1. Implementing integration in the omni-channel system

Building upon the conceptual framework of the omni-channel (i.e. Figure 1) and with the support of literature and interviews, this paper defines integration from three perspectives – corresponding to the three dimensions of the omni-channel framework:

(i) Integration among channel stages (Emrich *et al.*, 2015), which makes the customer's purchasing experience smooth, where all product or service providers are fully aware of what happens to the consumer in the earlier and later stages of the buying process. This integration allows consumers to move forward and backward across the channel stages without facing any confusion, losing control of their order, or finding any mismatch or inconsistency in the product, information or service they receive.

(ii) Integration among channel types (Neslin and Shankar, 2009; Verhoef *et al.*, 2015), which refers to synchronized operations and decisions among different channel types (e.g. online, offline, and mobile channels), while they should communicate and work together properly. This facilitates an easy switching from one channel type to another one for the consumer.

(iii) Integration among channel agents (Herhausen *et al.*, 2015), to ensure different channel agents send the same information and provide the same product and service to the consumer.

The above perspectives on integration imply that any available point in the omni-channel framework (Figure 1) should be able to connect to any other point in the framework. For example, the product information provided by the manufacturer, retailer, or product comparison websites, via catalogs, stores, websites, call centers or stores, and in pre-purchase, payment, delivery and return stages, should all be the same. Moreover, the whole omni-channel system should be informed about or have access to any change in the product/service, product information, payment method, delivery mode, or return procedure.

The key role of E-Commerce technologies (e.g. Electronic Data Interchange – EDI, and Radio Frequency Identification – RFID) in building the integration has already been addressed well in the literature (Kurnia *et al.*, 2015). However, the literature lacks a structural view to integration

to identify which functions in an omni-channel system should be integrated and how. Oh *et al.* (2012) and Das and Chowdhury (2012) introduce various integrations in the promotion, pricing, product information, transaction, order fulfillment, customer service, and reverse logistics functions. This research uses their concepts and identifies the position of those integrations in the omni-channel framework, as shown by Figure 2. Details of each form of integration are explained below.

*** Insert Figure 2 here ***

Integrated promotion refers to linking and synchronizing the sources, channels and interfaces of market data and promotions. Therefore, across all channel types and agents, ideally all promotion data sources must be shared, the product's/brand's name, logo and motto should be consistent, and the publicity of one channel should be used in other channels. In effect, each channel should be utilized to actively cross-promote other channels and so create a sense of a ubiquitous brand identity (Avery *et al.*, 2012; Weathers *et al.*, 2015).

Integrated transaction involves payment instruments such as cash, check, cards, coupons, gift cards, postal orders, and electronic transfer, and linking them with authorization mechanisms such as PIN number, verification code, and signature (Carton *et al.*, 2012). Transaction integration may also imply a secure accessibility to consumer transaction data via various channels. Regardless of how and with whom the transaction is made, the relevant data should be securely retrievable by other parties in the omni-channel as well as by the consumer.

Integrated pricing synchronizes the products' prices, and makes changes in them (e.g. discounts) visible for consumers and other members of the omni-channel system. The mix of multiple channels adds a new dimension of competition among retailers, and pricing integration is key to managing pricing strategies across channels (Yan and Pei, 2011; de Carvalho and Campomar, 2014; Chen *et al.*, 2015).

Integrated order fulfillment addresses traceability, tractability, and changeability of product, consumer, stock keeping point(s), delivery point(s), and transport mode(s) across all channels. Phan *et al.* (2005) define integrated order fulfillment across order placement, order preparation,

and order delivery stages of the order fulfillment process. Zhang *et al.* (2010b) also include components such as requirement analysis, product design, and coding system in the integrated order fulfillment. A high level of order fulfillment integration leads to a higher service level for customers (Ma *et al.*, 2014).

Integrated reverse logistics implies links among different stages of reverse logistics and different channels involved in it. So, information around the return point(s), stock keeping point(s), and product(s) reverse flow should be retrievable, traceable, and changeable (Skinner *et al.*, 2008).

