Omnichannel fulfillment strategies: defining the concept and building an agenda for future inquiry

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Abstract

Purpose – Since the emergence of e-commerce uprooted traditional brick-and-mortar retail in the early 2000s, many retailers have reacted by first independently servicing both the online and in-store channels (multichannel retailing) and subsequently integrating both channels to provide a seamless front-end customer interface (omnichannel retailing). Accordingly, firms had to adjust their logistics and supply chain management (SCM) processes from fulfilling orders for each channel separately to integrating channels on the back-end (omnichannel fulfillment). This development is mirrored by an emerging stream of academic publications. The purpose of this paper is to provide a snapshot of the current state of omnichannel fulfillment research via a systematic literature review (SLR) in order to identify omnichannel fulfillment strategies and to establish an agenda for future inquiry.

Design/methodology/approach – This SLR is based on 104 papers published in peer-reviewed journals through December 2018. It employs a six-step process, from research question to the presentation of the insights.

Findings – All selected manuscripts are categorized based on demographics such as publication date, outlet, methodology, etc. Analysis of the manuscripts suggests that the integration of fulfillment channel inventory and resources is becoming an important objective of fulfillment management. Appropriate omnichannel strategies based on retailer attributes are not well understood. Industry specific research has been conducted necessitating generalized extension for retailers. These findings provide a clear opportunity for the academic community to take more of the lead in terms of knowledge creation by proposing paths for industry pursuit of channel integration to successfully implement omnichannel fulfillment. Opportunities for future inquiry are highlighted.

Originality/value – This manuscript proposes a definition of omnichannel fulfillment strategies and identifies fulfillment links that are used interchangeably across channels as the key delimiter between omnichannel fulfillment strategies and related concepts. Six omnichannel fulfillment strategies from the extant literature are identified and conceptualized. Future research opportunities around omnichannel fulfillment, potential interdependencies between the established strategies and their impact on related SCM issues such as distribution and reverse logistics are detailed.

Keywords North America, Literature review, Omnichannel, Retail logistics, Supply chain processes

Paper type Literature review

1. Introduction

Over the past two decades retailing has undergone dramatic and accelerating change, largely due to the advent of the direct-to-consumer online channel and an ongoing surge in information technology capabilities (Gallino and Moreno, 2014; Piotrowicz and Cuthbertson,

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2014; Verhoef *et al.*, 2015). Sales for the online channel continue to grow rapidly, while foot traffic has become stagnant or is declining among many brick-and-mortar stores (Sorescu *et al.*, 2011). Indeed, during calendar year 2017, approximately 7,000 US brick-and-mortar stores closed, and iconic merchandisers such as JC Penney, Kmart, Macy's, Radio Shack and Sears each closed more than 100 stores (Thomas, 2017).

Retailers initially adapted to these disruptive channel developments by developing multichannel marketing, fulfillment and delivery strategies (Agatz *et al.*, 2008; Rigby, 2011; Christensen and Raynor, 2013). To this end, companies typically established online fulfillment operations that were autonomous from their brick-and-mortar operations. This often included separate and distinct order fulfillment capabilities for each channel, which resulted in dedicated storage facilities for each channel as well as inventory and other fulfillment assets that were committed to a specific channel (Frazier, 1999; Swaminathan and Tayur, 2003).

Within the past 15 years, some retailers began to refine their multichannel capabilities to focus on so-called "omnichannel" capabilities. Briefly, an omnichannel experience allows a customer to order from multiple platforms (omnichannel retailing) and the order can be filled from any location using inventory and other fulfillment assets flexibly across channels (omnichannel fulfillment). Conceptually, omnichannel capabilities provide a seamless shopping experience where the distinctions between brick-and-mortar and online operations become immaterial (Ishfaq *et al.*, 2016; Galipoglu *et al.*, 2018). The grocery industry was among the earliest to experiment with an omnichannel capability by implementing a buy-online-ship-from-store (BOSS) option for customers (De Koster, 2002; Boyer and Hult, 2006). One consequence of companies developing their omnichannel fulfillment strategies is a realization that tying fulfillment assets to particular channels increases inefficiency in terms of managing logistics costs and service.

In response to these changes in the retail environment, interest in omnichannel fulfillment has been increasing and academic articles focusing on the fulfillment and inventory aspects of omnichannel have become more plentiful in recent years. As such, we propose that the omnichannel fulfillment literature has developed sufficiently to justify a comprehensive analysis by means of a systematic literature review (SLR) of omnichannel fulfillment strategies. In addition, given the dynamic state of the concept, having a clear understanding of where academic inquiry has been provides a valuable platform to examine where inquiry should go moving forward. More specifically, the manuscript addresses the following research questions:

RQ1. What is the definition of omnichannel fulfillment strategies?

RQ2. What has been studied regarding omnichannel fulfillment and inventory usage?

RQ3. What are the future opportunities regarding omnichannel fulfillment strategies research?

We believe that addressing these questions can make multiple contributions to the literature; for one, the manuscript provides a detailed and comprehensive definition of the term "omnichannel fulfillment strategy" that can be used to guide a focus on fulfillment-related research within the broader omnichannel literature. The manuscript also adds to the emerging body of SLRs in the logistics and supply chain management (SCM) discipline (e.g. Galipoglu *et al.*, 2018; Friday *et al.*, 2018). Moreover, consistent with Burgess *et al.*'s (2006) seminal research on SLRs in SCM, the present manuscript can facilitate conceptual and theoretical development by identifying promising avenues for future inquiry.

During the review process, three literature review manuscripts were identified as pertaining to omnichannel fulfillment (Table I). Beck and Rygl (2015) and Galipoglu *et al.* (2018) concentrate primarily on the general concept of omnichannel. Melacini *et al.* (2018) identifies network design, capacity management, delivery planning and execution as main

Literature review	Review organization	Noted omnichannel fulfillment strategies
Beck and Rygl (2015)	Taxonomy of multichannel retailing. Categories are delimited by whether the consumer is able to initiate the cross-channel activity or if the cross-channel integration is controlled by the retailer Multichannel retailing Cat I (customer initiated) Cat II (retailer provided) Cross-channel retailing (partial) Cat III (customer initiated) Cat IV (retailer provided)) Cross-channel retailing (full) Cat V (customer initiated) Cat VI (retailer provided) Omnichannel retailing Cat VII (customer initiated) Cat VIII (retailer provided) Hybrid retailing	BOPS (Cat III) BORIS (Cat III)
Galipoglu *et al.* (2018)	Research themes of multichannel and omnichannel research Channel management and strategy Channel supply side Channel demand side	BOPS (click and collect) BORIS (order online return to store)
Melacini *et al.* (2018)	Key themes for e-fulfillment and distribution Distribution network design Inventory and capacity management Delivery planning and execution	BOPS/STS BORIS BOSS Omnichannel distribution centers
This SLR	Definition of an omnichannel fulfillment strategy. Identify and delineate omnichannel strategies according to Purchase origination Fulfillment links Receipt destination	BOPS STS BORIS BOSS Omnichannel distribution centers Omnichannel drop shipping

Table I.
Literature reviews pertaining to omnichannel fulfillment

issues related to e-fulfillment and distribution. Comparing Beck and Rygl (2015) to Galipoglu *et al.* (2018) and Melacini *et al.* (2018) illustrates the need to delimitate omnichannel fulfillment from omnichannel demand-side considerations. For example, Galipoglu *et al.* (2018) and Melacini *et al.* (2018) both characterize the fulfillment strategy for buy-online-pickup-in-store (BOPS or BOPIS) as omnichannel. Beck and Rygl (2015) categorize BOPS as part of cross-channel retail management but they do not view the strategy as omnichannel. They argue that from a demand-creation viewpoint, BOPS customers conduct their transactions online only and fulfillment from the store is merely an additional convenience option provided to customers. From a supply chain perspective, the fulfillment function is indeed omnichannel; the order was initiated online and was fulfilled using store inventory and store resources (Bendoly *et al.*, 2005; Boyer and Hult, 2006). Customers are provided the ability to shop how they wish and store inventory and resources are used to fulfill demand from more than one channel.

Beck and Rygl (2015) provide a taxonomy of omnichannel retailing concepts. Galipoglu *et al.* (2018) identify the research themes and intellectual foundations of omnichannel supply-side research. Melacini *et al.* (2018) note four omnichannel strategies. However, recognizing and delineating omnichannel fulfillment strategies was not the authors' stated objective; they focused on identifying the main issues and themes regarding omnichannel e-fulfillment. This SLR adds to previous literature review work by developing a definition of

an omnichannel fulfillment strategy and delineating six omnichannel fulfillment strategies from the literature. Future research opportunities regarding omnichannel fulfillment strategies are suggested.

The remainder of the manuscript is organized as follows. The next section establishes the definition of omnichannel fulfillment strategies used in the current study. Then the methodology for the SLR is described and this is followed by a section that presents and discusses the key findings from the review. Next comes a section that highlights research gaps and suggests potential directions for future inquiry, while the final section presents a summary and conclusions.

