FRAMING ANTECEDENTS OF LAST MILE OMNI-CHANNEL DISTRIBUTION FOR A RETAIL APPAREL GROUP

Thokozani Patmond Mbhele
University of KwaZulu-Natal

Sanjana Rambaran
University of KwaZulu-Natal

ABSTRACT

The last mile has to deliver goods at the right time for business logistics services to enhance the seamless customer service experience. The paper examines challenges confronting retail omnichannel distribution in achieving effective last-mile fulfilment operations processes in an apparel group (organisation phase). It investigates how the last mile for demand-driven store replenishment influences the level of retailers' order fulfilment (in full and on time) (environment phase). The paper also assesses integrated information systems' contribution to brick-and-mortar and virtual omnichannel distribution networks to improve timeousness, order accuracy and fill rate (technology phase). A mixed method was employed, with a quantitative methodology using frequencies and binomial testing combined with subjective thematic analysis of qualitative data from interviews. A hundred and seventy-five questionnaires were administered with a response rate of 85%. The main findings are that the current order fulfilment process aligned with the last mile is effective regarding the fill rate, lead time and condition of orders delivered via store economy and store express.

Keywords: Last Mile, Omni-Channel Distribution, TOE Framework, Order Fulfilment.

1. INTRODUCTION

While logistics hubs played an important role in traditional delivery solutions, the application of Industry 4.0 innovations has made it possible to redefine the hub and speak of a centralised transport topology optimisation paradigm. Supply chain disruptions and resilience have received increased attention due to a rise in several disruptions in first and last-line supply chain transportation (Katsaliaki, Galetsi, and Kumar, 2021; 3). Disruption is viewed as an occurrence resulting from a natural or human-made disaster that has negative consequences for a normal operation and causes dysfunction within a company (Essuman, Boso and Anna, 2020; 3). Magagula, Meyer and Niemann (2020) observed that disruptions can be external or internal and can trigger the risk of failure of offline – brick and mortar – or online electronic commerce retail apparel businesses (Rousset and Ducruet, 2020; 5). They are associated with last-mile operations and call for agility, responsiveness and resilience in omni-channel distribution. The first mile becomes a core component of electronic commerce (e-commerce) in inbound and outbound warehousing and valorised services, the last mile is the final link to deliver the goods at the right time and the right cost for business logistics services and the customer service experience (Henriksson, et al., 2018; Dablanc, 2019). First-mile (pickups) and last-mile (deliveries) operations should be integrated to optimise operational costs and the utilisation of resources such as delivery trucks, drivers, and hubs, with constraints like capacity, the time window, and availability taken into consideration (Bányai, Illés, and Bányai, 2018:15).

However, Ürgüplü and Hüseyinoğlu (2021) stressed that many offline retailers are also forced to transform towards digital retailing as a means to continue trading, seamless shopping experience (Nielsen, 2020a) and avoid being entangled with criminal activities in less secure shopping malls in South Africa. Retailers with omnichannel capabilities have come to truly appreciate the competitive advantage of such services in turbulent times (Kazancoglu & Demir 2021). Omnichannel retailing refers to a multichannel sales approach from a retailer that seeks to provide customers with a seamless shopping experience regardless of the consumer's channel or touchpoint. Conversely, South African retailers struggled to streamline their supply chains to facilitate online shopping, boost their online capacity to match shopper traffic and maintain their ability to fulfil customer demand (Weber, 2021). Demand spikes for online orders necessitate omnichannel infrastructure in front-end operations such as their website and mobile applications and back-end operations such as order fulfilment and last-mile delivery options to conjure integrated front-end operations. With its roots in the Latin word resilio, resilience means to adapt and 'bounce back' from a disruptive event (Klein, et al., 2003; Gu, Yang, and Huo 2021). Similarly, it refers to a system's ability to absorb, change, and continue. Applied to social systems, resilience refers to the capacity of a community system, or part of that system, to absorb and recover from disruptive events (Manyena, 2006; Timmerman, 1981). Supply chain resilience can be defined as "the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function" (Svensson, 2001; Ponomarov and Holcomb, 2009). This study analysed a supply chain network structure, designed mitigation strategies to build redundancy, and developed contingency strategies to recover the affected network for robustness and adaptability (Zhang, et al., 2021).

Distribution systems for agile networks

Logistics sprawl that involves warehousing and distribution centres relocating from central urban areas to the urban periphery such as the Cato Ridge hub in Durban, South Africa has resulted in Transnet South Africa establishing multiple distribution gateways. The spatial shifts have been attributed to the systematic geographic restructuring of goods production using Special Economic Zones, and Durban harbour as well as broader distribution systems in the KwaZulu-Natal supply chain network. They enable large volumes of goods to be quickly and cheaply transported while easing congestion in the harbour. More recently, the growing trend of online sales and demand for instant delivery has put tremendous pressure on online retail businesses to adopt time-saving logistics practices and strategically locate order fulfilment facilities in areas with direct access to consumer markets (Kang, 2020; Yua, et al., 2020). Logistics management ensures that relevant work support methods, such as traffic, warehouse and inventory management, packaging, and order tracking are in place (Kang, 2020; Yua, et al., 2020). The use of big data analytics in logistics and supply chain management supports the organisation and coordination of distribution activities for improved selection and innovation of distribution modes while reducing the cost improving the efficiency of logistics delivery, and meeting customers' diverse needs (Tirschwell, 2018; Yua, et al., 2020; Kang, 2020).