Integrated product information implies that providers, organizers, and distributors of product information in all channels should make sure the same information about the product is distributed to all members of the omni-channel system as well as the consumer. Product information may include product description, technical data, as well as stock status. This integration should also pick up on any mistake, mismatch, or absence of product data anywhere in the omni-channel system, and initiate the necessary corrective actions.

Integrated customer service implies the same or compatible service standards which are delivered by all members of the omni-channel, whether the service is provided prior to the purchase, during the purchase, in the product delivery, or in the product return stage. Hence, all service providers should be aware of and communicate the consumer expectation and service standards properly. For customers, the integrated service across various channels makes shopping simple and convenient, and for retailers it is therefore crucial to provide such an integration (Gulati and Garino, 2000; Willcocks and Plant, 2001).

Proper links among the above-mentioned integrated functions will enhance the omni-channel system toward total integration, where promotion, pricing, product information, transaction, order fulfillment, customer service, and reverse logistics functions are fully coordinated throughout channel stages, types, and agents. Table 3 summarizes the research interviews outputs and presents examples of information exchanges between integrated functions.

*** Insert Table 3 here ***

Understanding different forms of data exchange and integration, required by an omni-channel system, provides a more structural view to the omni-channel framework. Going further in-depth, the next step would be exploring the channel visibility, and type and nature of the information which is to be shared among the integrated functions of an omni-channel system.

5.2. Channel visibility

Channel visibility is typically referred to as the capacity of supply chain members to provide, share, or retrieve the required timely information (Goh *et al.*, 2009). Given the omni-channel framework, the information can be about products, consumers, inventories, deliveries, returns, and so on. Thus, channel visibility includes the following:

Product visibility implies keeping and sharing product data, including the product's technical, physical, component, and ingredient data, across the omni-channel members and consumers (Musa *et al.*, 2014).

Demand visibility is about market trends, demand size, consumer taste, consumer behavior, and similar demand data, as well as accessibility to them by relevant omni-channel parties. For example, availability of demand data of different channels helps the omni-channel system to move or keep products more effectively (Lau, 2012). Integration in the promotion, transaction and product information supports demand visibility; it leads to more accurate forecasts for demand, better matches between supply and demand, and more efficient inventory flows (Lehtonen *et al.*, 2005).

Order/payment visibility includes the availability of payment data of individual consumers to relevant parts of the omni-channel system, and can apply to consumers and other omni-channel parties. By having access to their account, consumers can have a better understanding of their payments and expenditures (Carton *et al.*, 2012). Similarly, other channels can use payment data for fulfillment, returns, pricing, and stocking activities.

Stock visibility refers to the inventory status and location information, which should be accessible and retrievable across the omni-channel system. More extended channel options/agents, perishability of the product, and a higher level of instability of demand in individual channels make stock visibility more crucial. Stock visibility facilitates cross-channel

movement of products, and improves supply and shipment decisions (Swaminathan and Tayur, 2003; Xia and Zhang, 2010).

Shipment/delivery visibility is about the transparency in delivery conditions, status of the delivery, location of the shipped items, and proof of delivery. Shipment visibility makes the delivery more reliable (Musa *et al.*, 2014).

Supply visibility refers to the awareness of consumers and different parties of the omni-channel system of the origin and supply process of the products. This is becoming more crucial for some product groups such as food products. Visibility of the sourcing or production process of the material is also important for the reverse logistics part of the omni-channel where some products need recycling, re-assembly or disassembly (Boyer *et al.*, 2003).

To conclude, it be claimed that integration and visibility synergize each other toward enabling omni-channel systems and their implementation. Table 4 illustrates how different types of visibility and integration can be linked with each other in omni-channel systems.

*** Insert Table 4 here ***

6. Theoretical relevance of the recommended framework

As addressed in section 2, omni-channel can be recognized as a complex adaptive system. Therefore, the conceptual framework, developed for omni-channel by this paper, tries to match the complex adaptive system's features. The literature (e.g. Choi *et al.*, 2001; Nilsson and Darley, 2006) discuss the complex adaptive systems dynamics very well in detail, and this section adapts them to mirror its recommended framework against the features of the complex adaptive systems as follows:

- *Agents and schema*: In the omni-channel framework, recommended by this paper, the channel agent dimension represents the agents, including physical retailer, digital retailer, manufacturer, and third-party companies. The agents take care of one or multiple-channels in each stage of the customer value-adding journey, and their activities may have impact on the whole omni-channel system and its performance. The agents' activities vary for different

channel types and over time in different channel stages. However, the integration and visibility across all agents and their channels (i.e. the channel types that they are involved in) establish a common schema for the omni-channel system.