2. Defining and delimiting omnichannel fulfillment strategies

Omnichannel retailing research has been robust in the marketing literature for several years (Brynjolfsson *et al.*, 2013; Rigby, 2011); more recently, omnichannel fulfillment research has begun to accelerate (Piotrowicz and Cuthbertson, 2014; Saghiri *et al.*, 2017; Verhoef *et al.*, 2015). Beginning in the 1990s, multichannel and dedicated-channel distribution research has accompanied the growth of e-commerce (Agatz *et al.*, 2008). Related to the multichannel distribution research, omnichannel fulfillment research encompasses the integration of multiple distribution channels (Bendoly *et al.*, 2005; Gao and Su, 2017). Verhoef *et al.* (2015) identified the firm's perspective of omnichannel retailing as the "synergetic management of the retail channels such that the customer experience and the performance across channels are optimized" (Beck and Rygl, 2015). The firm view of omnichannel retailing consists of how customers experience making purchases and how their purchases are fulfilled. Table II provides researchers' definitions and descriptions regarding the three views that comprise omnichannel retailing: the firm view of omnichannel, the demand-side view of omnichannel that emanates principally from the marketing literature and the supply-side view of omnichannel that is developing out of the logistics/SCM and operations management literature (Beck and Rygl, 2015; Galipoglu *et al.*, 2018).

The established marketing-based, demand-side view of omnichannel highlights the consumer's desire for a consistent and nearly invisible order fulfillment experience. Indeed, if the product exists in the retail network, the customer wants to be able to make the purchase with as little hassle as possible regardless of location and channel (Piotrowicz and Cuthbertson, 2014). Shoppers increasingly demand more convenience. They want to make purchases anytime, anywhere and from any device; to obtain their items in the store or have them delivered at home; and to be able to return their purchases hassle-free regardless of drop-off location (Mercier *et al.*, 2014; Piotrowicz and Cuthbertson, 2014). The marketing and SCM literature generally identify the demand-side view of omnichannel as providing a seamless shopping experience through all available shopping channels (Ailawadi and Farris, 2017; Gao and Su, 2017; Rigby, 2011).

The integration of fulfillment capabilities is coalescing as the SCM, supply-side view of omnichannel (Ishfaq *et al.*, 2016; Gao and Su, 2017). Bendoly *et al.* (2005) identify channel integration fulfillment as the use of multiple modes of fulfillment for "mutual support of, or as semi-interchangeable alternatives for, end-customers transactions." The authors explain that some modes are better suited for channel fulfillment than are others; however, the modes can be interchanged between channels when necessary. Broadly, the supply-side view, ommnichannel fulfillment, represents the integration of the physical distribution structure to meet customer demand from any combination of fulfillment channels (Bendoly *et al.*, 2005; Ishfaq *et al.*, 2016; Hübner, Holzapfel and Kuhn, 2016; Hübner, Wollenburg and Holzapfel, 2016).The integration of distribution channels includes both dedicated and interchanged order-flow paths (Banker, 2013).

As part of the fulfillment process, omnichannel delivery takes into account the emerging last-mile logistics concepts that utilize various modes of delivery to best serve online customers. Methods such as crowd-sourced delivery, ship-to-locker and third-party ordering

Firm view of omnichannel	
Beck and Rygl (2015)	The retailer shares customer, pricing, and inventory data across all channels, the channels are fully integrated from the retailer's viewpoint
Verhoef *et al.* (2015)	Omnichannel management is 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 is optimized
Hübner, Holzapfel and Kuhn (2016) and Hübner, Wollenburg and Holzapfel (2016)	With an advanced omnichannel logistics approach, neither the customer nor the retailer distinguishes between channels anymore
Demand-side view of omnichannel	
Rigby (2011)	Customers value parts of the shopping experience differently, but all are likely to want perfect integration of the digital and the physical
Lewis *et al.* (2014)	Customers want to be able to shop in a seamless and integrated way across multiple channels
Piotrowicz and Cuthbertson (2014)	The omnichannel concept is perceived as an evolution of the multichannel. While in multichannel, a division exists between the physical and online store; in omnichannel, customers move freely between online, mobile devices, and physical store, all within a single transaction process
Ishfaq *et al.* (2016)	The omnichannel approach seeks to provide a seamless consumer experience across all available shopping channels
Bernon *et al.* (2015)	Omnichannel retailing is a seamless approach to retailing that offers a single and unified shopping experience across all retail channel formats
Ailawadi and Farris (2017)	Omnichannel accepts the inevitability of needing to employ multiple channels and is focused on integrating activities within and across channels to correspond to how consumers shop
Gao and Su (2017)	Providing customers with a seamless shopping experience through all available shopping channels.
Supply-side view of omnichannel	
Bendoly *et al.* (2005)	Channel integration represents the use of multiple modes of fulfillment for mutual support of, or as semi-interchangeable alternatives for, end-customers' transactions
Ishfaq *et al.* (2016)	(Omnichannel) requires retailers to align their physical (store-based) and virtual (online and mobile) channels through the coordination of order management, fulfillment, and logistics processes
Hübner, Holzapfel and Kuhn (2016), Hübner, Wollenburg and Holzapfel (2016)	There is only one common logistics interface to the customer and distance orders can be processed through the stores as well as orders placed in-store for home delivery. Information exchange, joint operations, logistics and inventories across channels enable conflation of the fulfillment processes
Gao and Su (2017)	Integrating existing channels to enrich customer value and improve operational efficiency
Castillo *et al.* (2018)	How firms simultaneously manage in-store and online (delivery) channels to create customer value

Table II. Omnichannel definitions and descriptions

and delivery services are becoming important components for specific omnichannel distribution services (Deutsch and Golany, 2018; Lempert, 2018). Crowd-sourced delivery is currently used for deliveries both from stores and DCs (Castillo *et al.*, 2018). Although it is a growing component of retailers' omnichannel strategies, the nascent omnichannel delivery literature is very sparse. The roles of dedicated delivery and omnichannel delivery options regarding omnichannel fulfillment are still developing. Research into omnichannel delivery may take different directions regionally. While not common in North America, click-and-collect options augmenting lockers are being implemented in Europe that include train stations and post offices (Poulter, 2014). We outline omnichannel fulfillment touchpoints with omnichannel delivery and other relevant concepts in our discussion of future research opportunities in Section 5.

To date, the omnichannel retailing literature is uneven with respect to identifying and addressing the distinct logistical aspects of specific omnichannel strategies that facilitate the integration of retailers' fulfillment channels. Integration involves enabling personnel, inventory availability and other retailer assets to be used flexibly across different channels. The importance of concept definition is highlighted by Podsakoff *et al.* (2016), who point out multiple problems with poor concept definition. These include an inability to distinguish a particular concept from other related concepts as well as challenges with operationalizing a particular concept.

Regarding omnichannel fulfillment strategies, we believe that three components of the order fulfillment process offer clarity: purchase origination, fulfillment links and purchase receipt (Croxton, 2003; Gunasekaran and Ngai, 2005). The order flow begins with the customer's purchase initiation and is completed when the purchase is received by the end customer (Banker, 2013). The purchase origination can happen either in the retail store or online. The inventory used to fulfill the purchase can be pulled from a retail store, a retailer's distribution center or a supplier's distribution center. Hübner, Holzapfel and Kuhn (2016) and Hübner, Wollenburg and Holzapfel (2016) refer to the fulfillment processes between the purchase source and purchase reception as links. The fulfillment links between purchase origination and purchase receipt include the purchased item(s) (inventory), personnel that prepared the order, as well as DC, supplier and store assets utilized. The order-flow paths of the fulfillment links are typically intended to be most efficient for a dedicated distribution channel or are deliberately designed to be relatively efficient for more than one distribution channel (Bendoly *et al.*, 2005). Finally, with respect to the purchase receipt, the purchase can be received or retrieved at a retail store, at the customer's residence or at another location convenient to the customer. Table III demonstrates the fulfillment processes for the BOPS and for the BOSS strategies.

To delimitate supply-side omnichannel fulfillment strategies and to aid in delineating between strategies, we propose that omnichannel fulfillment strategies be defined as:

> Processes that enable a firm to meet customer demand through the flexible sharing of fulfillment link(s) across any combination of channels with respect to purchase origination and purchase receipt.