Artificial Intelligence (AI) technologies create business opportunities to accelerate the impact of last-mile logistics and supply chains by optimising efficiency, cutting costs, optimising operations, refining decision-making processes, and identifying avenues for resource optimisation (Alomar, 2022). AI-driven predictive analytics can empower organisations to anticipate demand fluctuations and optimise inventory levels while machine learning can help optimise last-mile logistics and reduce costs from the effective benefit route and scheduling optimisation, such as traffic congestion, route restrictions, and customer preferences. To optimise delivery operations, South African online retailing companies need a system that can efficiently manage all the variables involved as machine learning algorithms learn from big data and improve over time from analytics. Furthermore, the incorporation of blockchain technology amplifies the transformative potential of AI by ensuring transparency and security throughout last-mile distribution networks. Given that an e-commerce enterprise's logistics ability has become an important indicator of its competitiveness, the choice of a logistics distribution mode directly affects the enterprise's quality and cost of distribution as well as its supply chain coordination such as self-built logistics, third-party logistics, and the joint (hybrid) distribution mode (Zhenga, Zhang, and Song, 2020). The integration of IoT technologies in an apparel group's warehouse management system requires improved infrastructure based on several technologies such as radio frequency identification (RFID), Wi-Fi, Bluetooth, sensors, and cloud computing. The IoT can be used to monitor and track products, create an intelligent transportation system, and for demand forecasting that reduces inventory costs and the bullwhip effect across the supply chain (Bhattacherjee, 2012:31). According to Liu and Sun

(2017:3), the IoT refers to Internet-connected information communication technologies amongst people and within organisations across different industries including the supply chain.

Research problem and objectives

The research problem concerns the extent to which integrated first and last-mile operations provide a flexible delivery modus operandi that meets customers' expectations of an excellent service experience in terms of when, where and how products/services are delivered irrespective of spikes and seasonal logistics. The main challenges of last-mile distribution are infrastructural concerns about the transportation structure, information and knowledge sharing, and advanced technology. Such challenges have become more apparent with the shift to online business and the advent of Industry 4.0. South African e-commerce encounters numerous issues such as customers providing incorrect addresses (informal settlements and black townships), being unavailable to receive the delivery or cancelling it, all of which waste fuel and time. This article examines the challenges confronting a retail apparel group in ensuring effective last-mile fulfilment in omni-channel distribution (organisation phase) and the extent to which the last mile for demand-driven store replenishment influences the level of retailers' order fulfilment (in full and on-time) (environment phase). It assesses integrated information systems' contribution to improving brick-and-mortar and virtual omni-channel distribution networks' timeousness, order accuracy and fill rate (technology phase). The structure of the supply chain network, technological innovations, resource sharing to build last mile redundancy and fulfilment centres' location affect the distribution network (Zhang, Jia and You, 2021), supply chain performance (Gu, Yang, and Huo, 2021) and last-mile delivery for a valorised customer experience (Sheth, 2020).

The South African market

The growth of e-commerce in South Africa depends on the value-based quality of Internet services, and the reliability and cost of delivery mechanisms such as the first and last mile (translating to placement of the order, payment, and delivery). The disruption and closure of different sectors, including logistics facilities and transportation, resulted in stagnant economies worldwide (Ivanov, 2020; Dolgui, 2020; Hakovirta and Denuwara, 2020). The innovative technology includes multi-agent systems (Huynh, 2020) and complex network-based algorithms to optimise sustainable delivery routes (Kim, 2020, Hossain, 2020; Ivanov, 2020). There is a growing need for end-to-end synchronisation, collaboration and visibility across the supply chain commercial network (Sheth 2020). Offline (brick and mortar) and online apparel stores have been affected by a lack of product availability at fulfilment centres, while shortages of cold chain food, and insufficient supply have impacted the medical-fast-food moving industry (Yuen et al., 2020; Su, Zhao, Qi, Kim, and Park, 2021). Heightened customer expectations also require the logistics industry to improve the quality of physical distribution services (PDSQ) during and after the pandemic to ensure sustainable business resilience (Wang et al., 2020; Montoya-Torres, Muñoz-Villamizar and Mejia-Argueta, 2021).

Last-mile logistics in the country have resulted in more companies benefitting from economies of scale due to growth and optimised logistics. Firstly, companies have embraced integration; large online retailer Takealot has purchased Mr Delivery and vertically integrated its logistics including warehousing and delivery. Secondly, store distribution networks enable companies such as Makro, Checkers and Pick n Pay to leverage off their store distribution network, warehouse, and delivery hubs (although Pick n Pay and Woolworths have also created warehouses and distribution solely for e-commerce). Thirdly, companies have turned to outsourced logistics. Online retailers often make use of courier optimising companies such as uAfrica and Parcelninja which assist logistics optimising by using other courier companies underpinned by the Internet of Things (IoTs). E-commerce fulfilment specialist, Parcelninja provides scalable outsourced e-commerce warehousing and fulfilment for small and large online businesses. Such companies may also offer warehousing and fulfilment capabilities. Uber Eats, and fast-food outlet-based delivery systems (through start-ups crowdsourcing delivery vehicles and drivers) gain a few advantages by building geographical scale in the apparel industry. South African retail apparel stores with online order and delivery channels include Makro, Woolworths, Mr

Price, and the Foschini and Truworths groups (Verhoef, Kannan and Inman, 2015). They may include hybrid options such as 'click and collect' where shopping can be done online, with the goods collected in retail stores, or facilitation of returns to offline stores. Omni-channel management is the synergetic management of numerous channels and customer touchpoints to optimise the customer experience across channels and thus maximise the firm's value (Verhoef, Kannan and Inman, 2015; Hure, Picot-Coupey and Ackermann, 2017). The interplay between channels and brands (Verhoef et al., 2015) promotes synchronisation within the brand ecosystem that reinforces consumer loyalty.

