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Omni-channel management in the new retailing era: A systematic review and future research agenda

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ABSTRACT

Omni-channel retailing is a popular strategy in a new retailing era when digitalization, social media, big data and other emerging technologies (e.g., Artificial Intelligence (AI), virtual reality (VR), augmented reality (AR), blockchain, etc.) are transforming the retail business models. Meanwhile, omni-channel related operations impose a challenge on either well-established firms or new setups that they have to make "right" decisions to fit in the new retail environment. This review paper endeavors to reveal the established knowledge behind the omni-channel retailing literature, generate managerial implications for firms, and provides a guideline for future research. We conduct this systematic review by adopting *citation network analysis (CNA)*. The CNA helps identify seven independent and interdependent research domains, which depict (or constitute) a whole picture of "omnichannel management". The main path analysis reveals that each identified research domain is under study. We also find that the extant literature seldom examines the roles of how new technologies play in the "omni-channel management". Moreover, the domain of supply chain management and inventory management in the omnichannel environment is absent in this systematic literature review. Therefore, we propose a *prescribed* framework for "omnichannel management" (PFOM), which contributes to the literature on "omnichannel management" and provides important managerial applications to the retail firms that plan to implement the omnichannel strategy.

1. Introduction

"In the past, brick-and-mortar retail stores were unique in allowing consumers to touch and feel the merchandise and provide instant gratification; Internet retailers, meanwhile, tried to woo shoppers with wide product selection, low prices and content such as product reviews and ratings. As the retailing industry evolves toward a seamless omnichannel retailing experience, the distinctions between physical and online will vanish, turning the world into a showroom without walls," Brynjolfsson et al. (2013) describe. Verhoef et al. (2015) formally define "omni-channel management" as "the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels are optimized." However, "multiple channel retailing management" is to provide products or services to the consumers across multiple channels (i.e., online, offline, etc.), but it does not provide synergetic management of the numerous available channels. And "cross channel retailing management" provides partial integration among the channels. The definitions show the big difference among "omnichannel management", "multiple channel retailing management", and "cross channel retailing management".

In the real-world practices, "omnichannel" related operations are super popular and widely adopted, recently.[2] For example, Japanese fast-fashion brand Uniqlo initiates the "buy-online, and pick-up-in-store" retailing operations in 2018. Meanwhile, Uniqlo positions itself as a fashion technology company to go both fashionable and digital. Zara re-opens its flagship store in Stratford with digital experience, marking the important moment of fully integrating brick-and-mortar and online stores.[3] The online-to-offline trend in 2018 also presents a sign of Chinese and American omnichannel fashion retailing[4]. Based on the above discussions, we can see that omni-channel retailing is very popular nowadays in the new retailing era when digitalization, social media, big

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[2] https://www.scmp.com/lifestyle/fashion-beauty/article/2165057/online-offline-trend-sign-omnichannel-fashion-retailings (accessed 16 May 2019).
[3] https://uk.fashionnetwork.com/news/Zara-brings-the-online-world-into-new-Westfield-Stratford store,978,552.html#.XMb_ougzZPY (accessed 16 May 2019).
[4] https://www.scmp.com/lifestyle/fashion-beauty/article/2165057/online-offline-trend-sign-omnichannel-fashion-retailings (accessed 16 May 2019).

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data and other new technologies (e.g., AI, VR, blockchain, etc.) are transforming the retail business models. Moreover, sharing economy is a growing trend of retailing, as it enables an unlimited number of small service providers, and individuals to access the global customer base. In contrast, the transformation from multiple channels and cross channel retailing to "omnichannel retailing" is a contradicting concept, which provides seamless user experience across multiple (i.e., online and offline) channels of one service or product provider (i.e., single brand), and it emphases on central controls on customers information by the brand. Therefore, it is interesting to study, in the digital and sharing economy era, how omnichannel evolves from multichannel and cross channel retailing management (Beck and Rygl, 2015; Verhoef et al., 2015). Major international brands use omnichannel management to cope with the surging demand for easy access to products and services by digital and sharing economy business models. Thus, omni-channel related operations impose a challenge to either well-established firms or new setups that they have to make "right" decisions to fit in the new retailing environment.

Motivated by the industrial phenomenon, this systematic literature review endeavors to explore the state-of-the-art development of "omnichannel management" in academia and propose avenues for future research. Various issues in the omnichannel context are worth exploring, such as pricing (Zhang et al., 2017; Gupta et al., 2019), service quality (Reis et al., 2018; MacCarthy et al., 2019), consumer behaviors (Li et al., 2019; Xu and Jackson, 2019), product returns management (Zhang et al., 2018a; Dijkstra et al., 2017; Radhi and Zhang, 2019), etc. Meanwhile, we aim to provide important managerial applications for retail firms in the extremely competitive market. Different from the extant literature review articles on the omnichannel topic, this literature review is based on *Citation Network Analysis*, which can help identify and categorize the research domains objectively. Therefore, this review paper demonstrates a differentiated style from others in both format and content. To the best of our knowledge, no review paper has yet systematically explored "omnichannel management" with *Citation Network Analysis*. This review paper attempts to fill this research gap.

The contributions of this review paper are three-fold:

First, the descriptive analysis shows the trend of "omnichannel management" development with the paper amount distribution by year, by research area, by journal source, and by country. To be specific, academic research on omnichannel management attracts more attention and reaches momentum in 2018. The top three research areas (based on *Web of Science*) are *Business Economics*, *Operations Research Management Science*, and *Computer Science*. The top 10 journals publishing omnichannel management related papers are the journals featured by retailing, marketing, management science, etc. More interestingly, the researchers from the USA and China published most of the omnichannel related papers. The prosperity of omnichannel in the academia of the USA and China is also in line with the real-world omnichannel practices in the two countries.

Second, *Citation Network Analysis* helps identify 7 research domains and the 7 clusters are both independent and interdependent, which depict a whole picture of "omnichannel management". 7 research domains are omnichannel strategy, omnichannel retailing, omnichannel customer service, omnichannel logistics and fulfilment, omnichannel marketing and advertisement, omnichannel consumer behaviors, and omnichannel customers' preferences, the top three among which are omnichannel strategy, omnichannel retailing and omnichannel customer service. Based on the concept of the "omnichannel management" and the generated outcome from CNA, we propose a *diagnosed* framework for "omnichannel management" (DFOM) in this systematic literature review (see Fig. 6). The DFOM acts as an essential finding in this CNA.

Third, Main Path Analysis describes the clear picture of the evolving process of each research domain. Each main path presents a unique knowledge structure of the research domain, which shows important evidence of the literature development and lays significant foundations for future research. For each main path, we propose several possible future research directions (See Table 1). Finally, we propose a *prescribed* framework for "omnichannel management" (PFOM) to conclude this systematic literature review (See Fig. 14). The PFOM contributes to the literature on "omnichannel management" and provides essential managerial applications to the retail firms that plan to implement the omnichannel strategy.

As follows, we explain the methodology of this systematic review in Section 2. We demonstrate a descriptive analysis of the searching results in Section 3. The clustering results are shown in Section 4. The findings of MPA are shown in Sections 5. We show discussions and recommendation in Section 6. Finally, we give concluding remarks in Section 7.

2. Methodology

We adopt a three-stage systematic review methodology to collect and analyze the target papers from the enormous literature (Tranfield et al., 2003). The three-stage process includes planning, executing, and reporting, which can be found in Denyer and Tranfield (2009). The systematic literature review methodology can help researchers to discover the state-of-the-art of the field's development and the future trend (Rousseau et al., 2008; Denyer and Tranfield, 2009, Cai and Choi, 2019). This method reveals a wide range of relevant journals and shows interdisciplinary applications. Therefore, we regard the systematic review methodology as an appropriate way to explore our topic "operations management in an omni-channel environment" and reach our "research destination" to generate significant managerial implications for firms.

CNA is commonly adopted for systematic literature review, which is a scientific instrument for identifying the research domains and knowledge structure (e.g., Chen and Redner, 2010; Colicchia and Strozzi, 2012; Fan et al., 2014) in recent years. The primary purpose of CNA in this systematic review is "to identify the research domains, to reveal the evolution of research tradition and to map the changing paradigms" (Hummon and Dereian, 1989; Colicchia and Strozzi, 2012; Fan et al., 2014). We conduct the CNA after the target paper generation in the executing stage by using multiple software (see later part of this section). To make the structure of this systematic review clear, we depict a flow chart of methodologies of this study in Fig. 1.