Flexibility with inventory and fulfillment resources has been enabled through rapid developments in information technology capabilities (Oh *et al.*, 2012). Much of omnichannel fulfillment flexibility is achieved via rapidly developing distributed order management systems (Simon *et al.*, 2015; Manhattan Momentum, 2017). The focus on the flexible sharing of inventory, personnel and fulfillment assets in the definition of omnichannel fulfillment

	BOPS		BOSS	
	In-store channel	Online channel	In-store channel	Online channel
Purchase origination		The order begins online via the retailer's website or a mobile application		The order begins online via the retailer's website or a mobile application
Fulfillment links	The order is fulfilled from a retail store using store inventory, store personnel and store resources		The order is fulfilled from a retail store using store inventory, store personnel and store resources	
Receipt destination	The item is picked up by the customer at a retail store			The item is delivered to the customer's home

Table III.
BOPS and BOSS fulfillment strategies

strategies is necessary to reflect the breadth and complexity of the concept as well as to provide boundaries for our examination of the extant academic literature on this topic. For example, this detailed definition allowed us to identify and delineate six distinct omnichannel fulfillment strategies that are currently practiced in industry and are identified in the SCM and marketing literature. These strategies include BOPS or BOPIS, buy-online-ship-to-store (STS), BOSS, omnichannel distribution centers, omnichannel drop shipping and buy-online-return-in-store (BORIS). Each of these six omnichannel strategies is described in greater detail in Table AI. Predominately, in the literature, with the exception of omnichannel drop shipping, these strategies are not concerned with the sourcing function of SCM. An additional exception is the forecasting literature. From a demand-side perspective, other omnichannel strategies exist; however, from a supply-side perspective, they are indistinguishable from other dedicated-channel and omnichannel fulfillment strategies. For example, buy-in-store-deliver-to-store is fulfilled identically as an STS order. Buy-in-store-deliver-to-home is fulfilled the same as an online order (Agatz *et al.*, 2008; Gallino *et al.*, 2016).

While BORIS is not part of the forward order fulfillment process, the strategy has direct implications for omnichannel fulfillment from an inventory, personnel and assets perspective. A key aspect of BORIS is that the returned items cross from the online to the in-store channel where they can be processed to become inventory to fulfill orders from either channel (Table IV). Thus, BORIS is a reverse logistics strategy that retail firms utilize as part of their omnichannel capabilities (Bernon *et al.*, 2015; Ofek *et al.*, 2011).

An advantage of using the idea of flexible sharing of inventory for the definition of omnichannel fulfillment strategies is the opportunity to clearly delineate the concept from other notions with the label "omnichannel" that appear in the literature. Retailers are presently utilizing their inventory, personnel and other assets to fulfill multiple-channel orders using both dedicated-channel fulfillment strategies and omnichannel fulfillment strategies. Only the flexible sharing of fulfillment links across distribution channels can be considered uniquely an omnichannel fulfillment strategy. For example, crowd-sourced delivery from direct-to-consumer distribution centers fulfilling strictly online orders is clearly a dedicated-channel distribution strategy (Phillips, 2018). However, crowd-sourced delivery can be used to deliver online orders from dedicated-channel DCs, omnichannel DCs and from stores making it a possible delivery means for omnichannel fulfillment (Castillo *et al.*, 2018). Omnichannel fulfillment management, therefore, can be viewed as the synergetic managing of the retailer's portfolio of both omnichannel fulfillment and dedicated-channel fulfillment strategies.

3. Methodology

SLRs were originally introduced for medical research and in the sciences (Mulrow, 1987), but have been adapted to the social sciences, including business disciplines such as accounting (e.g. Massaro *et al.*, 2016), finance (Müllner, 2017) as well as marketing and management (Denyer and Tranfield, 2009; Tranfield *et al.*, 2003). For SCM specifically,

Table IV. BORIS fulfillment process

	BORIS		
	In-store channel		Online channel
Purchase origination			The item was delivered to the customer's home
Return links	The return is processed at a retail store using store personnel and store resources		
Return destination	The item is retained at the store for processing and potential resale	or	The item is shipped to a distribution center for processing and potential resale

Durach *et al.* (2017) indicated that SLRs have become increasingly important with rising numbers of articles being published in recent years.

We followed the SLR guidelines established by Mulrow (1987), the Cochrane Collaboration (Higgins and Green, 2011), the Campbell Collaboration (2016) as well as Tranfield *et al.* (2003) to guide the review process. Durach *et al.* (2017) succinctly summarize these guidelines and adjust them for use by SCM-focused researchers by condensing them into a set of six sequential steps. Table V summarizes the six steps and their goals as well as the actions taken by the research team in the current study.

Unlike many SLR's, we did not limit the publication dates during the search (which went through the end of December 2018) in order to avoid arbitrarily excluding earlier manuscripts. The initial results of a keywords search returned a large number of hits. For example, for the main keyword "omnichannel," results produced 5,300 hits from Google Scholar and 774 hits from EBSCO Business Source Premier. However, once limited to academic journal entries for EBSCO, the number dropped significantly to only 39 entries. Since Google Scholar does not provide an "academic journal only" option, we only used it to augment the results from EBSCO. This procedure was repeated for all keywords, and the output of this keyword search is summarized in Table VI. After a review of the titles and abstracts, the majority of the identified manuscripts could be eliminated from further evaluation. This process resulted in 62 papers that were viewed as having relevance to the extant omnichannel strategies from a fulfillment perspective.

A review of backward and forward citations as well as additional manuscripts that were picked up by Google Scholar via keyword search led us to identify another 76 potentially relevant manuscripts, which expanded the pool to 138 articles. Of these 138 manuscripts, 34 articles were excluded because independent analysis by two members of the research team suggested that they were either only tangentially related to the concept of omnichannel fulfillment (e.g. mentioning relevant issues once but never exploring any details) or did not appear in peer-reviewed outlets (this only pertained to manuscripts added to the review via backward citations or Google Scholar). This resulted in a final pool of 104 articles for further analysis, and to the best of our knowledge contains all relevant academic papers between 2002 (when the first manuscript was published) and the end of December 2018.

4. Findings

4.1 Demographic findings: dates of publication, authors and disciplines

This section provides an overview of the identified pool of omnichannel fulfillment literature. Consistent with other SLRs, this overview discusses descriptive material, such as publication dates, methodologies, publication outlets, among others, that provides a "lay of the land" of the omnichannel fulfillment research. Figure 1, which offers an overview of the papers by publication date, indicates limited omnichannel fulfillment research activity between 2002 and 2014 in the sense that no more than six articles were published in a particular calendar year. By contrast, Figure 1 also indicates that 77 of the 104 (or 74 percent) of the omnichannel fulfillment articles were published in 2015–2018, with the number of papers increasing more than four-fold in 2018 vs 2015. This research surge since 2015 suggests that omnichannel fulfillment is poised to become an increasingly common topic in the academic literature – reflecting the rising importance in industry.

The review process also tracked the background of each author with respect to academic discipline (as reflected by an author's university website) and this information is presented in Figure 2. If all authors of a paper came from the same discipline, it was categorized accordingly (e.g. SCM, operations, etc.). In cases of collaboration between authors from different disciplines, the paper was categorized as "mixed." According to Figure 2, the author teams are most likely to be from either the logistics/SCM (40 papers) or operations (28 papers) disciplines. These findings might not be unexpected given fulfillment's emphasis on logistics/SCM and operations.

Step description	Goal of the step	Actions by research team in the current study
Step 1: define research question	Establish relevance and timeliness Highlight contribution and establish initial theoretical framework	We defined the research question to gauge the state of the current SCM research with respect to omnichannel. Timeliness and relevance are established in the introduction The contribution of this effort is to summarize the current state of research and thus be able to identify gaps in the literature and opportunities for further inquiry
Step 2: determine required characteristics of primary studies	Craft inclusion/ exclusion criteria such as research method, study focus, language, etc.	Due to the novelty of the omnichannel concept in SCM research, we opted for a very inclusive approach. We included articles from all theoretical backgrounds and methods. In the early collection process, we considered articles from all business disciplines and only selected into marketing vs SCM-related manuscripts in a secondary step. In a final step, we eliminated articles that did not pertain to omnichannel fulfillment Due to the nature of the research team, only articles in the English language were reviewed. Further, this provides comparability of the results as English is the predominant language in SCM research
Step 3: retrieve sample of potentially relevant literature	Determine research procedures such as databases and cross-referencing Select initial keywords	We employed the search engines Business Source Premier by EBSCOhost as well as Google Scholar We selected the following list of keywords. We always looked for different spellings and acronyms. Keywords were initially selected based on seminal articles in the field and expanded throughout the search process to capture as many articles as possible Omnichannel Omni-channel Omni channel Bricks-and-clicks Bricks and clicks Click-and-mortar Click and mortar Buy online, pickup in store BOPS BOPUS BOPIS Click-and-reserve Buy online, deliver from store Deliver from store BODS Buy online, ship from store Ship from store SFS BOSS Buy online, ship to store Buy-online-ship-to-store Ship-to-store STS BOSTS Click-and-collect Ship to locker Ship and get Ship & get Parcel locker

(*continued*)

Table V.
Applied guidelines for systematic literature reviews based on Durach *et al.* (2017)

Step description	Goal of the step	Actions by research team in the current study
		Locker delivery Pickup-point networks Omnichannel Distribution Centers Omnichannel DC Hybrid Distribution Center Hybrid DC Multichannel Distribution Center Multichannel DC Drop shipping Omnichannel drop shipping Omnichannel reverse logistics Buy online, return in store BORIS Omnichannel Delivery Crowd-sourced delivery Crowd-source delivery Crowd-sourced logistics Crowd-source logistics
Step 4: select pertinent literature	Apply inclusion/ exclusion criteria	We included all articles returned by the keyword search that pertained to logistics and SCM We excluded all articles from further analysis that showed a direct/obvious marketing focus. The selection was made independently by two members of the research team. Then the selection was revisited and individual article inclusion/ exclusion was discussed and decided
Step 5: synthesize literature	Apply coding scheme to extract pertinent information. Synthesize studies and integrate findings	First, we systematically analyzed the selected 104 manuscripts based on their "descriptives" such as publication date, outlet, method, etc. Then, we coded the manuscripts based on the omnichannel fulfillment strategies identified from the literature (see Table AI), identified and characterized possible omnichannel (fulfillment) definitions, and summarized other pertinent insights Based on the analysis, we systematically compared and contrasted the selected manuscripts and in multiple iterations, settled on a framework for our presentation of the findings
Step 6: report the results	Report results, provide descriptive overview and discuss findings	We present the findings separated by a discussion of the "descriptives," the omnichannel definition, and emerging streams in the literature We discuss insights based on the omnichannel fulfillment strategies and distilled key take-aways Finally, we propose detailed further research opportunities in the body of the manuscript as well as Table V

Table V.