- *Connectivity and interactions:* Agents can form a complex adaptive system through interacting and connecting with each other. The omni-channel framework, recommended by this paper, reflects the large scale of interactions and connectivity along the three dimensions of channel stage, type and agent. The high level of connectivity leads to interdependence, which make the omni-channel system considerably complex. To make such a complex system manageable, this paper (through the expert interviews) has underlined the role of channel visibility and integration to support the necessary connectivity among the omni-channel dimensions. It provides various examples of integrations within and between promotions, transaction, order fulfilments, product information, customer service, and reverse logistics and shows how they reinforce the visibility of products, processes and market information.

- *Emergence and self-organization:* The omni-channel framework embeds virtually infinite sets of customer value-adding journeys via different channel stages, types and agents. In each set, flows of goods, services, and information depend on the customer's choice(s) as well as dynamic arrangements among the channels. Omni-channel agents and customers make decisions and actions based on their own priorities, interests and capacities. Therefore, various organizations may emerge for omni-channel spontaneously and invisibly for various customer journeys. However, what is seen by the customer is the collective outcome of the omni-channel system, as a whole. This emergence, as a key feature of complex adaptive systems, needs omni-channel to make adjustment across the three dimensions of its framework regularly. Channel stages may be extended or shortened, their boundaries may change, or if necessary some stages can be added or removed. Different channel types are offered at different channel stages by different channel agents and for different customers. And channel agents may vary for different channel stages, channel types, customers, and purchases. The case studies, presented earlier in the paper, show the case of emergence in the omni-channel organizations very well. For example, in the case of Amazon, introduction of locker-boxes as pick-up points (in addition to the previously well-established home-delivery option) reorganizes the movements of goods, information and customers dramatically. In another example, when John Lewis recently decided to introduce a minimum purchase amount for its free click&collect service, a new set of organizations were introduced around its flows of goods, information,

finances and customers. To benefit from the free click&collect service, some customers may increase their purchase amount by aggregating their current and near future needs. This may reduce the frequency of deliveries in the inbound logistics of the collection point, but increase the value (or size) of each delivery. Other customers may increase their purchase amounts artificially to take advantage of the free click&collect service, and return those unwanted items later. This simply makes extra load on the return stage. Some other customers may decide to not use the click&collect service at all, due to its cost, and return to the stores for shopping, which increases the load on the stores and the logistics around them. Each of these examples introduces changes on John Lewis omni-channel organization.

The emergence feature of omni-channel is coupled with its self-organizing characteristic. An omni-channel system should ideally achieve a total integration throughout the three dimensions of its framework – as explained earlier in this paper. However, individual elements of the framework (e.g. channel agents) make their own decisions about the stock location, ordering lot size, supplier selection, product/service delivery, and so on. Given the scale and scope of the omni-channel system, it is almost impossible for the whole omni-channel's infinite transactions and flows to be planned and managed centrally by a single agent, however dominant it may be. In the cases like Argos or Tesco (as studied in this paper), although the retailers are in a very strong position to manage some aspects of their omni-channels (e.g. stores, home-deliveries, and click&collect service), there are numerous decisions and activities (e.g. returns, third-party price/product comparisons, social media, payment services, and second and third tier suppliers' actions) which remain distributed. This makes the omni-channel framework a self-organized system, capable of adjusting its process and resources quickly, to meet the market and supply fluctuations.