Theoretical grounding

As an emerging trend in retail, the omni-channel aims to coordinate processes and technologies across supply and sales channels (Saghiri, Wilding, Mena, and Bourlakis, 2017). It is important to develop a conceptual framework to understand an omni-channel as a phenomenon through the lens of theory. As noted earlier, an omni-channel is made up of many elements, which need to interact with one another (such as the flow of information and material). Those interactions change over time and confront many uncertainties. Based on common definitions of complexity (Anderson, 1999; Vasconcelos and Ramirez, 2011), and complex adaptive theory (Miller and Page, 2009; Pathak, Day, Nair, Sawaya, and Kristal, 2007) an omni-channel can be characterised as a complex adaptive system. While the scale and scope of an omni-channel system and the interactions among its entities render it complex, it can reconfigure itself in terms of various stock-keeping points and flows of material and information via different channels. The retailing, marketing and supply chain management literature notes that the core elements and features of such complex adaptive systems (Choi, Dooley, and Rungtusanatham, 2001; McCarthy, 2003; Nilsson and Darley, 2006; Wollin and Perry, 2004) include agents, connectivity, emergence, and autonomy/control. The applicability of these features in the context of an omni-channel forms the theoretical grounding of this research. Complex adaptive systems consist of agents (or entities) which are interdependent and interconnected and can be an organisation or individual. Various parties such as retailers, manufacturers and delivery companies are agents of an omni-channel system. These agents are not static and their role and connections should be viewed by other agents and in various channels. To better understand their role and position in an omni-channel, it is necessary to revisit the concept of a channel in the technology-organisation-environment (TOE) framework.

Paradigmatic framework

The TOE framework was developed by Tornatzky and Fleischer (1990). It posits that the adoption of omni-channel distribution systems within an interrelated distribution network of in-store and online stock is influenced by factors about the technological, organisational, and internal and external environmental context. This study employed the principles supported by the TOE framework that describes the factors that influence technology adoption and the propensity to absorb online orders as well as how a firm's adoption and implementation of omni-channel distribution innovations is influenced by the technological, organisational and environmental contexts. According to Lin (2014:80), the TOE framework is a major determinant of the decision to adopt an omni-channel distribution system as it is "enabled by the characteristics of information technology (IT) innovation itself", while the extent of adoption is "driven by organisational readiness, and influenced by environmental factors", especially suppliers, customers and competitors' situation (Zhu, Dong, Xu and Kraemer, 2006:601). The technological phase is underpinned by the adoption theory, which notes that "many innovations do not achieve the expected results for failure to satisfy the requirements of potential adopters" (Figueiredo, 2005). It involves the adoption of omni-channel IT that includes new methods of order placement and fulfilment, integrated information, order and financial process capabilities, and/or proficient distribution network systems, to conduct value chain activities (Liu, Ke, We, Gu and Chen, 2010). The TOE framework only represents one segment of the entire process of innovation, explaining how the firm context affects the adoption and implementation of innovations. The framework includes three types of contexts that are posited to influence technological innovation: the technological context, the organizational context, and the environmental context.

Technology paradigm

Industry 4.0 technologies impact connections among products, customers, and production and service companies. Digitisation is germane to supply chain solutions that are more efficient, flexible, and customer-focused. The technological context describes the adoption of a pool of technologies as well as relative network benefits and compatibility, and accessible external and internal technologies (Gutierrez, Boukrami and Lumsden, 2015:28). The increased complexity of these interconnected logistics networks calls for synchronised design, and flexi-responsive first and last-mile supply chains introduce several challenges, including the location of facilities, routing, scheduling, the design of the loading unit building and packaging processes, budgeting, warehousing, and assignment or queuing. Geschickter, Kutnick, Velosa, Perkins, and Steenstrup (2015:31) argue that businesses need to consider the environment in which they operate and the barriers that may limit the use of the Internet of Things (IoT). Integration of IoT technologies in an apparel group's warehouse management system requires improved infrastructure based on several technologies such as radio frequency identification (RFID), Wi-Fi, Bluetooth, sensors, and cloud computing. The IoT can be used to monitor and track products, create an intelligent transportation system, and for demand forecasting that reduces inventory costs and the bullwhip effect across the supply chain (Bhattacherjee, 2012:31). According to Liu and Sun (2017:3), the IoT refers to Internet-connected information communication technologies amongst people and within organisations across different industries including the supply chain. It bridges the digital retail (online) and physical reality (offline - brick and mortar) gap and powers information-driven automation and improvements at the level of business, society, and people's lives.

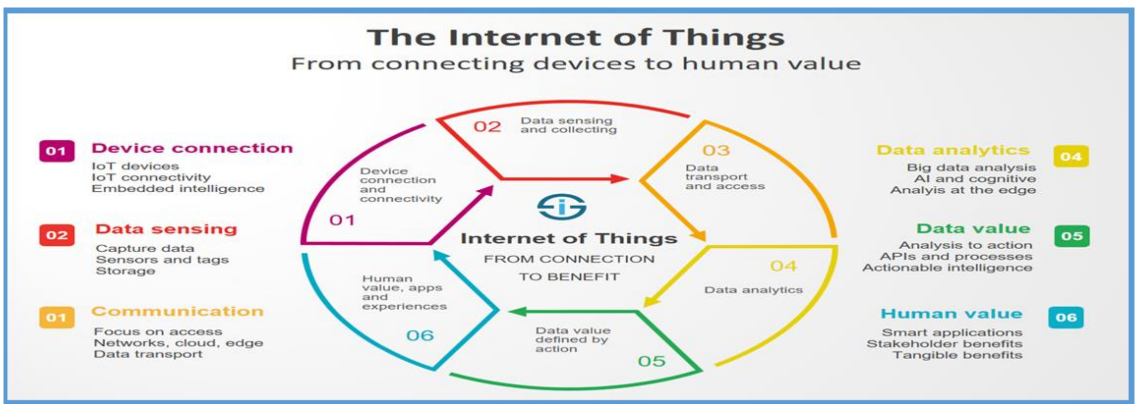

FIGURE 1
THE INTERNET OF THINGS

Source: i-Scoop (2020)