What might be unexpected in Figure 2 is the finding that only 6 of the 104 manuscripts (5.8 percent) involved authors from multiple disciplines (i.e. "mixed"). More specifically, although omnichannel fulfillment involves marketing, logistics, supply chain and operations activities in companies, to date there has been limited research that incorporates these different perspectives. Furthermore, we found no manuscripts that include authors from the strategy, organizational behavior, accounting or finance disciplines, all of which are areas potentially impacted by omnichannel fulfillment strategies. Moving forward, there appear to be clear opportunities for authors from multiple disciplines to collaborate on omnichannel fulfillment research.

Keyword	No. of EBSCO entries academic journals	Relevant articles after content review (abstract basis)
Omnichannel	31	21
Omni-channel	37	
Omni channel	39	
Bricks-and-clicks	42	2
Bricks and clicks	71	
Click-and-mortar	31	4
Click and mortar	51	
Buy online, pickup in store	1	1
BOPS	319	
BOPUS	0	
BOPIS	0	
Click-and-reserve	0	
Buy online, deliver from store	0	0
Deliver from store	37	
BODS	302	
Buy online, ship from store	0	4
Ship from store	23	
SFS	117	
BOSS	1,366	
Buy online, ship to store	0	5
Buy-online-ship-to-store	0	
Ship to store	23	
Ship-to-store	0	
STS	428	
BOSTS	21	
Click-and-collect	8	9
Click and collect	31	
Ship to locker	0	0
Ship and get	37	0
Ship & get	3	
Omnichannel Distribution Centers	0	0
Omnichannel DC	0	
Hybrid Distribution Center	2	0
Hybrid DC	229	
Multichannel Distribution Center	0	2
Multichannel DC	2	
Drop shipping	21	0
Omnichannel drop shipping	0	
Omnichannel reverse logistics	0	0
Buy online, return in store	0	0
BORIS	1,422	
Sum of Articles	4,687	48

Table VI.
Keyword search results via EBSCO

To provide visibility with respect to the journals that emerged from our analysis, we include an overview of the outlets of the reviewed articles in Figure 3. As shown in Figure 3, the 104 articles have appeared in 46 separate outlets, and no one outlet accounts for more than 13 articles. For the most part, the disciplinary emphasis of the journals is similar to what was found in terms of the researchers' disciplines. More specifically, the logistics/SCM discipline is represented by journals such as the *International Journal of Physical Distribution & Logistics Management* (*IJPDLM*) (the high number of publications in this journal is in part due to a recent special issue on the topic) and the *International Journal of Retail and Distribution Management* (*IJRDM*).

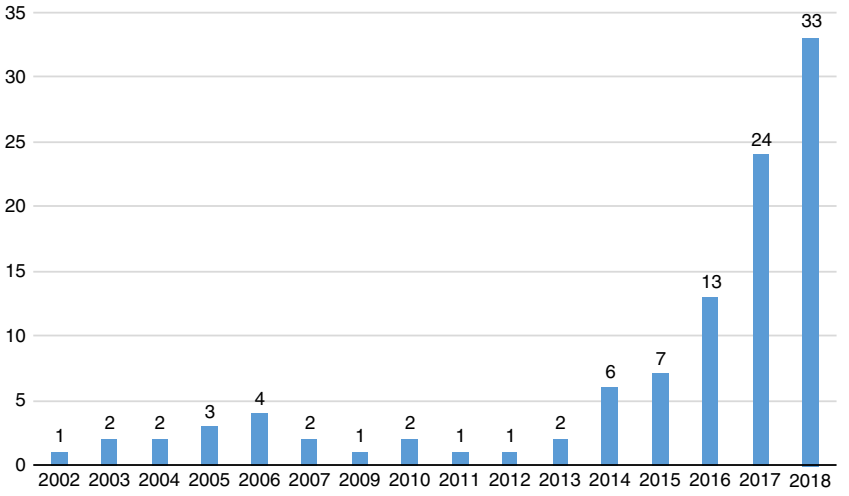

Figure 1.
Overview of reviewed manuscripts by publication date

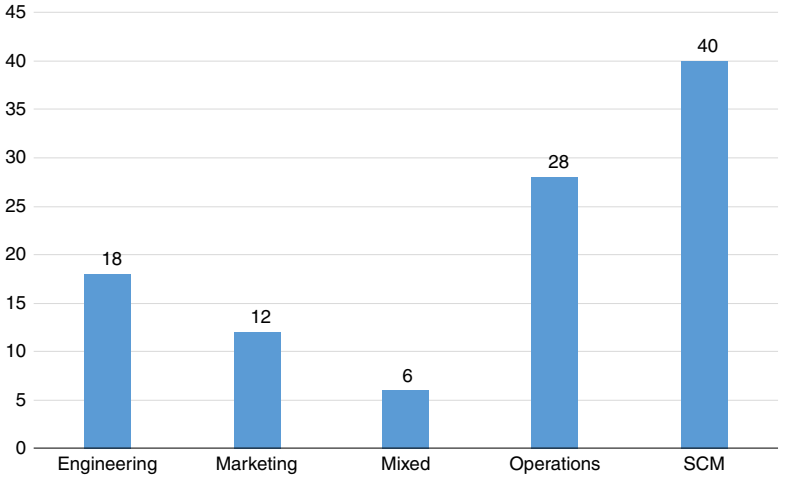

Figure 2.
Author teams by academic discipline

It is noteworthy that most of the relevant pieces in the logistics/SCM realm have appeared in just a few journals (roughly 18 percent of all reviewed articles have appeared in *IJPDLM* and *IJRDM* alone) while outlets such as the *Journal of Business Logistics* (three manuscripts) or the *Journal of Supply Chain Management* (no relevant manuscripts) do not currently reflect the emerging academic interest in omnichannel fulfillment. The operations discipline is represented by journals such as *Management Science* and the *Journal of Operations Management*, while marketing is represented by journals such as the *Journal of Retailing*. The strong showing of the *Journal of Business Forecasting* reflects a 2017 special issue that focused on the implications of omnichannel for forecasting.

4.2 Content-oriented findings: methods and fulfillment strategies

Figure 4, which summarizes the research methodologies utilized, indicates that more than 80 percent of the fulfillment research relies upon one of three methodologies – analytical