- *Autonomy and control*: The omni-channel framework is compatible with the autonomy vs. control feature of complex adaptive system. In one hand, more control over the channel stages, types, and agents reduces the uncertainty and variation. On the other hand, a higher level of autonomy for the omni-channel entities may inspire creativity and flexibility. Major brands, including those which are reviewed in this paper's case studies, try to manage the product information properly and provide a set of relevant, up-to-date, and consistent data for each product. As an example, a centralized system to generate, update, and share information can control the information flows throughout the omni-channel system. However, achieving such a centralized system is not straightforward, if possible at all. With less control over the product

information, various agents (e.g. comparison websites and search engines) may capture, generate and share such information via different channels. This may lead to a high level of inconsistency and uncertainty in the product information. On the other hand, the freedom to make and share information encourages innovative ideas which lead to a better organization and presentation of information by omni-channel entities (e.g. digital retailers), than the initial product information generated by the brand owner (e.g. manufacturers). The major challenge is achieving a proper autonomy vs. control in the omni-channel system. Industry standards such as GS1 (for supply chain information) or ISO 9000 (for quality management systems) may be helpful. Further to the properties of the recommended three dimensional omni-channel and its integration and visibility enablers, it has an appropriate capacity to monitor the autonomy vs. control of its entities across the channel stages, types and agents.

7. Concluding remarks

Following the consumer through the value-adding journey, this research has developed a three-dimensional framework for omni-channel systems, which can maintain connectivity and interaction, emergence, and autonomy and control properties of complex adaptive systems. This paper has explored those properties across multiple retail and supply chain channels, and tried to unfold them by ascertaining multiple dimensions of omni-channel. The framework also formalizes the integration practices to expand the visibility and consistency across the three dimensions of the omni-channel system.

To sum up, this paper has contributed to the academic literature by:

- articulating an overarching, multi-dimensional conceptual framework for the omni-channel as a complex adaptive system,
- shedding further light on the omni-channel phenomenon and addressing major gaps in the retail and supply chain management literature,
- formalizing the application of integration in the omni-channel framework,
- showing how different forms of integration can provide total visibility, as the necessary element of the omni-channel system, and
- overall, illustrating a range of theoretical implications for the omni-channel nascent literature.

Our work will benefit managers too. We have highlighted key issues they need to be aware of in relation to omni-channel systems and identified specific dimensions (i.e. channel stage, type and agent) they need to consider in their strategic thinking. We have also provided relevant case studies aiming to enhance managers' understanding for a plethora of operational challenges in connection with omni-channels. The provided case studies represent some good practices of omni-channel systems, based on them omni-channel practitioner can define operational patterns and models. Finally, our literature review and expert interviews have stressed the key role of integration and visibility in the omni-channel applications. This benefits industry managers by enabling them to develop or enhance their omni-channel configurations, using the specific visibility and integration types and their interconnections recommended in Table 3 and Table 4.

This research has a number of limitations too. The recommended omni-channel framework lacks an empirical validation. The case examples and interviews, which support this research, were all from one country (i.e. the UK). Moreover, the recommended framework mainly reflects the operations and information management perspectives on the omni-channel, and does not address other views such as customer behavior, organizational behavior, or financial management of the omni-channel phenomenon.

Retail business researchers and practitioners, who are interested in further research on the omni-channel phenomenon, might wish to run analytical studies to explore omni-channel operational implications in much more detail. Further theories from organizational behavior and leadership can also be employed in future studies to understand the dynamics of omni-channel systems. Furthermore, the outcomes of this research can recommend the following themes for future studies.

Omni-channel performance: it is crucial to define what performance means in the context of omni-channel systems and how it can be measured. Furthermore, the factors, which may influence omni-channel performance, should be identified and examined.

Channel choice: the choice of channel stage, type and agent, and the drivers, which may affect customers' and omni-channel members' decisions to move between channels, need to be explored by future studies.

Business model: New trends in retail, marketing and supply chain management as well as the technology advancements need new business models to be developed for omni-channel

systems. Given the new advances in IT-led technologies, future developments in omni-channel systems should be explored too.

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Appendix A: Companies' profiles

Amazon.co.uk, a subsidiary of Amazon.com, is the UK leading online retailer with the most extensive range of products (new, refurbished, and used items). By investing in multiple sales and delivery channels, the company's sales hit 64 items per second in recent years (Anonymous, 2011; BBC, 2014; Anderson, 2015; Bloomberg, 2016).

Argos is a leading UK retailer, which was originally known as a catalog retailer. Today, Argos offers more than 33,000 products to more than 130 million customers every year through various physical and digital channels (Argos, 2016).