This peer-to-peer database management technology, which allows information sharing across multiple sites and locations (Wang et al., 2019; Biswas & Gupta 2019), is based on a distributed ledger of information (Queiroz, Telles and Bonilla 2019). Blockchain technology is gaining popularity in logistics and supply chain management where it is expected to facilitate effective measurement of the performance of supply chain management processes (Kshetri, 2018). Various stakeholders in supply chain management can track shipments, deliveries, and progress (Sabahi and Parast 2020), enhancing order fulfilment that is embedded in the last mile. Experts predict that the adoption of blockchain may promote interoperability in a business circle (Liu et al., 2020; Koens and Poll 2019; Nakamoto 2019); thus, blockchain builds trust among various stakeholders. Businesses in developed and developed countries that are grappling with the efficacy of Industry 4.0 concepts have shifted from a conventional supply chain network to a blockchain-enabled one. According to Kshetri

(2018; Karuppiah, Sankaranarayanan and Ali 2020).), upgrading supply chain management activities with blockchain technology will assist industries in moving towards sustainable supply chain management and improved performance among first and last-mile partners. Nakano and Lau (2020) argue that the adoption of advanced technology like blockchain would minimise the risks involved in supply chain management activities to a large extent while the IoT provides visibility and transparency. Dubey et al. (2020; Karuppiah, et al., 2020) found that the adoption of blockchain improved collaboration among the various stakeholders in the supply chain network and enabled internal and external integration (Mbhele, 2014). Such collaboration improves mutual trust and efficiency, facilitates the flow of information and promotes interdependence that sustains relationships across the network (Kamble, Gunasekaran and Arha, 2019; Kouhizadeh, Saberi and Sarkis, 2021). Wamba and Queiroz (2020) also note that the adoption of blockchain benefits international trade organisations by providing real-time information on the location and movement of goods (Janssen et al., 2020).

Electronic commerce and big data analytics

Research on e-commerce platform-led supply chains focuses on the forward operation underpinned by the warehouse management system, and the reverse operation supported by synchronised last mile functionality (Liu, Zhang, Wei and Wang (2021)). An intelligent algorithm can be used to optimise the transportation path and improve the efficiency of an intelligent logistics system (Zhang 2018; Liu, Zhang, Wei and Wang (2021). Logistics service providers' capability affects the processing efficiency of e-commerce orders on e-commerce platforms (Leung et al., 2018; Lamba et al., 2019). Therefore, a big data model can be applied in the logistics development process to enhance the construction of e-commerce platforms' smart logistics and improve their efficiency (Li, Wei and Ge 2018; Liu, Zhang, Wei and Wang, 2021). Society and the system will also affect the intelligent logistics ecosystem's efficiency (Hu,Yang 2019). Information and communication technology also has a significant and positive impact on organisational performance in supply chain management practices (information sharing, supplier relations and logistics integration from first to last mile order fulfilment delivery) (Mbhele, 2014; Kumar, Singh and Modgil 2020).

Environmental paradigm

The environmental context relates to facilitating and inhibiting factors in areas of operation (Khosrow-Pour, 2013; Kurnia, Karnali and Rahim, 2015). Last-mile logistics have been characterised as the most expensive part of the supply chain, with a negative impact on pollution and operation costs (Scarinci, Markov and Bierlaire, 2017; Hoehne and Chester, 2017). However, in densely populated areas, there are more potential material flow paths, offering opportunities to optimise last mile solutions (Bányai, Illés and Bányai, 2018:15). Integration of last and first mile solutions increases the complexity of supply chain logistics. Improving the efficiency of fast-moving last mile (FMLM) delivery is a major driver of successful e-commerce (Cardenas, Dewulf, Beckers, Smet and Vanelslander, 2017). An intelligent retail environment, product enhancement, interconnected supply chain, and data-driven business are the key factors of successful FMLM processes. E-commerce increases demand for delivery vehicles in the last mile of product transportation to the customer or point of sale. This is a costly operation that accounts for up to 28% of the total cost of transportation (Bergmann et al., 2020). E-commerce order fulfilment requires responsive, agile distribution models that perform well in terms of cost-effectiveness, customer satisfaction, and operations management. Last mile logistics and related freight transportation networks trigger engagement with the city/town authorities, provincial and national governments, and cooperation with freight logistics businesses (Browne, Behrends, Woxenius, Giuliano and Holguin-Veras, 2019; Bjørgen, Seter, Kristiansen and Pitera, 2019). Integrated urban networks and digitalisation are required for sustainable mobility and efficient last-mile freight distribution (Bjørgen, Bjerkan & Hjelkrem, 2021). A holistic approach which includes the movement of goods and personnel requires sufficient knowledge of the transformative effects of e-commerce and other developments in mobility systems (Ringholm, Nyseth and Gro, 2018; Bjerkan, Bjørgen and Hjelkrem, 2019). It is also important to consider the impact of e-commerce and last-mile freight transport on the quality of places and spaces in cities (Banister, 2019) and on city planning (Dablanc, 2019; Bjørgen, Bjerkan and Hjelkrem, 2021).