2.1. Planning

The preliminary work is to identify the keywords. OM research in an omni-channel environment and its related areas are not yet well-established. Therefore, before the formal searching, we preliminarily read a variety of related papers to identify the keywords. After the preliminary reading, we uncover that the following keywords frequently appear in omni-channel related papers: "omni-channel (or omnichannel)", "cross channel", "multichannel", "strategy", "retailing and marketing", "logistics and distribution", "customer experience", "O2O", "click & collect", etc. Since the focus of this review paper is on "omnichannel", we do not set "multichannel" as one keyword. Because "multichannel" is another scope in which the individual channel is operated separately and has no interaction with each other. However, "omni-channel" and "cross channel" show total or partial integration and interaction among the channels. Therefore, we finally identify the keywords as follows: omni-channel (omnichannel, cross channel) retailing, omni-channel (omnichannel, cross channel) marketing, omni-channel (omnichannel, cross channel) strategy, omni-channel (omnichannel, cross channel) logistics and distribution, omni-channel (omnichannel, cross channel) supply chain management, omni-channel (omnichannel, cross channel) customer experience, O2O, click & collect, and buy-online-and-pickup-in-store.

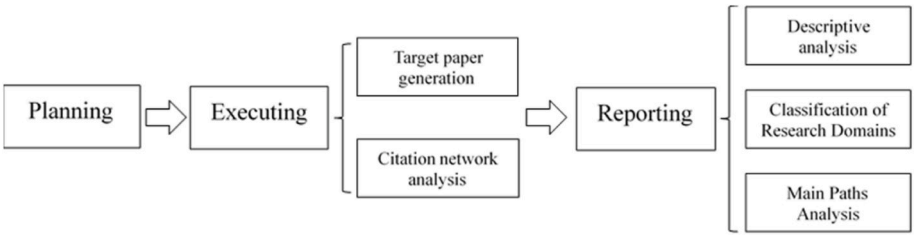

Fig. 1. The process of this systematic review.

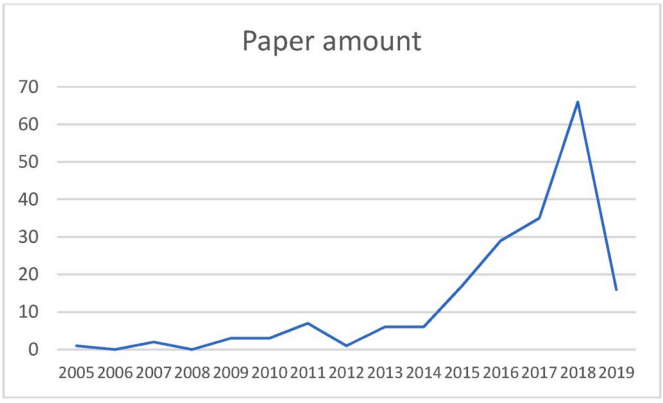

Fig. 2. Paper amount distribution by year (till March 2019).

2.2. Executing

In the Executing process, there are two steps: target paper generation and citation network analysis (CNA). The first step is to conduct the keywords searching and obtain the target papers for review. The second step is to execute the citation network analysis (CNA) to identify the research domains.

We conduct the keywords searching and analysis. Based on *Web of Science*, by entering the aforementioned keywords, we get thousands of papers. To obtain the target papers with high quality, we set three search criteria: i) locate in the domain of "business", "management", and "operations research and management science"; ii) SCI or SSCI journal papers; iii) keep the peer-refereed academic journal papers written in English and exclude the conference papers. Our initial search finds 106 papers in "omni-channel" related keywords, 59 papers in "cross channel" related keywords, 20 papers in "O2O", 36 papers in "click & collect", and 4 papers in "buy-online-and-pickup-in-store". Excluding the repeated papers, we identified 214 papers. To make sure that 214 papers are most closely related to our research topic "operations management in an omni-channel environment", we conduct the manual reading and checking to filter out irrelevant articles. Ultimately, we collect 192 papers as the target papers for review and the paper selection was completed in March 2019. As a remark, the process of selecting the target papers is shown in Appendix (A1).

We use the software "CiNetExplorer" to categorize the generated 192 papers. CitNetExplorer may serve as a prototype for citation-based information retrieval functionality that could be implemented in bibliographic databases. It can also be used for systematic literature based on citation relations (Van Eck and Waltman, 2014a). For the clustering methodology, more details can be found in Van Eck and Waltman (2014b & 2017). We obtain 7 key clusters (i.e., research domains) and then give each cluster a name. We employ the Main Path Analysis (MPA) (Colicchia and Strozzi, 2012) to reveal the knowledge structure by using the software "Pajek2.05" (De Nooyetal., 2005).

Table 1
Future research directions for each research domain.

Research domains	Future research directions
Omnichannel Strategy	i) How to improve the omni-channel efficiency from the organization behaviors' perspective? ii) How to re-visit the value chain in the omni-channel context? iii) How to gain the competitive advantage in the omni-channel retailing era?
Omnichannel Retailing	i) More channels' interaction and integration should be explored (for example, the interaction between social media retailing and brick-and-mortar retailing); ii) How do new technologies (e.g., VR, AI, Blockchain, etc.) transform the omnichannel retailing? iii) What is risk management associated with the omnichannel retailing?
Omnichannel Customer Service	i) How to help the consumers to achieve the seamless omnichannel experience? ii) How to increase the consumers' "channel loyalty" through channel service quality enhancement? iii) How to design the service quality standards in a "smart city"?
Omnichannel Logistics and Fulfilment	i) How to cope with the consumer returns in the omnichannel retailing? ii) Will the third-party last-mile delivery provider be more efficient than the retailer? iii) Could the manufacturer play a role in the order fulfilment?
Omnichannel Marketing and Advertisement	i) What is integrated marketing strategy for omnichannel retailing? ii) How to manage risks in social media marketing? iii) More analytical modeling research for the optimal online and offline marketing investment are needed.
Omnichannel Consumer Behaviors	i) How does social influence play a role in the omnichannel retailing? ii) What are individual preferences towards omnichannel retailing? iii) Investigate consumers' reaction to the new technology adoptions, such as AI, VR (or AR), blockchain, etc.
Omnichannel Customers' Preferences	i) To eliminate the product discrepancy between the offline channel and online channel is better or worse for the omnichannel retailer? ii) How should the omnichannel retailer design the product-service system (PSS) to meet consumers' new preference? iii) As consumers become more conscious of environmental protection, more research on environmental issues in the O2O service are needed;

2.3. Reporting

In the reporting process, we give a descriptive analysis of searching results in Section 3. The clustering results are shown in Section 4. The findings of MPA are shown in Sections 5.

3. Descriptive analysis

3.1. Publication distribution by year

Fig. 2 shows the trend of published omnichannel related papers in the past 15 years. From 2005 to 2014, the paper number is deficient, less than 10 papers, which can be explained by that the concept of multichannel retailing develops and dominates during this period. In 2015, the paper amount of omnichannel papers booms to 17, which implies the year 2015 is the turning point for the development of the omnichannel retailing. The popularity of omnichannel retailing in 2015 can be explained by the maturity of multichannel retailing and the transition from multichannel retailing to omnichannel retailing. Afterwards, omnichannel management attracts more attention and reaches momentum in 2018. Due to the paper searching in March 2019, we have incomplete paper amount for the whole year 2019. However, we can forecast that the year 2019 can achieve a high number of published omnichannel papers.

3.2. Research areas

The collected 192 journal papers in this systematic review involve 13 research areas (based on Web of Science), the top three among which are *Business Economics*, *Operations Research Management Science*, and *Computer Science*. Fig. 3 demonstrates the interdisciplinary characteristics of the omnichannel management papers. Apart from the three main research areas, the omnichannel related studies also relate to the areas such as Engineering, Telecommunications, Social science, Transportation, etc. Besides, Fig. 3 reveals that the mainstream of omnichannel management related studies locate at "Business Economics" and meanwhile, there exist more research opportunities and growth space for other research areas.

3.3. Top 10 journals

Fig. 4 shows the top 10 journals publishing omnichannel management related papers are the journals featured by retailing, marketing, management science, etc. The top three are *International Journal of Physical Distribution & Logistics Management*, *International Journal of Retail Distribution Management*, and *Decision* Support *Systems*, which publish more than 10 omnichannel management related papers. Next, the four journals publish papers with the amount of between 7 and 10. They are *Journal of Retailing*, *Journal of Retailing and Consumer Services*, *Management Science*, and *Marketing Science*. Finally, the three journals (*Internet Research*, *Journal of Interactive Marketing*, and *Journal of research in Interactive Marketing*) publish almost 5 papers. Thus, we can see the paper amount distribution by journal source and the degree of popularity of these journals.