John Lewis is one of the biggest UK private companies, which sells home, fashion, beauty, and electrical items. John Lewis stores and website offer around 350,000 and 250,000 product lines respectively, while the products are delivered via various channels (Reuters, 2015; The Sunday Times, 2015).

Ocado Group plc is the UK's largest exclusively online grocery retailer. Ocado's stock consists of about 43,000 product lines which support the retailer's ~200,000 orders/week generated by its ~500,000 active customers (Ocado, 2014; Reuters, 2015).

Tesco is the UK's largest grocery retailer with the largest number of stores and the biggest market share. The retail business is not limited to over 3,500 stores, but also has £2.5 billion online sales, 1,750 Click & Collect collection points, and over 260 Drive-through groceries in the UK (BBC, 2015; Clark, 2015; Tesco, 2016).

Westbridge is a made-to-order furniture producer, which offers a variety of products (in total more than 100,000 options) with short delivery lead-times (less than six weeks). Westbridge handles design and manufacturing operations internally with four manufacturing sites and the largest upholstery design and development resource in the UK. Westbridge's furniture is sold via multiple channels of retail stores (Cabinet Maker, 2013a; Westbridge, 2016).

Wren (Wren Kitchens) is a major British producer of kitchen, bathroom and bedroom cabinets and furniture. Wren has more than 50 retail stores/showrooms across the UK, and handles design, manufacturing, sale, delivery, and installation of its products. To provide its customers

with a high level service, Wren delivers its products fully built - unlike the expansion of DIY furniture in recent years (Cabinet Maker, 2015b).

Appendix B: Interview Guide

Introduction:

The UK grocery retail market is undergoing significant operational transformation as to meet the shoppers' growing expectations in terms of more personalized shopping experience, characterized by convenience, choice and instant access to products.

Retail supply chains are facing increased pressures by having to respond to multiple channels such as on-line, different store formats, discounters and pure play which have had the inevitable consequence of increased costs as well as tighter retail margins.

Effective management of activities, material and information flows will be crucial in this new omni-channel environment. So our discussions will focus on:

- Your company's retail and logistics operations and information management
- Its omni-channel practices
- Your views on omni-channel enablers and their implications

Question 1. (Main theme): To start, please provide us with an overall view of your company's retail and/or logistics activities.

Other relevant question(s):

- Does your business involve multiple channels of logistics, distribution or delivery?
- Is it moving towards an omni-channel business?

Question 2. (Main theme): How is the information (on supply, demand, and logistics) managed in your company?

Other relevant question(s):