In developing economies, last-mile logistic operations are confronted by fragmented retail channels, complex local freight policy regulations (Amarala and Cunha, 2020), and rural slums and shanty towns that are not easily accessible (Laranjeiro et al., 2019). A scalable framework for e-commerce supply chain management and last-mile logistics operations is required to address the inventory management implications of online retail, e-fulfilment and e-commerce distribution strategies, or outsourcing to third-party logistics (3PL) partners. In the last mile omni-channel distribution system, e-commerce 3PL confronts operational challenges including high order fulfilment costs for price-sensitive customers (Houde et al., 2017), strong competitive pressure to provide free delivery services (Perboli et al., 2017), increasing customer expectations about short delivery lead times (Janjevic et al., 2017), individually scheduled delivery time windows (Marujo et al., 2018), shipment traceability and customisation, and the option of alternative delivery locations (Kin et al., 2017), as well as failed delivery attempts and product returns (Allen et al., 2017; Xiao et al., 2017).

Organisation paradigm

The organisational context captures business characteristics such as the scope, size, managerial structure, technology readiness, quality of human resources and the level of available slack resources (Publow, 2007; Oliveira and Martins, 2014; Gutierrez et al., 2015). Last-mile delivery involves three main entities — customers, merchants, and delivery providers — each with its own set of expectations and challenges. Customers have an increasingly complex set of expectations regarding the speed, flexibility, security, and cost of delivery. Many customers would also like the flexibility to shop in-store and have items shipped home or to have the ordered items shipped to a different location, such as an office, a self-service locker, or another pickup point. The increase in express shipments caused by growing online sales, new ICT and the Industry 4.0 paradigm that allows a huge amount of data generated from infrastructure, devices and vehicles to be retrieved, are factors to be managed in a city that has to be rethought in terms of the mobility of goods (Ranieri, Digiesi, Silvestri and Roccotelli, 2018:2). Organisations use the IoT to leverage opportunities such as connecting devices to create new services that improve the customer experience, optimising supply chain operations, and creating new opportunities to generate revenue. Identification, traceability and real-time tracking of goods in supply chains have always been difficult because of the heterogeneity of platforms and technologies used by the various actors in the chain. The IoT offers a new approach that enables organisations to collect, transfer, store and share information on the logistics flow for improved cooperation and interoperability between supply chain partners. This logistical collaboration sparked by the invisible hand of a pull-based marketplace creates a vertically integrated network that creates advantages for the retail and transportation sides of the business. While new delivery approaches have been adopted such as stores hiring their delivery personnel and start-ups outsourcing delivery vehicles and drivers, these are only effective on a very local basis, Uber eats, and fast-food outlet-based delivery systems have gained few advantages by building geographical scale in the apparel industry.

Factors that push warehouses to suburban/exurban areas (Kang, 2020) include the need to process higher volumes of freight, or for larger premises, the metro area's role in globalised goods supply chains, demand and competition for land, economic development and land use policies, resistance from residents against locally unwanted land use (LULU), and the physical geography of a metro area (Dablanc et al., 2014; Giuliano and Kang, 2018; Kang, 2018b; Yuan, 2019). According to Yua, Yub, Xuc, Zhonga, and Huang (2020), logistics services for e-commerce order fulfilment are a bottleneck in the industry for several reasons (Zhenga, Zhang and Song, 2020). Logistics providers have to deal with high volumes of order fulfilment tasks at a time as millions of order buttons are clicked online (Tirschwell, 2018). This study analysed a supply chain network structure, designed mitigation strategies to build redundancy, and developed contingency strategies to recover the affected network for robustness and adaptability (Zhang, Jia, and You, 2021).

2. RESEARCH METHODOLOGY

Research Design

Yin (2014:26) defines a research design as "a rationale that links the research questions to the data collected and conclusions drawn". The purpose of conducting a case study is "to establish a complete picture" of the entire omnichannel retailing and distribution through the examination of a real-life example of an apparel group (Hair, et al., 2007:203). The group's apparel division was used as a case study and data was collected from experienced employees to understand how the group manages first and last-mile customer orders through its distribution network and how virtual technology and the IoT assist in fulfilling orders to remain globally competitive. A research philosophy is "a system of beliefs and assumptions about developing knowledge" (Saunders, et al., 2016:124). Pragmatism is a set of ideas that is supported by those who value subjective and objective knowledge. It was followed by taking into consideration the theory of TOE, the concepts of omni-channel operations, retailing, inventory, technology, and logistical distribution (FMLM), and ideas from the interviewees and respondents about the phenomenon. Respondents offer their views and, in some contexts, practical experiences (Saunders et al., 2016:143). Pragmatism advocates for the use of multiple techniques (Creswell, 2014). The pragmatic approach started with the problem of fuzzy omni-channel operations to identify strategies to manage demand-driven order fulfilment frequencies using the first and last mile that could inform future practice (Saunders et al., 2016:143). Pragmatism permits a middle stance (philosophically and methodologically), selecting a mixture of methodologies that are suitable to respond to the research questions (Johnson and Onwuegbuzie, 2004). It acknowledges that reality can be discovered from the perspectives of many people and different individual perspectives of the social world. A cross-sectional time horizon was utilised to establish current order fulfilment through omni-channel distribution in the company. A concurrent mixed methods research design was employed to gather qualitative and quantitative data, analyse it separately and compare the outcomes to determine whether or not the findings are related (Creswell, 2014). Omni-channel retailing is a contemporary topic and very little research has been conducted on this phenomenon, especially in a South African context. The study sites were Durban, the Apparel Group head office, the distribution centre and extended supply chain as well as the well-integrated 3PL service provider situated in Durban.