3.4. Top 10 popular countries

In omnichannel research, we have identified the top 10 popular countries, which are located in North America (USA), Europe (UK, Germany, Holland, France, etc.), East Asia (China), Oceania (Australia). Among these countries, the researchers from the USA and China published most of the omnichannel related papers. The prosperity of omnichannel in the academia of the USA and China is also in line with the real-world omnichannel practices in the two countries. For example, American Amazon and eBay, and Chinese Alibaba and JD. com contribute to the development of omnichannel retailing. Fig. A1 in Appendix (A1) shows the popularity degree of omnichannel research among different countries, in which the dark blue area implies high popularity, while the light blue area implies low popularity. Meanwhile, Fig. 5 reveals omnichannel development is unbalanced among these countries and provides directions for "weak" areas to learn from "strong" areas.

4. Classification of research domains

We adopt the software "CiNetExplorer" to classify the generated 192 papers into different clusters. We obtain 7 main clusters, and 23 scattered papers which do not belong to any of the 7 main clusters. The 7 main clusters contain 169 papers. The 7 clusters are named from Omni 1 to Omni 7. Through carefully reading the papers in each cluster, we identify the research domain for each cluster, as shown in Fig. 5.

From Fig. 5, we can learn that the clusters of omnichannel strategy and omnichannel retailing are the two most popular research domains with 38 articles, respectively, followed by 24 articles on omnichannel customer service. The top three research domains show that the topics of strategy, retailing, and customer service are the main melodies in omnichannel research. The domain of omnichannel logistics and fulfilment locates in the middle with 21 articles, followed by omnichannel marketing and advertisement with 19 articles. The domains of omnichannel consumer behaviors and omnichannel customers' preferences gain the least attention with only 15 and 14 articles respectively. In addition, the details of articles in each cluster are shown in Appendix (A2).

In the omnichannel environment, the product or service can be delivered to the end consumers through a series of activities like retailing, marketing, customer service, etc., and a variety of channels

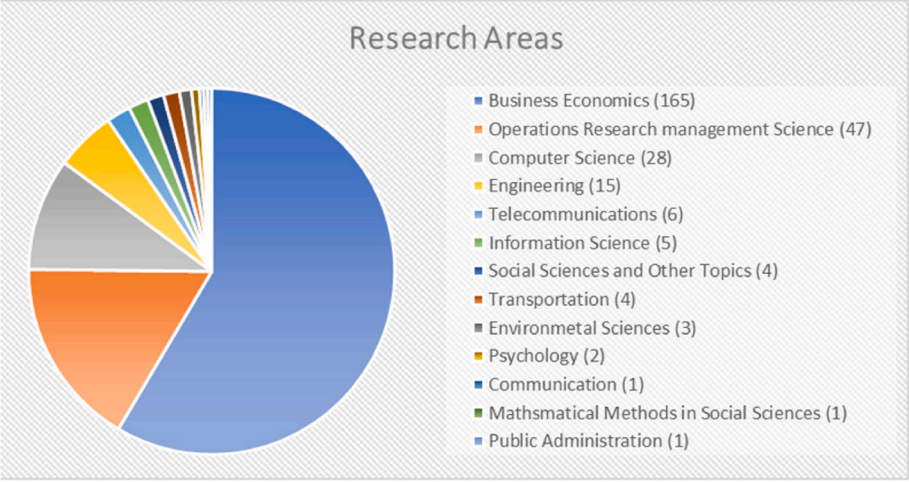

Fig. 3. Paper amount distribution by research areas.

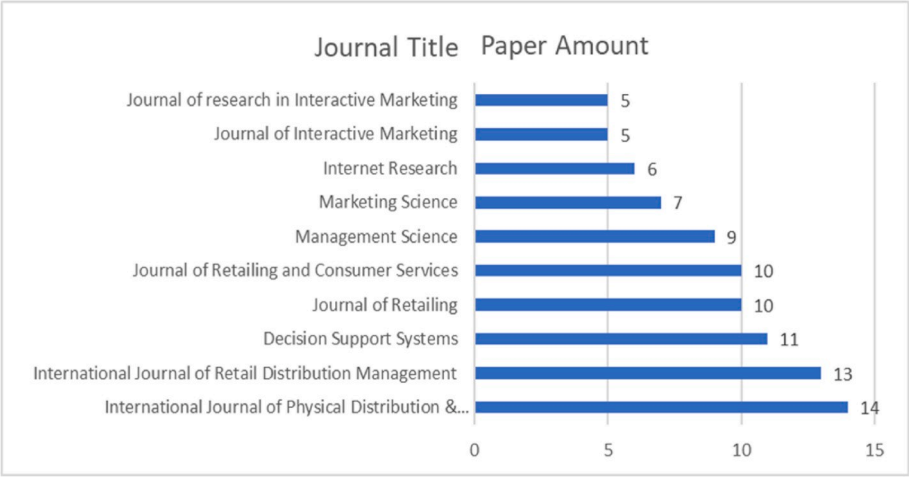

Fig. 4. Paper amount distribution by journal source.[11].

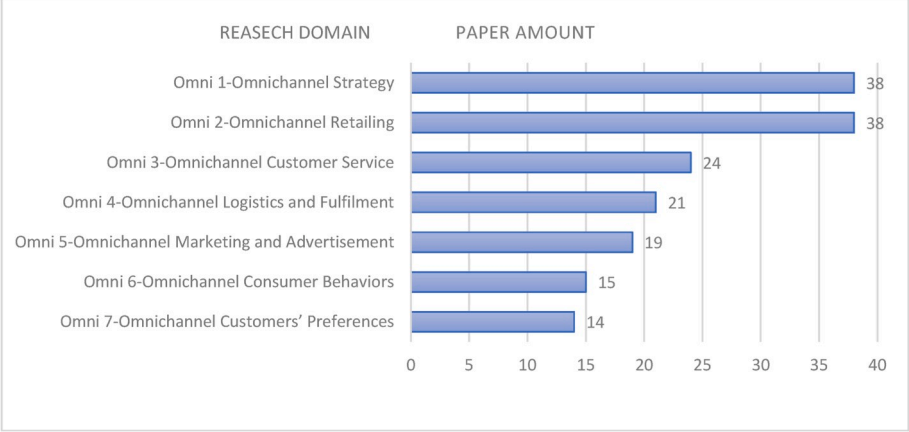

Fig. 5. Paper amount distribution by research domain.

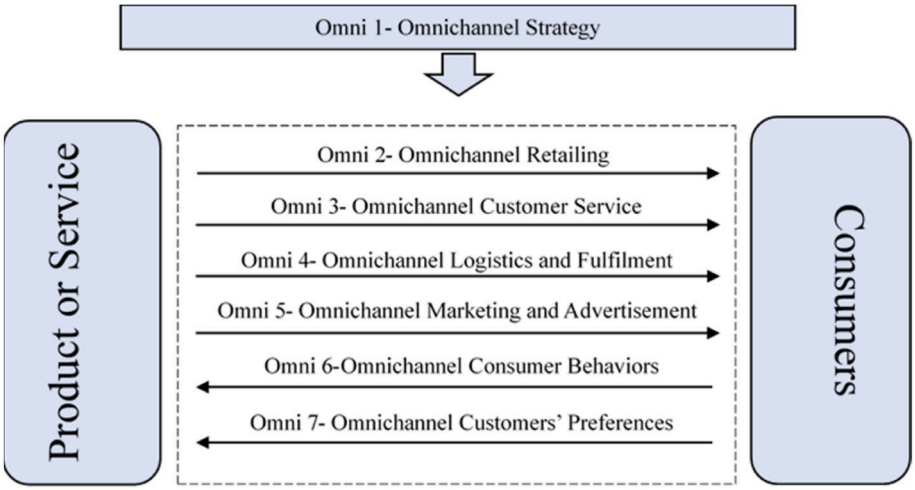

Fig. 6. A *diagnosed* framework of "omnichannel management" in the literature review.

like online channel, offline store, video and TV channels, etc. Based on the concept of the "omnichannel" and the generated outcome from CNA, we propose a *diagnosed* framework for "omnichannel management" (DFOM) in this systematic literature review (see Fig. 6).