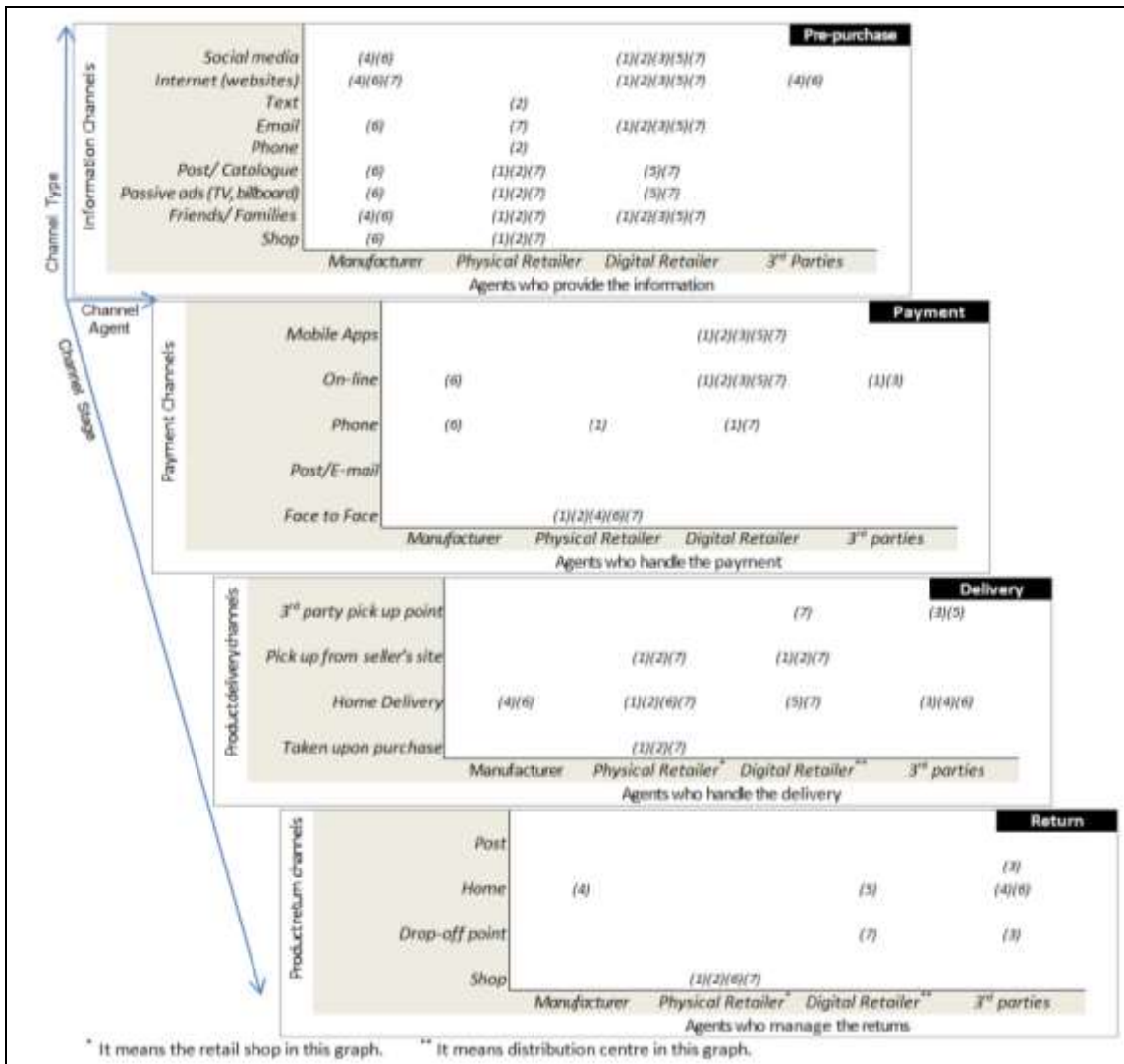
- Are there specific information management practices for your multi-channel/omni-channel business?

Question 3. (*Main theme*): To your opinion, what is needed to achieve a total omni-channel system?

Other relevant question(s):

- What does move a conventional business toward omni-channel?
- Any specific need for omni-channel information management?

Question 4. (*Main theme*): To your opinion, what are the implication of omni-channel and its enablers (for the business, for the supply chain, etc.)?



(1) Argos; (2) John Lewis; (3) Amazon; (4) Westbridge Furniture; (5) Ocado ; (6) Wren; (7) Tesco;

Figure 1. A three-dimensional, conceptual framework of omni-channel systems (with some indicative case examples).