Sampling

Non-probability sampling is commonly used in business research case studies (Lewis et al., 2009:233). Purposive sampling ensures that the research questions are posed to the right people. The sample size for interviews varies depending on the scope of the research and the interviewer's proximity to the participants in the case of face-to-face interviews (Schindler and Cooper, 2008:172). Qualitative data were gathered from 13 directors and senior managers in the group and the 3PL provider. The sample size depends on the desired precision which is translated into the confidence level and size, the dispersion of the population, the population size and population homogeneity. Schindler and Cooper (2008:408) state that a 95% confidence level is frequently applied to quantitative research studies and Krejcie and Morgan's (1970:607) sample reference table assumes a standard error of 5%. The authors highlight that the sample size increases as the population increases at a diminishing rate up to the point of 380. Sekaran (2010:295) endorses this table. Based on a population of 333 managers (322 store managers and 11 area managers) from 161 stores and a standard error of 5%, 175 store managers and area managers were surveyed for the quantitative component of the study (with a response rate of 85% equating to 148 responses). Stratified random sampling was used to ascertain the position held by each respondent in the group, thus ensuring that the sample was representative. According to Cooper and Schindler (2014:379) and Saunders et al. (2016), stratified random sampling is a process of constraining and modifying a sample to include subjects or elements from each of the segments and is based on several attributes. It specifies the traits that the sample should include.

Survey instrument and administration

A survey is "a system for collecting data based on the defined objectives to analyse the results and compile findings in response to the research question" (Ritter and Sue, 2012:3). The respondents were made aware of the study via e-mail. All participants and respondents were required to provide informed consent and were assured that they would remain anonymous. The funnelling approach was applied to gauge the respondents' views on omni-channel retailing, followed by more specific questions relating to the challenges of omni-channel distribution for order fulfilment by the group using FMLM logistic services (Dumay and Qu, 2011:249). The semi-structured questions followed a logical sequence in line with the study's themes. Surveys are a useful tool to gain information from a large sample in a short space of time. The survey was self-administered electronically using a web-based questionnaire via Survey Monkey. However, access to store managers and area managers was limited. The respondents had the option of uploading the survey via the store interface, point-of-sale, or via e-mail. Due to the IT department's resource constraints, the surveys were distributed via e-mail to every store in the sample. The e-mail addresses were acquired from the network teams after obtaining permission from the group's gatekeeper and ethical clearance from the University Ethics office. The Human Resources Executive and Omni-channel Manager advised stores of the survey. To put the participants at ease, the interview questions followed a hierarchical structure, with broader questions at the beginning of the interview followed by specific questions. Although an audio recording device was used, notes were also taken during the interviews. Greener and Martelli (2015:113) suggest that interviewees be given a copy of the interview questions in advance to facilitate a reflective response.

Data analysis and interpretation

Quantitative and qualitative data were collected to establish how the use of omni-distribution channels is contributing to stock replenishment and in-store order fulfilment, and how information systems facilitate an omni-distribution approach using first and last mile systems. Whilst the survey enabled an investigation of store operations, the interviews probed further to gain a more extensive understanding of the phenomenon. Abfalter, Muller and Raich (2014:737) distinguish between triangulation, and the mixed method and hybrid approach by "identifying the focus of the study, data sets used, analysis methods and degree of integration of the methods". According to Davis and Golicic (2012:727), "a mixed method study combines quantitative and quantitative research approaches … to fully understand phenomena and reduce bias associated with the use of a single method". This approach employs a moderate level of integration at the interpretation and conclusion stages. Abfalter et al. (2014:737) concur with Davis and Golicic (2012) and add that triangulation "seeks to combine different methods to unpack complex relationships in the study either through a comparative, convergent, or sequential design". The authors are of the view that a combined approach should utilise intertwined analysis, known as the hybrid approach. Hence, the Statistical Package for the Social Sciences (SPSS) was used for the quantitative and NVIVO for the qualitative analysis. These were performed separately, but the interpretation and conclusion were integrated. The quantitative and qualitative methods were used sequentially and carried equal weight. The timing of the methods and the weighting of each are supported by the study's purpose. "A sequential study entails the second method being conducted after the researcher acquires the results of the first method" (Abfalter et al., 2014:737).

Quantitative analysis

A mixed method strategy employs quantitative and qualitative approaches. From an epistemological perspective, positivists believe that the empirical methods used in quantitative approaches produce data that are not influenced by people (Bryman and Bell, 2011:15; Saunders et al., 2016:136). This section discusses the triangulation of the outputs from the quantitative and qualitative analysis and presents, interprets and analyses the data.

Frequency distribution

Frequency is an account of the number of times a phenomenon occurs which is represented as a percentage or cumulative percentage. Frequency is used to identify commonality in responses which is represented graphically using charts. Binomial tests are used to establish whether the observed distribution of a dichotomous variable is the same as that expected from a specified binomial distribution. By default, each named variable is assumed to have only two values and the distribution of each named variable is compared to a binomial distribution with p (the proportion of cases expected in the first category) equal to 0.5. If $p < 0.05$, there is a high level of statistical significance and $p < 0.025$ for a two-tailed test.

The sample comprised 175 respondents with a response rate of 85% (148 responses). The useable responses comprised 70% of the strata of middle and senior management. Approximately 68% of the respondents had more than five years of managerial experience, of which 56% had more than ten years of experience. This indicates that the majority of the responses are from a group of experienced managers. Using SPSS, the average of the coefficient of all items is calculated to determine the Cronbach Alpha. Coefficients below 0.7 are considered to be moderate and those of 0.7 and above are considered good (Hair et al., 2007:244). The questions scored 0.945 on the Cronbach Alpha out of 61 items, implying that the sample is highly reliable. The results show that 60% of respondents were of the view that the extension to online buying increased sales, and 14% felt that it resulted in decreased sales, while 22% opted for unchanged, and 4% for unspecified.