From Fig. 6, we can see that the identified 7 research domains have been included in this picture. The "omnichannel strategy" is positioned as the strategic level, while the others are located at the operational level. The forward arrow directions indicate that the product or service can be delivered to the end consumers through actions like omnichannel retailing, marketing and advertisement, logistics and fulfilment, and

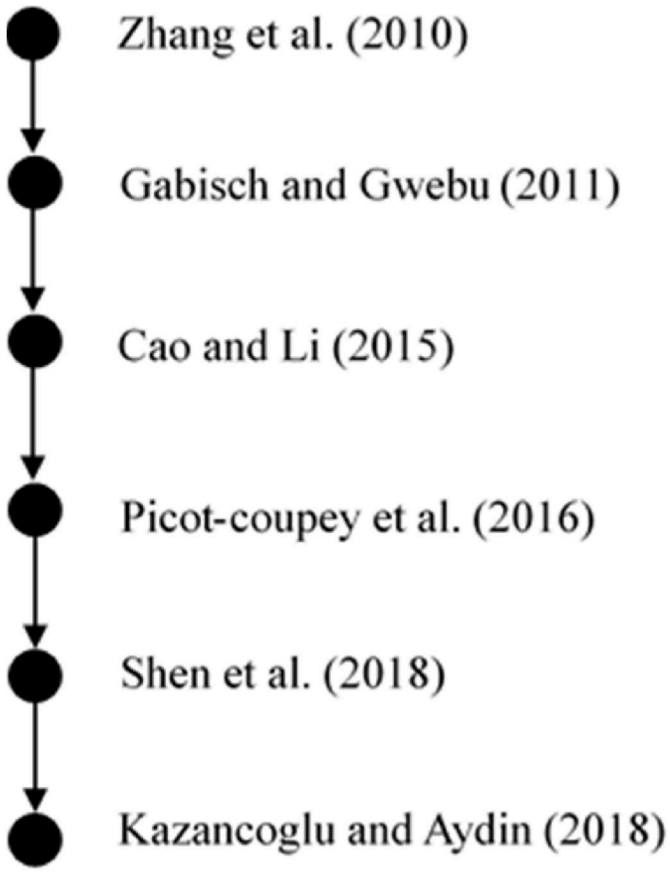

Fig. 7. The main path of omnichannel strategy.

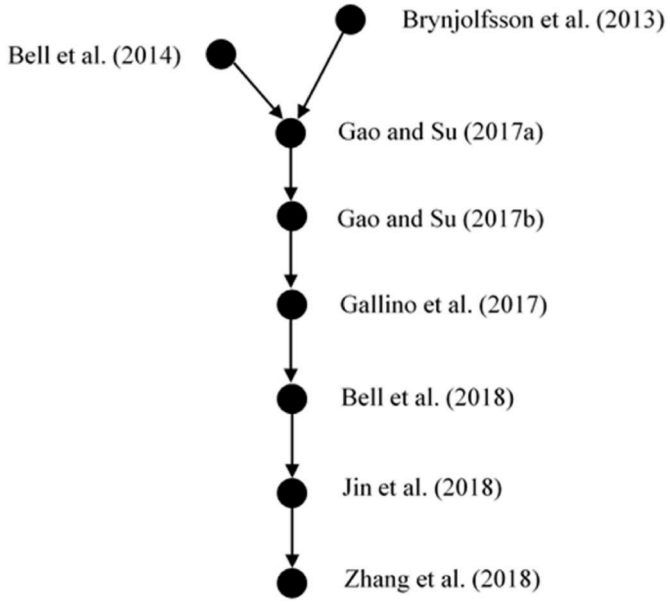

Fig. 8. The main path of omnichannel retailing.

[1] In Fig. 3.3, the last journal's full name is "International Journal of Physical Distribution & Logistics Management".

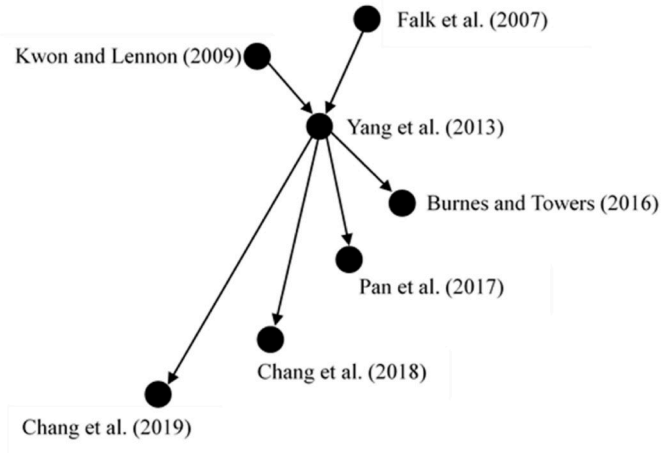

Fig. 9. The main path of omnichannel customer service.

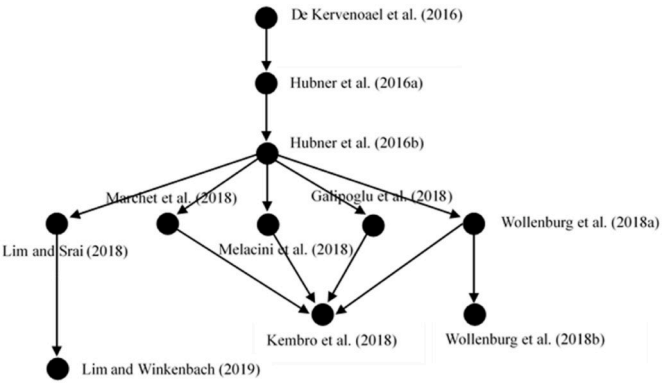

Fig. 10. The main path of omnichannel logistics and fulfilment.

customer service. The reverse arrow directions imply that omnichannel consumer behaviors and customers' preferences in the omnichannel shopping are returned for better designing the product or service. The *diagnosed* framework shows a virtuous circle for "omnichannel management".

5. Main paths analysis

In this section, we conduct the main path analysis of each research domain to reveal the knowledge structure by using the software "Pajek2.05" (De Nooyetal., 2005). Colicchia and Strozzi (2012) demonstrate the guidelines of the main path analysis, based on which we constructed the knowledge structure by weighting the citations in each research domain and identified the most important citation path. Moreover, Colicchia and Strozzi (2012) have explained how to calculate the weighting of a citation. For more details, please see Colicchia and Strozzi (2012). As a remark, although the literature is identified by CitNetExplorer tool for each research domain, some literature may not appear in the main paths, if they do not have citation relations with the main ones (Colicchia and Strozzi, 2012). After each MPA, we propose possible future research directions for each research domain.

5.1. Omnichannel strategy

The cluster of omnichannel strategy is one of the most significant research domains, the main path of which is depicted in Fig. 7. Zhang et al. (2010) is the early work exploring the integration and synergies of multichannel retailing, which facilitates the development of this research domain omnichannel strategy. The authors identify

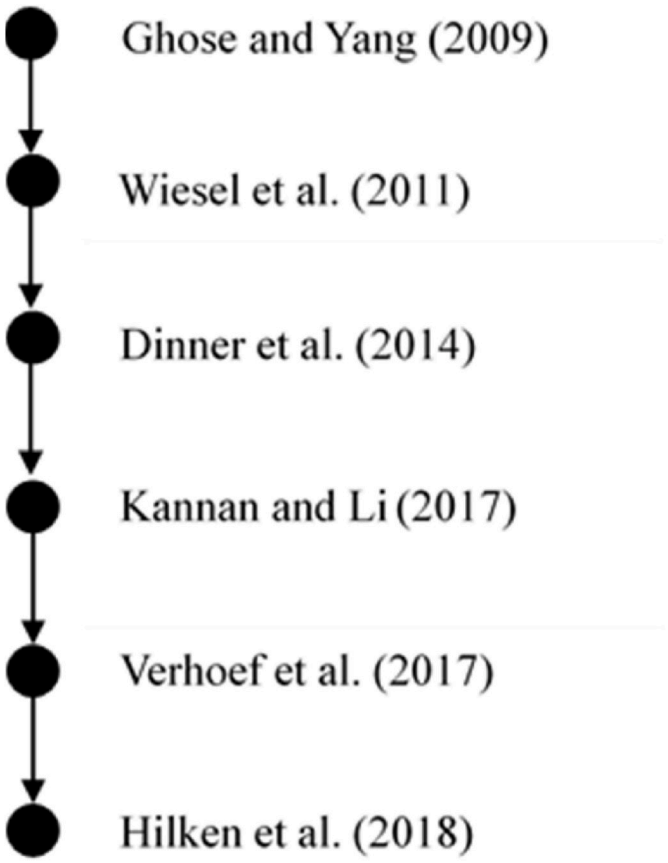

Fig. 11. The main path of omnichannel marketing and advertisement.

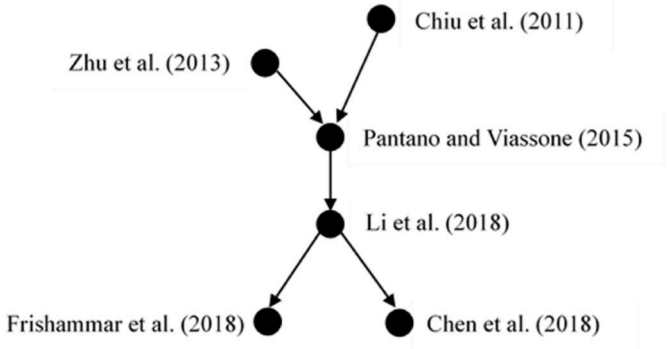

Fig. 12. The main path of omnichannel consumer behaviors.