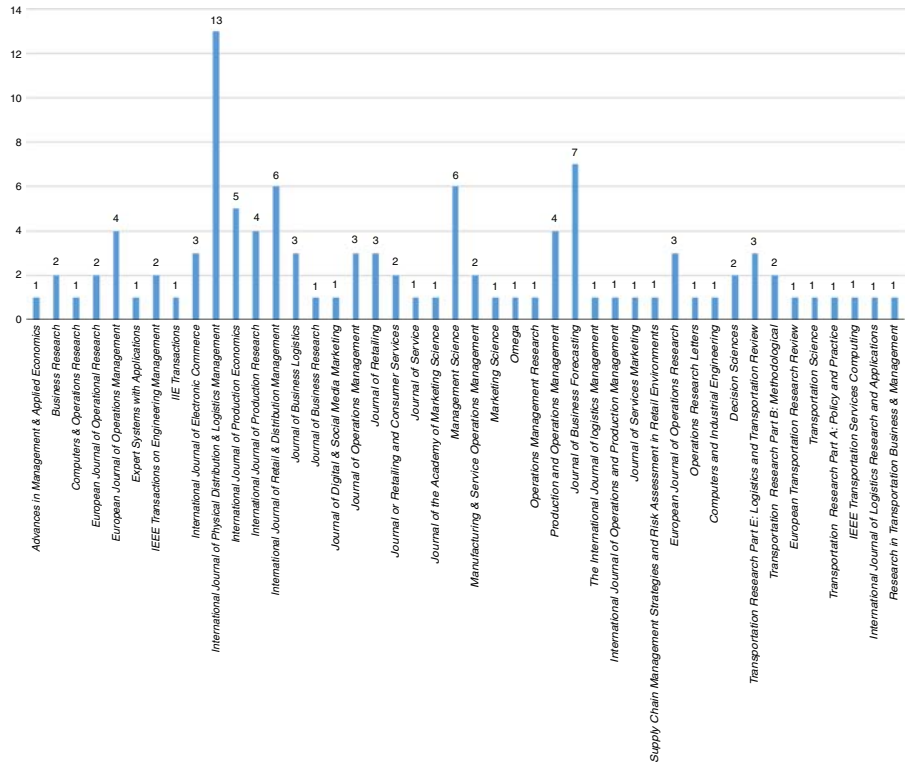

Figure 3.
Manuscripts by outlet

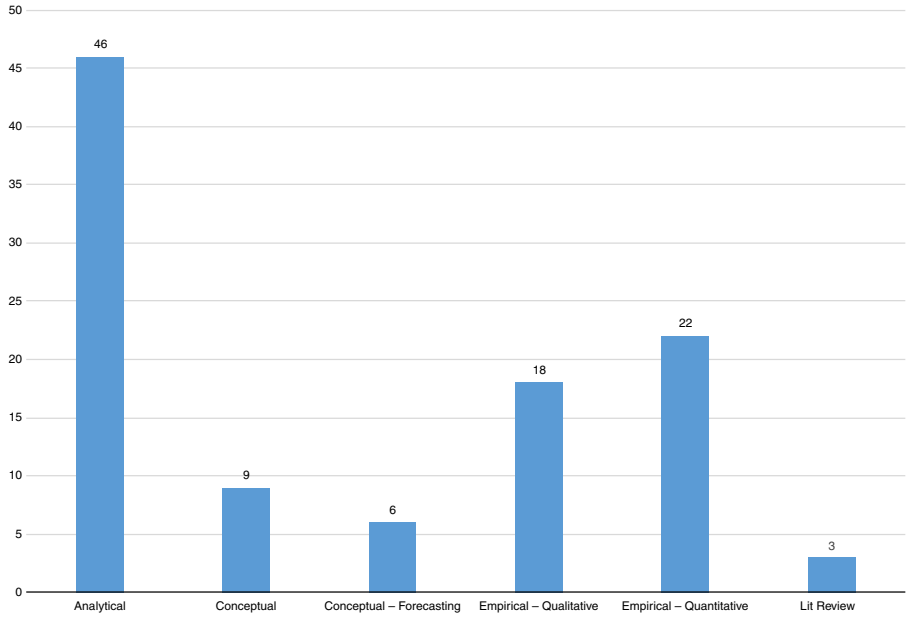

Figure 4.
Manuscripts by research methodology

modeling (46 papers), qualitative empirical (18 papers) and quantitative empirical (22 papers). Content analysis of the articles (not presented in Figure 4) indicates that the analytical and empirical streams have formed largely in isolation from each other. That is, analytical pieces rarely reference empirical work in detail (other than a few individual citations in the paper's introduction sections to demonstrate relevance) and empirical manuscripts largely ignore the insights from the analytical modeling side. As such, one potential avenue moving forward involves omnichannel fulfillment research that incorporates both analytical and empirical characteristics.

Only three of the reviewed manuscripts are literature reviews, which created an additional impetus for the current manuscript. Specifically, two reviews (Beck and Rygl, 2015; Galipoglu *et al.*, 2018) focus on literature around the general concept of omnichannel while this current review of the literature specifically pertains to omnichannel fulfillment. The third review by Melacini *et al.* (2018) identifies network design, capacity management, delivery planning and execution as main issues related to e-fulfillment and distribution. The current manuscript complements the Melacini *et al.* (2018) review of the extant literature by explicitly identifying and delimiting six omnichannel fulfillment strategies based on three parameters – purchase origination, fulfillment links and purchase receipt. Melacini *et al.* (2018) noted four of the omnichannel strategies identified in this SLR: BOPS/STS, BOSS, omnichannel distribution centers and BORIS. Because both BOPS and STS involve picking up online or in-store kiosk orders at stores, Melacini *et al.* (2018) did not delineate between the two strategies. From an omnichannel fulfillment strategies perspective, the BOPS and STS fulfillment links are not the same. BOPS utilizes the pickup store's inventory and store resources and can be accomplished in hours. STS utilizes a DC's or another store's inventory and resources and orders are typically fulfilled over a period of days (Gao and Su, 2017; Murfield *et al.*, 2017). Omnichannel drop shipping is also identified as an omnichannel fulfilment strategy. The fulfilment link is provided by the retail supplier to augment the retailer's network inventory when needed (Khouja and Stylianou, 2009; Simon *et al.*, 2015).

Figure 5 presents an analysis of the different methodologies over time and shows that research between 2002 and 2014 employed almost exclusively analytical and empirical-quantitative methods. A majority of the pre-2015 analytical papers broach the topic from a purely theoretical perspective and lack any visible resonance from outside the modeling community. BOSS research was among the earliest efforts by analytic researchers; Bendoly (2004) used simulation to demonstrate situations where BOSS implementations could draw down, and in some cases completely deplete, in-store inventory, which could lead to lost in-store sales. Similarly, Seifert *et al.* (2006) utilized optimization models to

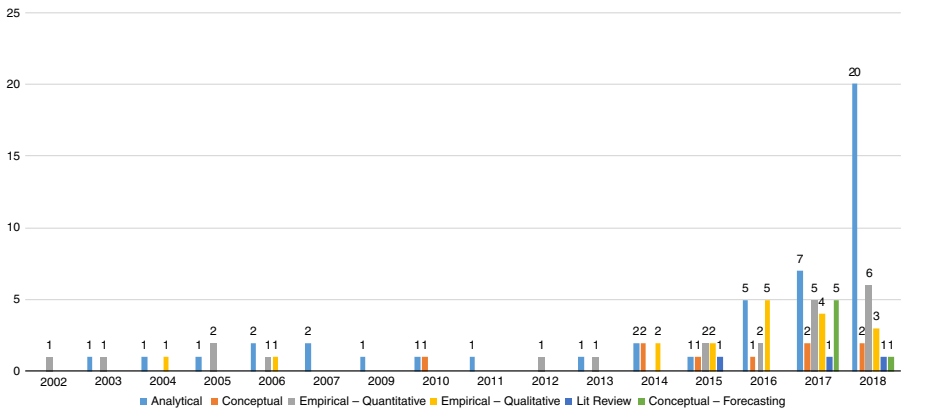

Figure 5.
Manuscripts by research methodology over time

demonstrate that integrating fulfillment for retailers' virtual stores with the retailers' exiting store replenishment network resulted in significant savings over separate channel-fulfillment networks. At the time, most retailers were pursuing channel-dedicated fulfillment capabilities, and many retailers were still using third-party providers for online orders.

Herer *et al.* (2006) added to the analytic literature by showing the connection between BOSS and the transshipment literature. They demonstrate that a stochastic optimization model quickly overwhelms computing power when attempting to determine stocking levels for stores that utilize BOSS. Herer *et al.* (2006) and Mahar *et al.* (2009) combine to demonstrate the inventory pooling benefit of integrated multichannel fulfillment.

Analytic studies in the 2010s include Liu *et al.* (2010), who use a facility location optimization model to identify the best distribution centers within a fulfillment network to convert to omnichannel fulfillment. Also regarding distribution centers, Kull *et al.* (2013) use corporate panel data and discrete event simulation to demonstrate different sources of inventory record inaccuracy for a multichannel distribution center. More recent manuscripts address modeling considerations regarding agility (Lim *et al.*, 2017), transshipment considerations (Zhao *et al.*, 2015) and mathematically the appropriateness of BOPS for various products (Gao and Su, 2017).

As a general rule, the pre-2016 quantitative empirical pieces mostly "feel the pulse" of the industry via management surveys and case studies that gauged practitioner interest but did not ground the work in applicable theory and largely lacked a formalization of the underlying concepts as well as homogeneous terminology. This appears to be a similar pattern of evolution as seen during the early stages of logistics outsourcing and SCM research (see, for example, Selviaridis and Spring, 2007; Stevens, 1989; Stevens and Johnson, 2016). Examples of pre-2016 quantitative empirical research include Boyer and Hult (2006), who considered consumer satisfaction with grocery products received from distribution centers vs from stores. Bell *et al.* (2015) used a case study and corporate data to analyze the sales effect of opening retail showrooms with some inventory for a traditionally online-only retailer. Michel (2015) surveyed the current status and growth of omnichannel fulfillment within retail. While the majority of quantitative empirical manuscripts take deep dives into omnichannel fulfillment strategies and provide explanations for the results, with the exception of Bell *et al.* (2015), they lack theoretical grounding.

Further review of the literature indicates that starting in 2002 labels such as "bricks-and-clicks" or "click-and-mortar" transcended from industry and news outlets into the academic discourse in SCM, but seemed to be used interchangeably and lacked an established meaning or definition. Early publications often employed the term "multi-channel," which – unlike "omnichannel" – does not necessarily require any form of integration between channels. Gradually, starting around 2010, the vocabulary evolved to terms such as "cross-channel" or "integrated multi-channel." The term "omnichannel" did not appear as a title (Piotrowicz and Cuthbertson, 2014) or in the author keywords (Lockie, 2014) until 2014. The first appearance of conceptual work in omnichannel fulfillment (see Figure 5) appeared in 2014. In the same year, the first publications emerged that pursue qualitative empirical methods such as case studies (e.g. Lockie, 2014) and thus sparked a stream of manuscripts across a broader set of methods, with an emerging homogeneity in terminology.