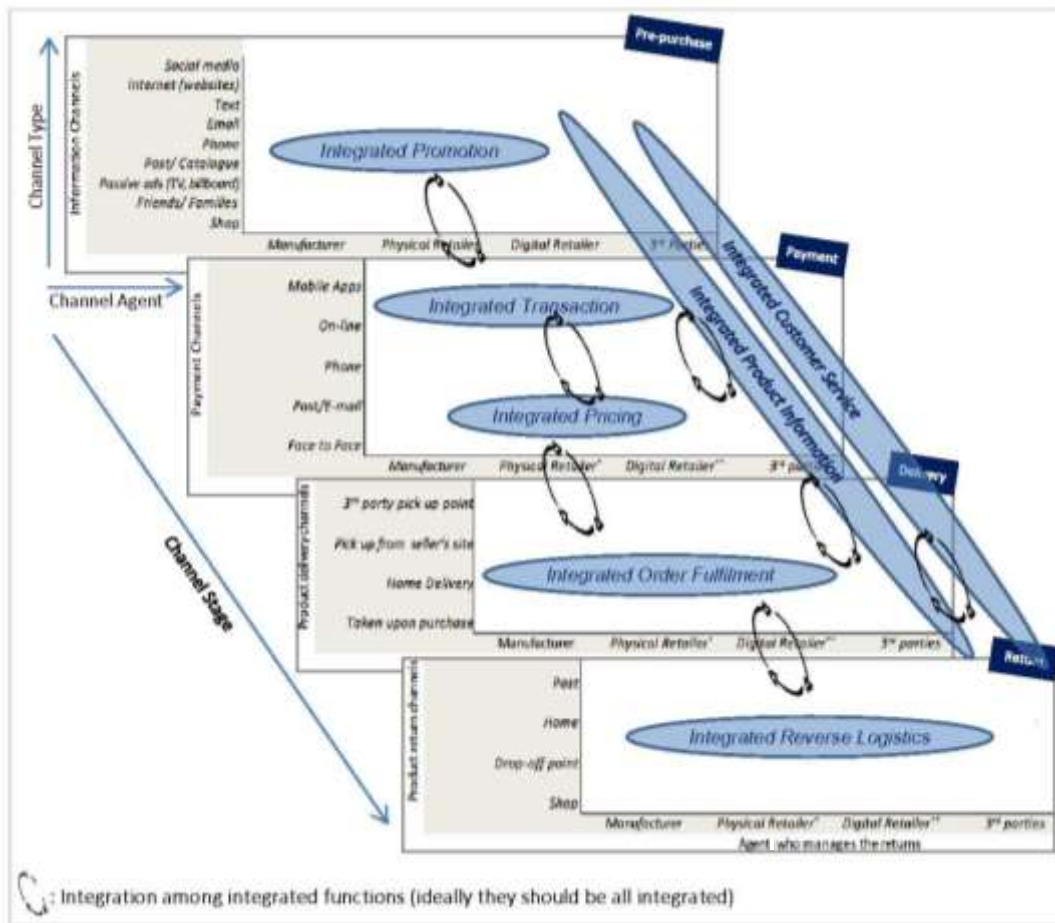


Figure 2. Schematic of integration implications in omni-channel systems.

Table 1. Selected case studies and their main omni-channel highlights.

Case Study	Type	Provided Channels*	Major attempts towards multi-channel/ omni-channel
Amazon	Online Retailer	Online, Home delivery, locker box 3 rd party collection points	2016: Entering the TV and Internet service market (Heine, 2016) 2015: Launching the grocery delivery service (William, 2015a) 2014: Introducing same day delivery (William, 2015b) 2011: Introducing locker box delivery (Century PR, 2011)
Argos	Catalog Retailer	Store, Online, Catalog, Home delivery, store collection	2015: Launching the same day delivery from UK stores (Chapman, 2015) 2014: Introducing collection points in Tube stations (Chapman, 2014) 2013: Replacing the paper catalogs with iPads (Tyson, 2013) 2011: Launching Argos TV channel (Laughlin, 2011) 2006: Introduction of Argos credit card (Home Retail Group, 2006) 2001: Introduction of Click & Collect scheme (Jindal (2011) 1998: Telephone stock inquiry and reservation service launched (Tyler (2011) 1995: Launch of its first internet site (Tyler (2011)
John Lewis	Retailer	Store, Online, Catalog, Home delivery, store collection	2015: Major investment in digital & physical channels innovation/integration (Joseph, 2014) 2013: Launching loyalty card (Vizard, 2015) 2011: Introducing free in-store wi-fi (Marketing Week, 2011) 2011: Opening the first 24 hour virtual shop (Steers, 2013) 2009: Launching click and collect service (Steers, 2013) 2001: Starting e-commerce by launching johnlewis.com (Thomas, 2001)
Ocado	Online Retailer	Online, Home delivery, 3 rd party collection points	2016: Developing internet of things technology for customers (Weinbren, 2016) 2015: Launching the first grocery app for the Apple Watch (Sabharwal, 2015) 2015: Trialing a shopping center click-and-collect service (Fleet Business Centre, 2015) 2013: Expanding the online visibility to FoodTube (Chapman, 2013) 2009: Launching of iPhone app (Harley, 2009)
Tesco	Retailer	Store, Online, Catalog, Home delivery, store collection, Third party business partners	2015: Running joint digital marketing with its main supplier Unilever (Retail Technology, 2015) 2013: Trial of an in-store mobile app to help shoppers navigate through the store and to collect the items as per their shopping lists (Kantar, 2013) 2012: Major investment in e-commerce and omni-channel technologies (Cotterill, 2012) 2010: Introducing Click&Collect service for grocery (Marketing Week, 2010)
Westbridge Furniture	Manufacturer	Online, 3 rd party showrooms, Home delivery	2015: Relaunching the new interactive website (Cabinet Maker, 2015a) 2014: Expansion of delivery fleet for large and small furniture delivery (Slaven, 2014) 2013: Development of IT system to enhance order management and data exchange systems (Slaven, 2013) 2013: Supply deal with IKEA and expansion towards the retail market Cabinet Maker, 2013a)
Wren	Manufacturer	Online, Store, Home delivery	2015: Launching a new user-centric online kitchen design tool (KBB Daily, 2015) 2013: Expansion of its retail stores across the UK (Cabinet Maker, 2013c) 2013: Major investment in logistics and distribution system (Cabinet Maker, 2013b) 2011: Expansion of manufacturing facilities (Cabinet Maker, 2011)