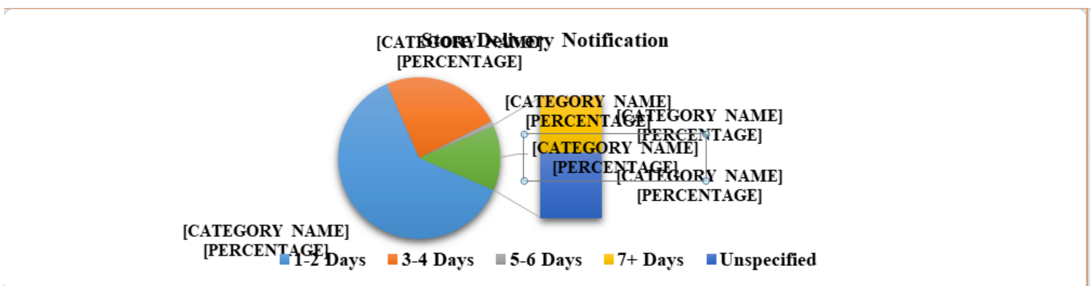

FIGURE 2
STORE DELIVERY NOTIFICATION

In response to the question on how many days in advance the branch received notification of customers' orders to be received by the store, 62% of the respondents indicated that the store receives notification of orders 1-2 days in advance, with 24% stating 3-4 days, 1% 5-6 days, and 6% seven days or more. Lastly, 7% of the respondents did not answer this question.

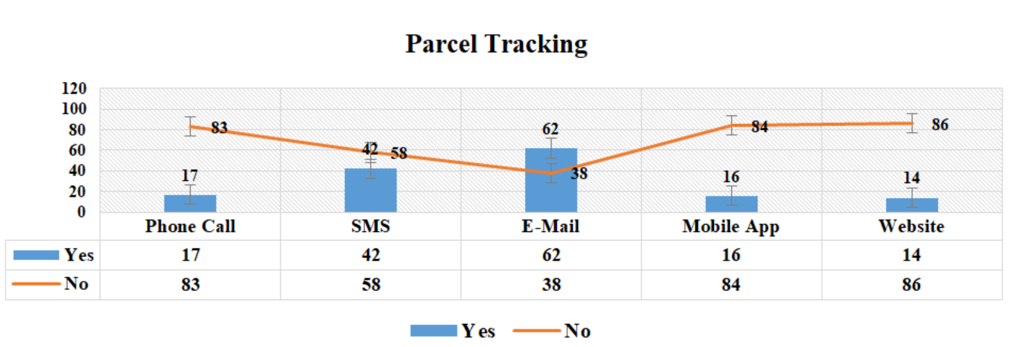

FIGURE 3
PARCEL TRACKING

Sixty-two per cent of the respondents stated that email was the most common medium used by customers to track their parcel, and 42% stated that customers relied on SMSs. Using the binomial test, a significant proportion of the respondents indicated that alternate tracking methods were not used: phone call (83%, p< 0.025), mobile application (84%, p< 0.025) and website (86%, p< 0.025).

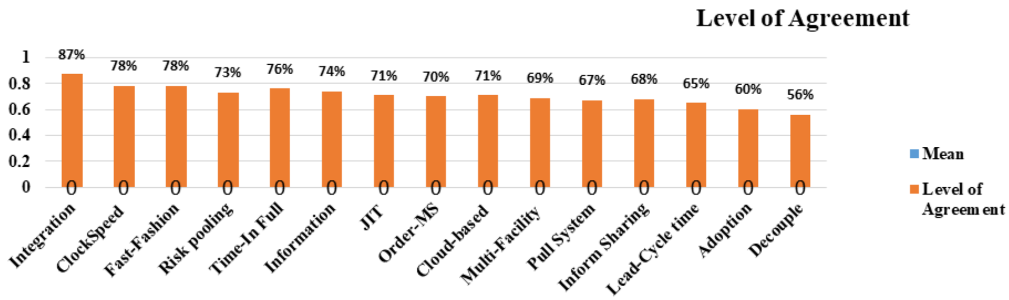

FIGURE 4
OMNI-DISTRIBUTION SYSTEM- LEVEL OF AGREEMENT

There is a significant level of agreement at p<0.05 for all statements. Sixty per cent of the respondents agreed that the adoption of Omni-retail channels influences the supply chain retail distribution system to improve first and last-mile performance. In terms of the propensity to increase sales (60%), the magnitude of customer demand (mean=4.09) influences 'in full' and 'on time' order fulfilment (76%) in the overall distribution system. Change in demand influences fulfilment lead time and cycle time (65%) in the distribution network; however, when demand is unknown, the supply chain can be decoupled to respond to forecast orders until the stock reaches the distribution point, then distributed based on known demand by pull supply chain activities (67%) using the push-pull system with a decoupling point (56%). Integration of both the channels (highest mean=4.45) and the information systems (mean=4.03) improves in full and on-time order fulfilment (74%) where information sharing and visibility within the virtual distribution network (68%) provide an excellent customer experience (87%). Online channels offer improved product variety to customers. The omni-channel distribution network enhances the speed and dependability of customer service (78%) by delivering stock in small frequent loads just-in-time (JIT) to improve the response to changes in demand (71%). It supports last-mile order fulfilment through on-time delivery and the order fill rate.

Fast fashion retail channels (78%) (mean=4.13) require agile supply chains with a quick response strategy and shorter cycle times. The omni-channel distribution system aims to pull supply chain activities (67%) from demand-driven orders to reduce system inventory, with cloud-based technology providing visibility of detailed data in real-time from various sources across the chain (71%). The utilisation of a main distribution centre and multiple smaller distribution facilities (69%) benefits mass last-mile distribution in two ways: firstly, it reduces the risk of online channels due to risk pooling (73%) from a broader product assortment to customers; and secondly, an order management system (70%) unifies order processing across the retailer's network of physical stores.