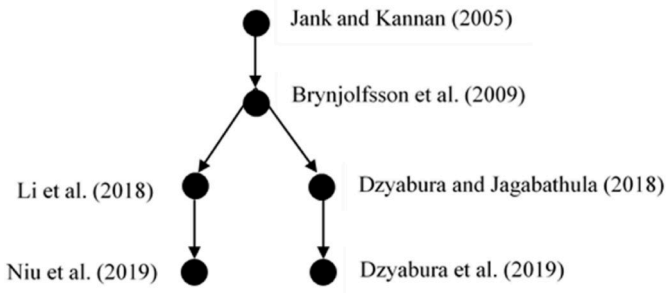

Fig. 13. The main path of omnichannel customers' preferences.

opportunities for managing multiple channels' synergies which emphasize the importance of cross-channel operations, like cross-channel prices and promotions, customer communication, marketing research, etc. Gabisch and Gwebu (2011) propose a model of channel congruency for multi-channel marketing strategy and identify three types of cross-channel congruence: perception, self-image, and behavior. Cao and Li (2015) examine the impact of cross-channel integration on sales and reveal that the cross-channel integration strategy can boost the retailers' sales growth. Picot-Coupey et al. (2016) find that it is difficult for retailers to directly shift from multi-channel retailing to omni-channel retailing, because the retailers have to face the strategy-related challenges at the first stage in the transformative process. The authors suggest organizational learning and trial-and-error learning in the channel design for successfully implementing the omni-channel retailing strategy. Recently, Shen et al. (2018) examine the influential factors for omnichannel service usage and identify that the quality of channel integration significantly affects the users' experience across all the channels. The authors suggest that the practitioners should pay attention to the service transparency, channel choice variety and content and process consistency. Kazancoglu and Aydin (2018) investigate consumers' purchasing intentions on omni-channel buying and generate important factors as follows: trust, situation, risk, anxiety, interaction need, and privacy. The authors suggest the retailers incorporate these factors into the omni-channel retailing from the consumers' perspective.

Based on the above analysis, we can see omni-channel strategy plays an essential role in omni-channel management. However, not every company can benefit from this strategy, due to the complexity of this retailing model. We suggest each firm should initiate a customized omnichannel strategy, because each firm may possess different channel resources and assets. For future research, we propose three perspectives: i) How to improve the omni-channel efficiency from the organization behaviors perspective; ii) How to re-visit the value chain in the omni-channel context; iii) How to gain the competitive advantage in the omni-channel retailing era (Picot-Coupey et al., 2016).

5.2. *Omnichannel retailing*

The cluster of omnichannel retailing constitutes another largest research domain. The main path of this cluster is shown in Fig. 8. Omnichannel retailing aims at integrating all the channels and optimizes the retailer's total sales. Brynjolfsson et al. (2013) and Bell et al. (2014) pioneer this research domain and lay necessary foundations for omnichannel retailing research. Brynjolfsson et al. (2013) identify that technology plays a crucial role in omnichannel retailing and suggests that the retailers and their supply chain partners should reshape their competitive advantages. The authors propose possible successful strategies for omnichannel retailers, like attractive pricing strategy, powerful data analytics ability, unique product provider, etc. Bell et al. (2014) demonstrate a customer-focused framework for omnichannel retailing model in which the information and products delivered to consumers are most important.

Next, Gao and Su (2017a) study how to deliver both online and offline information to omnichannel consumers effectively. The authors find that physical showrooms can help the retailers to reduce the store inventory, while virtual showrooms may lead to an increased online return and profit reduction. Gao and Su (2017b) examine the model of buy-online-and-pick-up-in-store (BOPS) in omnichannel retailing and find that not all types of products are suitable to this model and BOPS may reduce the profit when store fulfillment cost is high. After Gao and Su (2017b)'s BOPS model, Gallino et al. (2017) introduce a "ship-to-store" (STS) model in which the online products ordered by the consumers can be shipped to the local store and consumers can pick up in store. The authors find that under the STS model both the overall sales dispersion and safety inventory of the retailer are increased. Recently, Bell et al. (2018) investigate another model "online-first and

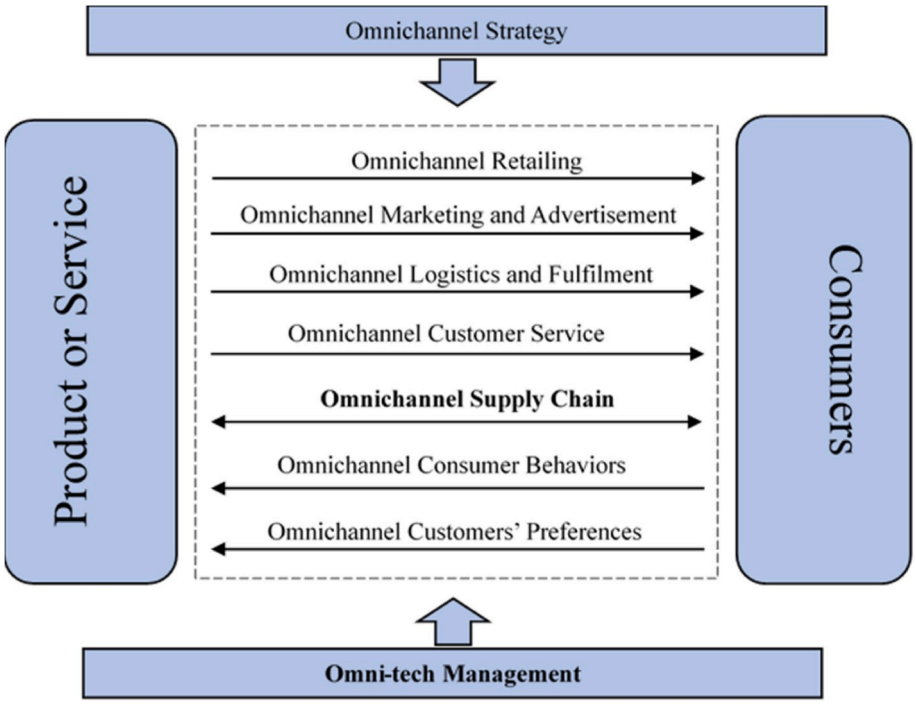

Fig. 14. A *prescribed* framework of "omnichannel management" for future research.

offline-showrooms-second" and reveal that offline showrooms can improve the overall demand and operational efficiency by reducing the online returns. Jin et al. (2018) also study the BOPS model but focus on the service design of the optimal pick-up store for the consumers. Zhang et al. (2018a) study consumer returns and order cancellation in the omnichannel context and conclude that the retailers cannot always benefit from the omnichannel strategy because the value of omnichannel retailing is subject to many factors, like "cross-selling benefit and the market expansion effect".

Due to the short history of omnichannel retailing, its main citation path is not long. But we can expect its evolution and expansion in the near future. Overall, the extant literature in this domain has achieved a fruitful outcome and demonstrated important and influential components in the omnichannel retailing research. For future research, we propose the following directions: i) More channels' interaction and integration should be explored (for example, the interaction between social media retailing and brick-and-mortar retailing); ii) How do new technologies (e.g., VR, AI, Blockchain, etc.) transform the omnichannel retailing? iii) Manage risks associated with the omnichannel retailing (Brynjolfsson et al., 2013; Zhang et al., 2018b).

5.3. Omnichannel customer service

Fig. 9 shows the main path of the cluster of omnichannel customer service from 2007 to 2019. Falk et al. (2007) conduct the early work exploring the cross-channel conflict in the multichannel service providing. The authors identify that the satisfactory performance of the offline channel will decrease the usefulness and increase the risk of the online channel. The results show a typical cross-channel effect in the multichannel service and provide managerial implications for multichannel service providers. By contrast, Kwon and Lennon (2009) study the "reciprocal effects" between offline and online brand images in the multichannel retailing. The authors find that the reciprocal cross-channel effects are supported by the experiment results. From Falk et al. (2007) and Kwon and Lennon (2009), we learn that cross-channel effects are different in different contexts and their correlation can be both positively and negatively related.