* This refers to all available mediums to communicate and interact with customers. They will be organized later in the recommended conceptual framework of this paper.

Table 2. Breakdown of citations found for each case study – number of reports/publications by source.

Case study	Data Source	Company report and documents	Press releases	Specialist reports	Total
Amazon		4	44	5	53
Argos		6	36	3	45
John Lewis		8	52	5	65
Ocado		5	30	4	39
Tesco		6	40	6	52
Westbridge Furniture		2	7	1	10
Wren		2	6	1	9

Table 3. Examples of information exchanges among different omni-channel functions toward omni-channel total integration.

From \ To	Integrated Promotion	Integrated Transaction	Integrated Pricing	Integrated Fulfillment	Integrated Reverse Logistics	Integrated Product Information	Integrated Customer Service
Integrated Promotion		Promises made to customer about product features, price, delivery, installation, after-sale service, etc.	Market sensitivity to price	Delivery terms, promised to customer; Market sensitivity level to delivery options	Return policies promised to the customer	Consumer taste; Market Trends; Market behavior	After-sale and policies promised to the customer.
Integrated Transaction	Consumer product preference Consumer purchasing choice		Consumer sensitivity to payment methods and associated charges	Consumer delivery preference	Return terms & conditions	Demand size; Market Trends; Refunds made	Payment details; Return terms & conditions; Refund details
Integrated Pricing	Pricing decisions; Product pricing structure	Product/Service Price; Discounts/offers		Delivery price	Return price; Recycling price	Product pricing structure	Service pricing structure
Integrated Fulfillment	General delivery considerations and available options	Specific delivery considerations and available options	Delivery cost considerations and options		Delivery point information (e.g. special conditions)	Product delivery conditions/ options	Product delivery navigation
Integrated Reverse Logistics	Returned items status (numbers and locations)	Approval of the returned item and its condition	Delivery cost considerations and options; Returned item's status	Returned item's physical and functional conditions		Returned item's status (numbers and locations & conditions)	Confirming the status of the returned item; Handling disputes on returned items
Integrated Product Information	Stock status	Stock status	Stock status	Stock status (level & location); Product features (physical & functional info); Product handling guidelines	Product features (physical and functional information); Product handling guidelines		Product technical and usage information
Integrated Customer Service	Consumer feedback	Consumer feedback	Consumer feedback	Consumer feedback	Consumer feedback	Consumer feedback	

Table 4. Realization of various visibilities across omni-channel systems via integrated functions.

From \ To	Integrated Promotion	Integrated Transaction	Integrated Pricing	Integrated Fulfillment	Integrated Product Information	Integrated Customer Service	Integrated Reverse Logistics
Product visibility	✓		✓		✓	✓	✓
Demand visibility	✓	✓			✓		✓
Order/payment visibility		✓	✓				
Stock visibility	✓	✓		✓	✓	✓	✓
Shipment/delivery visibility		✓		✓		✓	
Supply visibility	✓				✓		✓