To summarize, the analysis of research methodologies suggest that the integration of fulfillment channel inventory and resources is becoming an important objective of omnichannel fulfillment management (Rigby, 2011; Beck and Rygl, 2015; Gao and Su, 2017). Earlier literature provide important developmental steps toward integration (Bendoly, 2004; Boyer and Hult, 2006; Agatz *et al.*, 2008). Often retailers have been moving forward with omnichannel initiatives prior to theoretical understanding of implications. For example, Manhattan and Associates (Manhattan Momentum, 2017) suggest that broader-based department store retailers such as Walmart and Macy's are generally pursuing higher

service levels from their omnichannel fulfillment management while specialty retailers trend toward seeking better inventory utilization. Appropriate omnichannel strategies based on retailer attributes are not well understood. Industry specific research has been conducted necessitating generalized extension for retailers (De Koster, 2002; Boyer and Hult, 2006; Castillo *et al.*, 2018). We believe that these are important findings because they provide a clear opportunity for the academic community to take more of the lead in terms of knowledge creation by proposing paths for industry pursuit of channel integration to successfully implement omnichannel fulfillment.

Figure 6 shows the fulfillment strategies that are identified by the different papers; because some manuscripts discuss more than one strategy in detail, the total number of identified strategies differs from the number of papers that were reviewed for this study. According to Figure 6, the most commonly discussed strategies, appearing in at least 30 articles, are BOPS and BOSS. This might reflect literature suggestions that companies in pursuit of omnichannel opportunities leverage their stores both for the pickup of online orders (BOPS) as well as to become local distribution hubs for online orders (BOSS). The popularity of omnichannel DCs, comprising 23 articles, appears to align with industry trending away from the traditional model of separate fulfillment operations between in-store and online orders to allow inventory to travel flexibly between channels. The papers that discuss what we dubbed "general omnichannel" are for the most part conceptual pieces that have only more recently provided formalized definitions of omnichannel (and its connection to forecasting) in the literature.

5. An agenda for future inquiry

To date, the omnichannel fulfillment literature exhibits a disconnect between empirically based manuscripts and modeling papers. Specifically, in the extant literature insights from analytical work do not generally translate into the hypotheses development of empirical pieces; alternatively, modeling papers fail to ground their assumptions in the boundary conditions raised by empirical work. Thus, there is potential for researchers in these methodological communities to inform each other's research. Our analysis of the extant

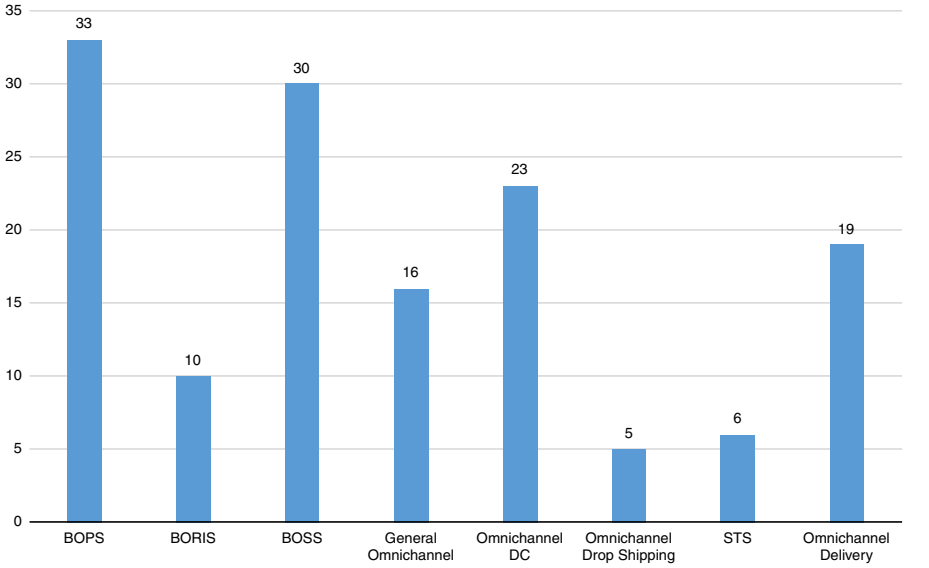

Figure 6.
Manuscripts by discussed omnichannel strategy

literature suggests three main opportunities for future omnichannel fulfillment research. These opportunities are discussed below and Table VIII highlights existing research, potential research questions, as well as possible methodologies, analysis techniques and research designs.

5.1 Identifying policies for improving and optimizing omnichannel fulfillment strategies

There have been several approaches to make better decisions regarding individual omnichannel fulfillment strategies, particularly in the analytical research. As discussed in Section 4, several manuscripts address individual omnichannel fulfillment strategies, such as Liu *et al.* (2010) who developed a model to assist in determining which DCs within a network should implement omnichannel. In a similar vein, Bendoly (2004) considered the potential for causing store stockouts when using BOSS and Mahar *et al.* (2009) considered assignment policies within a BOSS enabled omnichannel network.

Trends are also beginning to be identified empirically; Gallino *et al.* (2016) identified greater sales dispersion when a retailer adds STS to its omnichannel capabilities. In addition, Kull *et al.* (2013) demonstrated how channel fulfillment within an omnichannel DC can lead to different types of inventory inaccuracy. For example, systematically adding more picks from the online channel can cause the DC to have more inventory than the warehouse management system indicates (Kull *et al.*, 2013). Table VII depicts representative research of the six individual omnichannel fulfillment strategies and their relation to the three components of the retail transaction outlined in Section 2.

While these (and other) papers make important contributions to the literature, there appear to be plentiful research opportunities associated with improving the performance of omnichannel fulfillment implementations. For example, industry practice suggests that omnichannel DCs appear to be more attractive to retailers with smaller stores that are replenished via less-than-truckload (Guillot, 2016). Is this because store replenishment and direct-to-consumer online fulfillment are more similar for smaller-store retailers? Moreover, smaller-store retailers frequently replenish stores with less-than-case quantities; are larger-store retailers, therefore, more attracted to BOSS when utilizing their store replenishment networks to support direct-to-consumer orders (Rabinovich *et al.*, 2007)? Ship-to-locker is maturing, especially in Europe. How are locker locations being decided? What are the benefits of locker locations at stores, at train stations, at post office, etc.?

Demand-side view of omnichannel (marketing)

Supply-side view of omnichannel (supply chain management)

Omnichannel fulfillment strategies

	BOPS	STS	BOSS	Omnichannel DC
Purchase initiation	Online	Online	Online	Either channel
Fulfillment links	Store	Either channel	Store	Shared by both channels
Purchase receipt	Store (via pickup)	Store (via pickup)	Online (via delivery)	Either channel
In the literature	Murfield *et al.* (2017) and Bell *et al.* (2014)	Gallino *et al.* (2016)	De Koster (2003) Bendoly (2004) and Boyer and Hult (2006)	Liu *et al.* (2010) and Michel (2015)

	Omnichannel drop shipping	BORIS	
Purchase initiation	Online	Online	Indistinguishable strategies from a fulfillment perspective i.e. buy-in-store-deliver-to-home
Fulfillment links	Supplier	Store	
Purchase receipt	Online (via delivery)	Either channel	Strategies not typically used in practice i.e. buy-in-store-return-to-DC
In the literature	Khouja and Stylianou (2009)	Bernon *et al.* (2015) and Ofek *et al.* (2011)	Strategies not yet identified

Omnichannel delivery (Halderson *et al.* (2010) and Castillo *et al.* (2018)

Table VII. Omnichannel fulfillment strategies and the three components of the retail transaction

In addition, current research does not address the reasons specific retailers seek omnichannel strategies. For example, department stores are forward positioning products in their stores in anticipation of fulfilling online orders. Specialty stores are using BOSS to augment capacity and inventory constraints of their DC-based online fulfillment capabilities (Manhattan Momentum, 2017). Optimizing based on firm goals and retailer attributes may produce different insights for different categories of retailers. At present, these managerial questions remain unanswered in the literature (Leriche, 2015). Omnichannel fulfillment strategies form the building blocks for generalized omnichannel fulfillment theory. Further research will be needed as additional viable omnichannel fulfillment strategies emerge and are recognized.

5.2 Omnichannel fulfillment theoretical underpinning and establishing an omnichannel fulfillment strategies portfolio for retailers

Galipoglu *et al.* (2018) propose that identifying theoretical underpinnings of omnichannel fulfillment strategies can help researchers better examine the mix of omnichannel fulfillment strategies for different types of retailers. It is important to note that research into the simultaneous use of fulfillment channels is noticeably different than historic research that has simply compared channels and strategies (Hübner, Holzapfel and Kuhn, 2016; Hübner, Wollenburg and Holzapfel, 2016; Galipoglu *et al.*, 2018). Rather than just coexisting, some omnichannel strategies naturally interact with each other: For example, as previously mentioned, if returns are processed as omnichannel inventory, BORIS potentially provides inventory positions for BOSS and BOPS. Further research needs to develop suitable theory (Sutton and Staw, 1995) that can better explain why and when omnichannel fulfillment strategies are successful.