Based on the two crucial literature, Yang et al. (2013) investigate the consumers' channel adoption behaviors and find that both cross-channel synergies and dis-synergies coexist and affect consumers' channel evaluation. The authors suggest the managers pay attention to the two phenomena in the process of service delivery and focus on channel integration and overall channel system performance. Yang et al. (2013) also offer multiple research directions for future research. Burnes and Towers (2016) examine how the development of the omni-channel retailing in the fashion industry meet people's need in the context of "smart city". Pan et al. (2017) study how to improve the service quality of the recommendation systems in online to offline (O2O) service. Chang et al. (2018) study the channel integration problem and O2O service in the travel industry. Afterwards, Chang et al. (2019) investigate the cooperation and competition problem between online travel agencies and offline hotels. For future research, we suggest more attention should be paid to i) How to help the consumers to achieve the seamless omnichannel experience; ii) How to increase the consumers' "channel loyalty" through channel service quality enhancement; iii) How to design the service quality standards in a "smart city" (Burnes and Towers, 2016; Yang et al., 2013).

5.4. Omnichannel logistics and fulfilment

The main path of omnichannel logistics and fulfilment is relatively complicated as presented in Fig. 10. The publications locate between 2016 and 2019. De Kervenoael et al. (2015) study the logistics service of online grocery retail and find that the flexibility of collection points, offline infrastructure service and premium provision are significant aspects for improving consumers' expectations. Hübner et al. (2016) investigate the retail fulfillment in the integrated omni-channel environment and analyze the logistics options for integrated fulfillment. The authors suggest that retailers, who operate in multiple channels should design their warehouse system for channel-integrated inventory management. Hübner et al. (2016) investigate the last-mile fulfilment and distribution problem in omni-channel management and propose a logistics planning framework. The authors suggest that omni-channel retailers should consider the specifics of the country, the retailer and the customer behaviors into the omni-channel logistics design. Hübner et al. (2016)'s study plays a fundamental role in the succeeding researches on

omni-channel logistics service. A number of new works emerge in 2018.

Wollenburg et al. (2018) study the logistics networks problem in omni-channel grocery retailing. The authors find that non-food product logistics benefits more from channel integration, while logistics design for grocery retailing depends more on the specifics of product, market and retailer. Wollenburg et al. (2018) study the retail fulfillment processes for better guiding omni-channel customers. The authors identify that the integrated management of inventory, delivery, and return can be adopted. Marchet et al. (2018) identify 11 logistics variables in the omni-channel management strategy in four aspects: delivery, distribution, fulfilment and returns management. The authors indicate that a "one-fits-all" business logistics model is absent. Melacini et al. (2018) conduct a systematic literature review on e-fulfilment and distribution in omni-channel retailing and investigate the issues of distribution network, delivery, and inventory management. The authors identify that many essential topics in the omnichannel context are underexplored, which includes "retail distribution networks, assortment planning over multiple channels, the logistics role played by stores in the delivery process, and the interplay between different logistics aspects." Galipoglu et al. (2018) overview the omni-channel retailing relevant literature and focus on logistics and supply chain management research domain. The authors reveal that the consideration of logistics and supply chain management literature is limited in the omni-channel retailing context. Moreover, the authors call for more attention on the conceptual and analytical research.

Kembro et al. (2018) conduct a structured literature review on warehouse operations and design in omni-channel logistics. The authors find that less attention is paid to the domain of warehouse operations and design. Instead, more discussions are given to consumer demand changes and network design. The authors identify ten themes from the extant literature for omni-channel warehousing and generate a comprehensive and structured agenda for future research by taking into account the network design, channel management, and value proposition.

Lim and Srai (2018) investigate how the interaction between of last-mile supply networks and the underlying mechanisms affect the omnichannel performance and find that limited operations management literature has paid attention to this issue. And the new mechanism proposed for the last-mile supply networks in this paper can provide design implications for retailers. The authors suggest managers consider product types and delivery responsiveness, when designing an appropriate last-mile supply network. Afterwards, Lim and Winkenbach (2018) study how retailers execute the last-mile delivery to meet the omnichannel demand and establish a typology of last-mile distribution by incorporating the product variety and delivery responsiveness.

This main path has shown important issues in the omnichannel logistics and fulfilment, such as logistics service, logistics network design, warehouse operations and design, retail fulfillment processes, last-mile distribution, etc. This main path shows that more research emerged in 2018 and we can forecast more new research will come out in the future. For future research, we propose three directions: i) How to cope with the consumer returns in the omnichannel retailing (since we have witnessed the business model "order online and return in-store"); ii) Will the third-party last-mile delivery provider be more efficient than the retailer? iii) Could the manufacturer play a role in the order fulfilment (Hübner et al., 2016a, 2016b; Lim and Srai, 2018; Lim and Winkenbach, 2018)?

5.5. Omnichannel marketing and advertisement

The main path of omnichannel marketing and advertisement is shown in Fig. 11. The articles located between 2009 and 2018. Ghose and Yang (2009) study the sponsored search method in the search engine advertising. The authors examine the sponsored search advertisement performance by considering consumer, advertiser, and search engine behaviors and reveal that different kinds of keywords (retailer-specific and brand-specific) show heterogeneous effects. Wiesel et al. (2011) explore the marketing resources allocation problem in both online and offline channels. The authors identify the cross-channel effects on profit generation, in which offline marketing has an impact on online funnel metrics, and online funnel metrics influence offline sales. Dinner et al. (2014) examine cross-channel effects of traditional media and online advertising on offline and online sales. The authors find that paid search advertising is more effective than traditional advertising on driving offline sales.

Kannan and Li (2017) propose a framework for digital marketing research, which links the marketing strategy, the marketing process, and the digital technology together. The authors identify the evolving issues and research questions and outline a comprehensive future research agenda for digital marketing research. Verhoef et al. (2017) present a framework for discussing how consumer connectivity is reshaped in the omnichannel context. The authors identify that particularly mobile-oriented technologies facilitate the connection of consumers with People, Objects, and Physical Environments. Hilken et al. (2018) explore how the new technology augmented reality (AR) improve customers' omnichannel experiences. The authors find that seamless omnichannel experiences can be acquired through AR and the current obstacles existing in the omnichannel environment can be smoothed.

This main path has shown the essential issues of the omnichannel marketing and advertisement, which includes the effectiveness of search engine advertising, marketing resources allocation, cross-channel effects, the transformation brought by new technologies, etc. However, the current research for this area is insufficient. For future research, we outline three aspects: i) What is integrated marketing strategy for omnichannel retailing? ii) How to manage risks in social media marketing? iii) More analytical modeling research for the optimal online and offline marketing investment are needed (Kannan and Li, 2017; Verhoef et al., 2017).

5.6. Omnichannel consumer behaviors

Fig. 12 demonstrates this main path of research on omnichannel consumer behaviors. The articles are published from 2011 to 2019. In the omnichannel environment, consumers can switch shopping channels easily from one to another. Chiu et al. (2011) study consumers' free-riding behaviors in cross-channel purchasing, in which consumers can obtain the product information from one channel and shop in another channel. The authors reveal that multichannel self-efficacy, perceived service quality of competitors' offline store and the reduced risk in the offline channel all affect the cross-channel free-riding intentions. Zhu et al. (2013) examine the consumers' reactions on the failure of self-service technologies (SSTs), to stay with or to switch. The authors identify consumers' channel switching behaviors in which "more participants (56%) initially opted to fix the SST problem rather than switch from it (44%)".

Based on the above two works on the switching behaviors, Pantano and Viassone (2015) study how to effectively engage consumers in the integrated multichannel retailing and find that if the retailer can provide the consumers with the integrated retailing environment, consumers' switching purchasing from competitors' channels can be avoided. Later on, Li et al. (2018a) examine how customer react on cross-channel integration in omnichannel retailing through the Push-Pull-Mooring (PPM) framework. The authors reveal that uncertainty, identity attractiveness, and switching costs play pushing, pulling, and mooring roles, respectively, in affecting customers' reaction to cross-channel integration. After that, Frishammar et al. (2018) investigate the digital strategy for the shopping malls, which connect retailers and shoppers, in the omnichannel retailing. The authors suggest three generic strategies: to be a labeled digital brand, to gather digital data, and to embrace the digitalization. Chen et al. (2018) discuss the opportunities and challenges in omnichannel business research from both the retailer-centric and consumer-centric perspectives.

Apart from the most frequently mentioned "free-riding" behaviors in

the omnichannel retailing, more other consumer behaviors should be explored. For future research agenda, we propose three research questions: i) How does social influence play a role in the omnichannel retailing? ii) What are individual preferences towards omnichannel retailing? iii) What is consumers' reaction to the new technology adoptions, such as AI, VR (or AR), blockchain, etc. (Li et al. (2018a); Zhu et al., 2013).