Better theoretical understanding of omnichannel fulfillment can also help identify which capabilities can be outsourced to logistics service providers; to date the role of logistics service providers regarding omnichannel fulfillment strategies has received little attention in the literature (Piotrowicz and Cuthbertson, 2014). For example, retailers are asking logistics service providers to not only replenish stores but to also assist in online direct-to-consumer fulfillment (Panayides, 2007; Stank *et al.*, 2017; Zhang *et al.*, 2017). Should these continue as outsourced functions, or should they be solely integrated as core functions of the retailer?

Furthermore, retailers should consider how to effectively pair their omnichannel fulfillment strategies with the appropriate mix of last-mile delivery options. While traditional parcel services are able to efficiently handle aggregated deliveries of online orders from a DC, they are likely unsuitable to economically deliver dispersed and shorter-distance orders from a store to the customer that are necessary to fully implement BOSS strategies. Longer-distance BOSS shipments may still be best serviced by traditional parcel delivery services. For stores near customers, crowd-sourced delivery, employee delivery and third-party delivery independent of the parcel services may provide higher service levels to customers and more economical options to retailers. Ship-to-locker at companies own retail location might be accomplished using store inventory or the retailer's store replenishment assets. Consequently, this eliminates last-mile delivery in a manner similar to STS. Practitioners and researchers should evaluate novel distribution solutions that fit the omnichannel challenge.

As an example, crowd-sourced delivery options may provide an innovative solution to these challenges: crowd-sourced delivery is an emerging delivery method where packages are brought to their final destination by other customers, ride-share drivers from platforms such as Uber and Lift or other travelers if the drop is on their way (Paloheimo *et al.*, 2016). Thus, crowd-sourced delivery means switching out a "traditional" parcel delivery for any given *ad hoc* last-mile delivery solution (Castillo *et al.*, 2018). As such, if applied as a novel delivery solution in a regular e-commerce environment, it does not

qualify as an omnichannel strategy in the sense of our definition because the fulfillment process remains unaffected.

However, if crowd-sourced delivery solutions are used to transport packages from retail stores to the customer, they can emerge as a powerful facilitator of BOSS (Nassauer, 2018; Abdulkader *et al.*, 2018). Thus, from a research perspective, opportunities to integrate crowd-sourced deliveries with an omnichannel fulfillment strategy should be further evaluated because they will likely emerge as a key means of leveraging retail outlets as mini distribution centers for omnichannel fulfillment. Going beyond the forward order fulfillment process, research can also explore options to integrate BOSS and BORIS strategies if crowd-sourced delivery providers for BOSS orders pick up returns from the same or closely located customers as part of their trip.

Another trend often discussed as part of the omnichannel delivery literature is the ship-to-locker concept: ship-to-locker has been a popular delivery method in Europe for several years (Morganti *et al.*, 2014). Considered alone, delivery to a pickup point as opposed to the customer's front door is not an omnichannel concept because simply changing the drop location of the package does not alter the fulfillment process. However, some lockers have more recently been incorporated into retail locations. Amazon has added delivery lockers at its Whole Foods Markets (Haddon and Stevens, 2018). As a third-party, 7-Eleven has also added delivery lockers to its stores (Chao, 2015).

If these lockers inside the retail locations are managed by the in-store channel, this concept qualifies as part of an omnichannel strategy because the inventory crosses from the online to the in-store channel. As such, ship-to-in-store-locker can be considered a variant of STS and researchers could evaluate the economic, as well as possibly the environmental benefits of offering these in-store lockers as an alternative to home delivery. Furthermore, if a customer does not pick up his/her order from an in-store locker, the item could be reclaimed by store employees and processed as a return – essentially a unique form of BORIS. So far, this combination of STS and BORIS has not been adopted in practice on any scale: research could investigate the value of further integrating these concepts via in-store lockers. The role of novel delivery methods as part of omnichannel fulfillment management is not well understood.

While several papers provide an overview of omnichannel fulfillment (Hübner *et al.*, 2015; Ishfaq *et al.*, 2016; Picot-Coupey *et al.*, 2016), there is limited research that addresses the proper mix of fulfillment strategies for retailers. Retailers suffering declines in-store foot traffic may seek to implement BOSS and BOPS to justify variety at stores to keep their stores attractive as destination to customers. When seeking to add a product segment to their offering, retailers may seek to utilize omnichannel drop shipping to minimize the risk inherent to carrying too much or too little inventory of new products (Khouja and Stylianou, 2009). At a minimum, future research could investigate the omnichannel fulfillment strategies of different types of retailers such as department stores, specialty stores, category killers and big-box retailers. Retailers are pursuing different omnichannel fulfillment strategies and in different manners (Manhattan Momentum, 2017). Are particular fulfillment strategies associated with specific types of retailers? What is the proper portfolio of omnichannel fulfillment strategies and dedicated-channel fulfillment strategies for retailers to pursue?

5.3 Omnichannel fulfillment and cross-functional considerations

A key aspect for omnichannel success involves the coordination and cooperation across marketing, fulfillment and delivery. Research is needed to better understand the dynamic between omnichannel marketing efforts, omnichannel fulfillment capabilities and omnichannel delivery. The literature suggests that marketing "promises" may have outpaced fulfillment capabilities as firms have reacted to pressures in the marketplace to

make channels available before logistics teams had the fulfillment processes developed (Lambert *et al.*, 2008). Future research could investigate the impact of cross-functional efforts among marketing, fulfillment and delivery as well as efforts between suppliers and retailers regarding omnichannel fulfillment implementation. More empirical research into how omnichannel fulfillment strategies can benefit sales and decrease costs is needed.

Omnichannel fulfillment approaches are by their nature cross-functional and research efforts across a broader set of disciplines could be valuable when examining these complex strategies. As previously mentioned, fewer than 10 percent of manuscripts regarding omnichannel fulfillment involved authors from multiple disciplines. In addition, the extant fulfillment literature lacks input from the organizational behavior and human resource management disciplines; likewise, there are currently no contributions from the strategy, accounting or finance disciplines. There appear to be plentiful opportunities to incorporate researchers from these disciplines as well as their concepts and theories. For example, inventory management is a key facet in omnichannel fulfillment; inventory has obvious financial and accounting implications. Likewise, the role of logistics service providers in omnichannel fulfillment might touch upon organizational behavior, human resource management, strategy, finance and accounting considerations (Table VIII).

6. Summary and conclusions

This paper provides an SLR of 104 research papers focused on omnichannel fulfillment published between 2002 and 2018. The manuscript proposes a definition of omnichannel fulfillment and the 104 papers are analyzed across selected demographic and contextual characteristics. This analysis provides a foundation that identifies three broad areas for future omnichannel fulfillment research. While considerable effort was made to ensure that this review would be all inclusive, the rapidly growing literature on the subject matter makes it possible that some relevant research studies may have been overlooked.

The term "omnichannel fulfillment strategy" is defined using nomenclature where inventory, personnel and fulfillment assets are flexibly shared to fulfill orders regardless of channel of order origination and regardless of ultimate channel of receipt. In contrast to omnichannel delivery, which is an emerging last-mile logistics concept that focuses on innovative delivery alternatives, omnichannel fulfillment emphasizes on interchangeably employing inventory positions and resources to complete a customer order across any combination of channels with respect to order origination and order receipt.

Demographic analysis of the literature indicated a surge in omnichannel fulfillment manuscripts after 2015; these three years combined accounted for more than 70 percent of all omnichannel fulfillment articles published between 2002 and 2018. While the logistics/SCM and operations disciplines have been well represented in the extant literature, less than 6 percent of the articles involve authors from multiple disciplines. Moreover, to date the omnichannel fulfillment literature lacks input from scholars in disciplines such as strategy, organizational behavior, finance, among others. The analysis also indicates that the omnichannel fulfillment research between 2002 and 2018 was published in 46 separate journals, and no one journal accounts for more than 13 articles.

Contextual analysis of methodologies and strategies found that more than 80 percent of the manuscripts rely on one of three methodologies – analytical modeling, quantitative empirical and qualitative empirical. Furthermore, the research between 2002 and 2014 utilized almost exclusively analytic and quantitative empirical methods. In terms of strategies, six different strategies emerge in the literature, with the two most popular being BOPS and BOSS.