5.7. Omnichannel customers' preferences

The main path of omnichannel customers' preferences is shown in Fig. 13. The articles position from 2005 to 2019, which implies the main path of this cluster is the longest one regarding time. Jank and Kannan (2005) is the early work which studies online customers' preferences and choices in different geographical markets. The authors find that online customers' behaviors can be predicted by the established spatial modeling, which provides implications for cross-channel marketing strategy. Brynjolfsson et al. (2009) also study product selection problems and geographical impacts in cross-channel competition between traditional brick-and-mortar retailer and Internet retailers. The authors find that Internet retailers face more competition in selling everyday products but have more advantages in selling niche products. The findings suggest managers consider the types of products sold in different retail channels. After Brynjolfsson et al. (2009), there are two sub-main paths developed in this cluster. One is about the geographical impacts on customers' preferences and O2O commerce (see Li et al. (2018b) and Niu et al. (2019)); the other is product selection and evaluation problems on both offline and online channels (see Dzyabura and Jagabathula (2018) and Dzyabura et al. (2019)).

Li et al. (2018b) study the online-to-offline (O2O) service of Groupon and its connection with the local market. The authors find that both the word-of-mouth effect and the observational learning effect help expand the O2O platform service. The local market characteristics determine both the demand and supply. The findings provide important implications for managers in the O2O commerce. Niu et al. (2019) examine the traffic congestion issue in O2O commerce. The authors find that both the uniform pricing model and the online-to-store channel can decrease the online demand and hence reduce the offline traffic congestion.

Dzyabura and Jagabathula (2018) explore the products selection problems on both offline and online channels and address the optimal offline assortment choice to maximize both channels' profits. The authors show that measuring the impact of offline assortment on online sales gains up to 40% expected revenue. Dzyabura et al. (2019) investigate consumers' online and offline product evaluations and demonstrate a large discrepancy existing the two evaluations: one is the offline "live"; the other is online description. The authors propose two statistical methods: a hierarchical Bayesian approach and a k-nearest-neighbors approach for better evaluating the offline and online products.

Till now, we have reviewed the literature on omnichannel customers' preferences and generated important findings. We learn from the main path that there are two distinct paths in this area: one path is customers' preference on "product" in the omnichannel retailing; the other is customers' preference on "service" (i.e., O2O service) in the omnichannel retailing. The extant literature is minimal. For future research, we provide three directions based on the two distinctive paths: i) To eliminate the product discrepancy between the offline and online channels is better or worse for the omnichannel retailer? ii) How should the omnichannel retailer design the product-service system (PSS) to meet consumers' new preference; iii) As consumers become more conscious on environmental protection, more research on environmental issues in the O2O service are needed (Brynjolfsson et al., 2009; Dzyabura et al., 2019; Niu et al., 2019).

6. Discussions and recommendation

MPA helps describes a clear picture of the evolving process of each research domain. Each main path presents a different knowledge structure of the research domain, which shows important evidence of the state-of-the-art development and lays significant foundations for future research. After each main path analysis, we propose several future research directions. We conclude in Table 1.

After the main path analysis of the 7 research domains, we find that the extant literature seldom examines the roles of how new technologies play in the "omnichannel management". The technological advancements (e.g., digitalization, AI, VR, mobile apps, mobile payment, etc.) create opportunities for omnichannel retailing. As these technologies blur the distinction between the offline and online shopping and are changing the retail landscape, the retailers and their supply chain collaborators have to reconsider their competitive strategies (Brynjolfsson et al., 2013). We name the supporting technologies for "omnichannel management" as "Omni-tech". For example, Tofugear Omnitech[5] is an omnichannel technology service provider, based in Hong Kong, to enable a genuinely seamless and highly personalized shopping experience to their multinational retail clients. We believe there will be an increasing number of omnichannel technology companies worldwide in the coming decades. Moreover, the domain of supply chain management and inventory management in the omnichannel environment is absent in this systematic literature review. We believe there is a big space to explore the issues of supply chain management in the future research, especially with the concept of sharing, such as co-opetitive relationship in the supply chain on data, cost, and inventory sharing (Shockley and Fetter, 2015).

Therefore, as omni-tech spectrum is missing from the current literature, we propose a *prescribed* framework for "omnichannel management" (PFOM) based on the DFOM, in which we incorporate two additional research domains, i.e., "Omnichannel supply chain management" (e.g., inventory management) and "Omni-tech management" (see Fig. 14). The PFOM not only contributes to the literature on "omnichannel management", but also provides important managerial applications to the retail firms. First, PFOM can guild the retail firms to implement a comprehensive omnichannel strategy. Second, PFOM shows the emerging important elements which the retail firms should pay attention to in their omnichannel management, such as the role of omni-tech. Last but not the least, with an effective omnichannel management strategy, retail firms can possess more competitive advantage in the retailing market.

7. Concluding remarks

In this paper, we have conducted a systematic literature review on "omnichannel management" with *Citation Network Analysis*. The descriptive analysis shows the trend of "omnichannel management" development with the paper amount distribution by year, by research area, by journal source, and by country. The CNA helps identify 7 research domains in the vast extant literature. Based on the concept of the "omnichannel management" and the generated outcome from CNA, we propose a *diagnosed* framework for "omnichannel management" (DFOM) in this systematic literature review (see Fig. 6). Further, the MPA helps describe the knowledge structure of each research domain, which shows important evidence of the state-of-the-art development and lays significant foundations for future research. The above analyses show that the topic "omnichannel management" is on its fast development stage, but far from maturity. Each identified research domain is also lack of sufficient research. We forecast that the main path tree of each research domain will be growing more prominent and more plentiful. This systematic literature review fills the research gap on this vital

[5] https://tofugear.com/solutions/(accessed 20 May 2019).

moment and provides critical avenues for future research (see Table 1). Given the research gap, we propose a *prescribed* framework for "omnichannel management" (PFOM) to upgrade the DFOM. The PFOM contributes to the literature on "omnichannel management" and provides important managerial applications to the retail firms that plan to implement the omnichannel strategy.

Finally, we admit the limitations of this systematic literature review. Firstly, the target papers are only from SCI or SSCI journals to ensure the paper quality. We might have missed some other papers on the topic of omnichannel management. Moreover, the clusters are identified with the use of software "CiNetExplorer" that only have single clustering approach, while there are other clustering approaches available for similar analysis. Although CiNetExplorer can provide an objective classification of these clusters, it lacks flexibility on clustering choices. Anyhow, we believe the innovative proposals in this paper will contribute to the development of "omnichannel management" literature under the growing trend of sharing economies.

CRediT authorship contribution statement

Ya-Jun Cai: Writing - original draft, Formal analysis, Conceptualization. **Chris K.Y. Lo:** Supervision, Conceptualization, Software, Writing - review & editing.

Appendix A. Figures and Tables

Table 1
Key words searching and target papers selection

Keywords		Paper Amount1[1]	Paper Amount2[2]	Paper Amount3[3]
omni-channel	omni-channel (omnichannel) retailing omni-channel (omnichannel) marketing omni-channel strategy omni-channel supply chain management omni-channel logistics and distribution omni-channel customer experience	106	214	192
cross channel	cross channel retailing cross channel marketing cross channel strategy cross channel supply chain management cross channel logistics and distribution cross channel customer experience	59		
O2O (or click & collect, or buy-online-and-pickup-in-store)		60		

[1] Paper Amount1 shows the searching results of paper numbers under different keywords.
[2] Paper Amount2 is the one excluding the duplicated papers among Paper Amount1 under different keywords.
[3] Paper Amount3 is the finally selected papers after filtering out the irrelevant papers by manual reading.