The analysis offers multiple insights concerning future research in the area of omnichannel research. To begin, omnichannel fulfillment research is on an upward trajectory, as seen by the pronounced increase in academic journal articles across the 2015–2018 time period. Moreover, while the extant literature exhibits strong contributions

Table VIII. Omnichannel fulfillment research agenda, associated research and potential research questions

Research agenda	Existing research	Potential research questions	Possible methodologies and analysis techniques
Identifying tactics for improving and optimizing omnichannel fulfillment strategies			
BOPS	Consumer behavior with inventory availability information (Gallino and Moreno, 2014) BOPS quality of service perceptions (Swaid and Wigand, 2012) Consumer loyalty and BOPS service quality (Murfield *et al.*, 2017)	What is the impact of BOPS out-of-stock failures? How does BOPS impact store inventory considerations? Strategies to increase BOPS cross-selling? How does BOPS impact store operations? Manager metrics for BOPS? Who is credited for BOPS sales? What are the capacity constraints of BOPS?	Consumer surveys consumer experiments Corporate panel data analysis Archival studies: databases and other secondary data Simulation
STS	Sales dispersion when offering STS (Gallino and Moreno, 2014)	How accepting are consumers of certain products only being offered online? What are the cost considerations of STS vs home delivery? Strategies to increase STS cross-selling? Should STS be fulfilled through the store replenishment network, the direct-to-consumer network, or through drop shipping?	Analytic models Case and interview studies Field research Longitudinal designs Social media analysis
BOSS	Consideration of in-store safety stock (Bendoly, 2004) Customer satisfaction with store-sourced vs DC-sourced groceries (Boyer and Hult, 2006) Cost savings via BOSS (Seifert *et al.*, 2006)	Does BOSS increase the risk of store stockouts? What is the impact of BOSS on clearance reduction? How does BOSS impact channel service levels? How does BOSS impact store operations? Manager metrics for BOSS? Who is credited for BOSS sales? Strategies to increase cross-selling? When should products be offered exclusively through BOSS? Store inventory allocation with BOSS? What are the capacity constraints of BOSS?	
Omnichannel DCs	Facility location (Liu *et al.*, 2010)	What situations are most appropriate for these DCs? Are there benefits to channel inventory pooling within DCs? Operational challenges of servicing both channels?	
Omnichannel drop shipping	Evaluation of omnichannel drop shipping vs backordering vs lost sales (Khouja and Stylianou, 2009)	Benefits to retailers and suppliers from drop shipping? Consumer reaction to a portion of products being drop shipped? How to coordinate shipping among multiple nodes?	

(*continued*)

Table VIII.

Research agenda	Existing research	Potential research questions	Possible methodologies and analysis techniques
BORIS	Identification of increased return rates when BORIS is available (Bernon *et al.*, 2015)	What to do with returned merchandise in the stores? Does BORIS increase sales? Cross-selling from BORIS?	
Omnichannel Delivery	Comparison of dedicated fleet and crowd-sourced delivery (Castillo *et al.*, 2018) Crowd-sourced routing problems (Arslan *et al.*, 2018) Crowd-sourced delivery and social networks (Devari *et al.*, 2017) Crowd-sourced delivery operations and environmental impact (Qi *et al.*, 2016; Rai *et al.*, 2017) Crowd-sourced delivery bidding (Ermagun and Stathopoulos, 2018) Ship-to-locker and environmental impact (Brown and Guiffrida, 2014) Ship-to-locker networks (Cheng *et al.*, 2017) Conceptual Ship-to-locker (Morganti *et al.*, 2014)	Best delivery strategies portfolio? What constitutes an omnichannel delivery strategy? Comparison of ship-to-locker locations: storefronts, retail locations, train stations, post offices What are ship-to-locker and cross-selling opportunities? What is the role of third-parties for omnichannel delivery?	
Omnichannel fulfillment theoretical underpinning and establishing an omnichannel fulfillment strategies portfolio for retailers			
Omnichannel fulfillment theoretical underpinning	Very little theoretical basis for omnichannel fulfillment has been developed. Only RBV is cited in papers (Galipoglu *et al.*, 2018)	Which omnichannel fulfillment functions can be outsourced? How does omnichannel fulfillment benefit the firm? How do omnichannel benefits relate to established theory?	Surveys Systematic reviews and meta-analyses Case and interview studies Field research Field experiments Corporate panel data analysis Archival studies: databases and other secondary data Longitudinal designs

(*continued*)

Table VIII.

Research agenda	Existing research	Potential research questions	Possible methodologies and analysis techniques
Omnichannel fulfillment strategies portfolio	Value of consumer perceived channel integration (Bendoly *et al.*, 2005)	Which company attributes predict the most successful omnichannel strategies? Are certain companies attracted to specific omnichannel capabilities? How are fulfillment locations shifting with current demands of customers? Are stores becoming showrooms or fulfillment centers? How to best utilize inventory across channels to provide equal access to all customers? What goals are different companies seeking with omnichannel fulfillment?	
Omnichannel fulfillment & integration with omnichannel marketing and omnichannel delivery			
Integration with omnichannel marketing	Product type influences the best sales channel and fulfillment channel for customers (Bell *et al.*, 2015) Showrooms: impact on efficiency and demand generation for traditionally online retailers (Bell *et al.*, 2017) Impact of channel integration and sales growth (Cao and Li, 2015) Sales impact of offering BOPS, evaluation of different products (Gao and Su, 2017) Benefits of monitoring online demand for aligning inventory positions for stores and DCs (Mahar *et al.*, 2009) IT and channel integration leads to better innovation for creative future product offerings (Oh *et al.*, 2012)	Which firm functions should gain or share credit for omnichannel sales? How can customers be enticed to cross channels when fulfillment is not possible via the initial purchase channel? Is it beneficial to entice customers to shop channels where the retailer has the strongest distribution capability? Which marketing channels drive the highest fulfillment costs? Can consumers be enticed to pick products and deliver products for online sales? Which fulfillment methods lead to greatest customer loyalty? Benefits promotions coordination and fulfillment methods?	Systematic reviews and meta-analyses Case and interview studies Field research Corporate panel data analysis Archival studies: databases and other secondary data Longitudinal designs
Integration with omnichannel delivery	No research to date	Relationship between BOPS, BOSS, and same-day delivery? How does crowd-sourced delivery benefit BOSS? Which omnichannel fulfillment strategies lend themselves to omnichannel delivery?	

from the operations and logistics/SCM disciplines, future research should involve researchers from multiple disciplines, to include strategy, organizational behavior and finance.

The extant literature also shows the need for more empirical, analytical and case study research for improving and optimizing omnichannel fulfillment strategies. According to Galipoglu *et al.* (2018), there is a need for better omnichannel fulfillment theoretical underpinning and for establishing the best mix of omnichannel fulfillment strategies for different retailers' omnichannel fulfillment portfolio. Finally, the literature could benefit from research into the integration of omnichannel fulfillment with omnichannel marketing and omnichannel delivery.

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Appendix

Strategy	Description
Buy-online-pick-up-in-store (BOPS)	BOPS is initiated by a customer's online order with the customer requesting to pick up the order at the store (Murfield *et al.*, 2017; Bell *et al.*, 2014). The BOPS network consists of the stores and the DCs that replenish the stores. The inventory used to fulfill BOPS orders comes from the stores' on hand supply (Gallino and Moreno, 2014)
Buy-online-ship-to-store (STS)	STS is also initiated by a customer's online order with the customer requesting to pick up the order at the store. The difference with BOPS is the inventory used to fulfill STS orders does not come from the store's on hand supply. STS orders are fulfilled from DCs and are shipped to the stores. Often these are different DCs than are used to replenish stores. The STS network consists of the stores and the DCs that satisfy STS orders (Gallino *et al.*, 2016)
Buy-online-ship-from-store (BOSS)	BOSS is again initiated by a customer's online order with the customer requesting delivery. The order is directed to a store for fulfillment (De Koster, 2003; Bendoly, 2004; Boyer and Hult, 2006). Much like BOPS, the BOSS network consists of the stores and the DCs that replenish the stores (Bendoly, 2004; Chiang and Monahan, 2005)
Omnichannel distribution centers	Omnichannel distribution centers fill the role of both store replenishment DCs and of direct-to-consumer DCs. DC inventory is shared across both channels (Michel, 2015). An omnichannel DC is a single-echelon fulfillment system when servicing online customers and it is the first node of a two-echelon network when replenishing stores (Liu *et al.*, 2010)
Omnichannel drop shipping	Omnichannel drop shipping differs from traditional drop shipping in that the retailer also carries the supplier's product in its own DCs and/or stores. The supplier's inventory is not always utilized and fulfillment by the supplier occurs because the retailer is either out-of-stock or to suit another objective of the distributed order management system (Khouja and Stylianou, 2009). The omnichannel drop shipping network includes the supplier and retailer DCs that fulfill online orders as well as stores that can fulfill orders
Buy-online-return-in-store (BORIS)	BORIS occurs when a customer returns an item purchased online to a retailer's store. The item is processed to inventory and may ultimately be resold in the store (Bernon *et al.*, 2015; Ofek *et al.*, 2011) or be shipped directly from the store to another online customer. The retailer may also return the item to a DC for repackaging or for other preparation for resale or liquidation. Finally, the retailer may simply dispose of the item from the store or the retailer may ship it for liquidation

Table AI.
Omnichannel fulfillment strategies

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