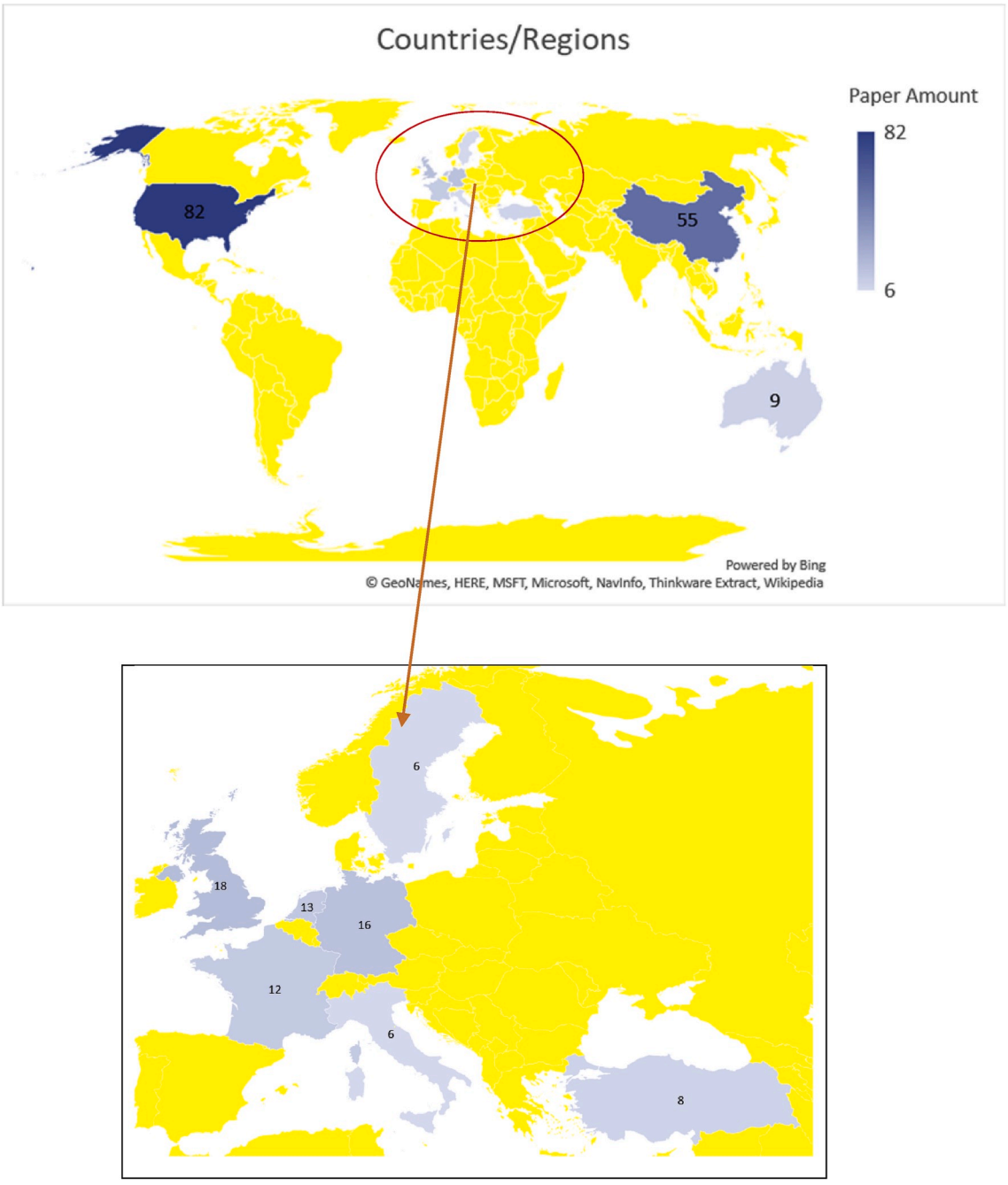

Fig. 3.4. Paper amount distribution by countries/regions.

Appendix B. Articles of Each Cluster

Research Domains	Articles
Omnichannel Strategy	Ailawadi and Farris (2017); Bai et al. (2017); Beck and Rygl (2015); Bell et al. (2015); Berman and Thelen (2018); Cao (2014); Cao and Li (2015&2018); Chatterjee and Kumar (2017); Cummins et al. (2016); Dahl et al. (2018); Fornari et al. (2016); Gabisch and Gwebu (2011); Hansen and Sia (2015); Huré et al. (2017); Jara et al. (2018); Kazancoglu and Aydin (2018); Lapoule et al. (2016); Larke et al. (2018); Manser Payne et al. (2017); Millstein and Campbell (2018); Murfield et al. (2017); Ovezmyradov and Kurata (2019); Pauwels and Neslin (2015); Picot-Coupey et al. (2016); Porto and Okada (2018), Rigby (2011); Rosenmayer et al. (2018); Shen et al. (2018); Von Briel (2018); Vyt et al. (2017); Wang et al. (2018); Ye et al. (2018); Yrjölä et al. (2018); Yumurtacı Hüseyinoğlu et al. (2017); Yumurtacı Hüseyinoğlu et al. (2018); Zhang et al. (2010); Zhang et al. (2016).
Omnichannel Retailing	Abdulkader et al. (2018); Serkan Akturk et al. (2018); Avery et al. (2012); Barwitz and Maas (2018); Bell et al. (2014); Bell et al. (2018); Blom et al. (2017); Breugelmans and Campo (2016); Brynjolfsson et al. (2013); Caro and Sadr (2019); Gallino et al. (2017); Gao and Su (2017a); Gao and Su (2017b); Gao and Su (2018); Gawor and Hoberg (2019); Gonzalez-Lafaysse and Lapassouse-Madrid (2016); Gu and Tayi (2016); Herhausen et al. (2015); Huang et al. (2016); Iyer et al. (2018); Jin et al. (2018); Jing, B. (2018); Kim and Chun (2018); Kireyev et al. (2017);

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(*continued*)

Research Domains	Articles
	Kumar et al. (2017); Lee (2016); Lipowski and Bondos (2018); Ma (2017); Murillo (2017); Newman et al. (2018); Rippé et al. (2017); Saghiri et al. (2017); Shi et al. (2018); Verhagen et al. (2018); Verhoef et al. (2015); Yurova et al. (2017); Zhang et al. (2018a, 2018b).
Omnichannel Customer Service	Burnes and Towers (2016); Chang et al. (2019); Chang et al. (2018); Falk et al. (2007); He et al. (2016); He et al. (2013); Hsieh (2017); Ji et al. (2017); Kwon and Lennon (2009); Li et al., 2016); Liao et al. (2011); Long and Shi (2017); Nel and Boshoff (2015); Pan et al. (2017); Pascoe et al. (2017); Phang et al. (2014); Piercy and Archer-Brown (2014); Wang et al. (2012); Wang and Zhang (2018); Wu and Wu (2015); Xiao et al. (2018); Xiao and Dong (2015); Yang et al. (2013); Yang and Leung (2018).
Omnichannel Logistics and Fulfilment	Bernon et al. (2016); Castillo et al. (2018); De Kervenoael et al. (2015); Galipoglu et al. (2018); Hübner (2017); Hübner et al. (2016a, 2016b); Ishfaq et al. (2016); Ishfaq and Raja (2018); Kembro et al. (2017); Kembro et al. (2018); Lim et al. (2018); Lim et al. (2018); Lim et al. (2018); Marchet et al. (2018); Melacini et al. (2018); Paul et al. (2019); Savelsbergh and Van Woensel, 2016; Wollenburg et al. (2018a, 2018b); Zissis et al. (2018).
Omnichannel Marketing and Advertisement	Berman (2019); Dinner et al. (2014); Fang et al. (2015); Ghose and Yang (2009); Goic et al. (2018); Hammerschmidt et al. (2015); Hilken et al. (2018); Hoehle et al. (2018); Kalyanam et al. (2017); Kannan and Li (2017); Lin et al. (2018); Parise et al. (2016); Pauwels et al. (2016); Schlangenotto et al. (2018); Verhoef et al. (2007); Verhoef et al. (2017); Voorveld et al. (2016); Wiesel et al. (2011); Yang and Ghose. (2010).
Omnichannel Consumer Behaviors	Chen et al. (2018); Chiu et al. (2011); Chou et al. (2016); Daugherty et al. (2019); Flavián et al. (2016); Frishammar et al. (2018); Grewal et al. (2016); Hosseini et al. (2018); Li et al. (2018a); Liu and McKinnon (2016); Pantano and Viassone (2015); Wang (2018); Wiener et al. (2018); Zhu et al. (2013).
Omnichannel Customers' Preferences	Abhishek et al. (2016); Brynjolfsson et al. (2009); Brynjolfsson et al. (2010); Chen et al. (2017); Dzyabura and Jagabathula (2018); Dzyabura et al. (2019); Gong et al. (2015); He et al. (2017); Jank and Kannan (2005); Li et al. (2018b); Mukherjee and Kadiyali (2011); Niu et al. (2019); Wang et al. (2016); Xu et al. (2018).
Others (scattered)[9]	Aguirre et al. (2015); Cai and Chen (2016); Chen and Keng (2019); Gong et al. (2017); Ho et al. (2011); Kolakowska et al. (2016); Lawson et al. (2018); Lee et al. (2019); Lee and Yoon (2017); Lee et al. (2015); Leung et al. (2018); Li et al. (2016a); Lin et al. (2013); Liu et al. (2015); Peng et al. (2014); Rezaei (2015); Ryu et al. (2019); Sorensen et al. (2017); Vinhas and Gibbs (2018); Weidinger et al. (2019); Yang et al. (2016); Yu and Deng (2017).

9 "Others (scattered)" mean these papers are scattered, which do not belong to any of the above seven research domains.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijpe.2020.107729.

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