Qualitative analysis

Pragmatists suggest that in a subjective enquiry, reality is dynamic and the best way people can learn is to apply knowledge acquired through thoughts and experiences. These meanings are investigated by interpretivists who postulate that human behaviour and insights into it depend on people's varied experiences and interpretations of life (Saunders et al., 2016:140). Thematic analysis is the first qualitative method of analysis that researchers should learn, as it provides core skills that are useful in conducting many forms of qualitative analysis. It is "a flexible and useful research tool, which can potentially provide a rich and detailed, yet complex account of data" (Braun and Clarke, 2013:78). A thematic map graphically presents themes, categories, and their relationships, with each thoroughly explained. It helps to outline the objectives that were achieved from the interviews (Ranney et al., 2015:22). The categorisation and summation of data were utilised to explore each department's contribution to fulfilling customers' orders on time and in full. The interviews were transcribed from the audio recordings, categorised and summarised based on the research objectives. Thematic analysis followed, and the following themes and categories emerged.

THEMES	CATEGORY	CODES	Questions
Store Replenishment	Order fulfilment	In full On-time	To what extent does the last mile for demand-driven store replenishment influence the level of the retailer's order fulfilment (in full and on time)?
Integration Strategy	Inbound activity Outbound activity	First mile Door-to-door Click and Collect Overnight	How does the group integrate inbound and outbound activities to manage the first mile, door-to-door, click and collect, and overnight store fulfilment?
Order and Stock Accuracy	Order accuracy and fill rate	Online and offline Initiatives	What initiatives are in place to improve order accuracy and fill rate?
Integrated Information Systems	Information Sharing SC visibility	Virtual omni-distribution	What contribution do integrated information systems make to information sharing and visibility within the virtual omni-distribution network?

FIGURE 5
THEMATIC MAPPING

Section 1.02 Theme One: To what extent does the last mile for demand-driven store replenishment influence the level of the retailer's order fulfilment (in full and on time)?

The value-based fast and new fashion business uses website and mobile application catalogue items for its online store, and store visits and advertising for brick-and-mortar stores, with volatile on-demand changes. *The level of visibility of inventory and orders, and the service level agreement between the retailer and 3PL have implications for the last mile for store replenishment and order fulfilment. The allocation to the online store and fulfilment store is based on demand and the cost of transportation, in terms of reducing courier costs and lead days of delivery from the store through close-to-source deliveries.* The first mile depends on optimised operations systems. If the picker cannot locate the item, the order is picked, failed and redirected to the online store. The *operations process facilitates more control of inventory through the use of the online store whilst achieving reduced cost-effective use of stock, reduced distribution costs to the customer and enhanced speed to market through the use of fulfilment stores.* The online and fulfilment stores customise operational processes based on route optimisation. Couriers have specific pick-up times for stock delivery to the hub based on the planned sorting time, loading, vehicle type and expected volume to synchronise the omni-channels' first and last-mile operations process designs.

Theme Two: How does the group integrate inbound and outbound activities to manage the first mile, door-to-door, click and collect, and overnight store fulfilment?

First mile on online and offline: The online facility expects a delivery between 8 and 10 am to manage inbound and outbound. The integrated systems provide visibility of expected stock delivery through the advanced shipping notice, and the shared information is received by the facility two days in advance to build capacity and resources such as labour planning. On the first mile, *the layout, height and category of the product within the facility are grouped as the layout influences the pick rate. The online store has smaller single-item locations where the boxes are open and easily accessible in contrast to being stacked.* Well-laid-out stock means that less time is spent looking for the item, which speeds up the pick. *The online store has adapted its system for business-to-consumer fulfilment which requires fine picking in comparison to full case picking.* On the last mile, *the in-house logistics management system (LMS) is integrated with many preselected couriers based on courier cost optimisation using a predefined algorithm to select the cheapest courier that can deliver the order the fastest.*

Door-to-door store fulfilment: Door-to-door orders are prioritised first, followed by store economy and store express. *Door-to-door orders are collected from the fulfilment store at noon, and store economy and store express orders are collected at 4 p.m. If the courier misses the time to pick up, the order overlaps with the morning of the next day and is delivered to the designated collection store. There are designated click-and-collect express queues for the customer to collect their orders in-store. The online store picks and packs within 24 hours and can achieve same-day delivery for areas near the facility*. The fulfilment store plays a similar role to the online store but can provide same-day or next-day delivery in the region where the store is situated.

Click and collect: Different organisations have different key drivers for click and collect. In some organisations, high levels of availability are a key driver whilst in others higher service levels are the driver. *Changing the availability of the courier company has cost and quality implications. There is a trade-off between low-volume and high-variety processes versus high-volume and low-variety processes. From a routing perspective, couriers provide additional services to identify the carton so that it gets some form of priority using track and trace*. The form of prioritisation used is dependent on the cost of the service.

Store overnight delivery : Overnight deliveries may be nominated compared to a delivery with a three-day lead time. *The option with the three-day lead time may utilise the existing network whilst the overnight delivery may require a specialised delivery vehicle which is outside of the usual distribution network.* The overnight delivery can be done at a higher price point than the three-day delivery. In the current model for store economy, the courier meets a price point. *Cartons loaded at the courier loading store with economy orders follow FIFO.* Deliveries via post office are cost-effective with longer lead times than deliveries via economy.

Last-mile deliveries via door-to-door and store express : The online store system optimises door-to-door, and door-to-store deliveries using predefined algorithms in the logistics management system. The system selects the most cost-effective courier; however, the rate is still at a premium compared to store economy deliveries. *The 3PL developed … track and trace software like the Uber model whereby there is visibility of the parcel and delivery vehicle. Other couriers contracted with them also use similar applications to gain visibility and achieve route optimisation*. Store fulfilment is pivotal in achieving on-time delivery to exceed the customer's expectations.

Theme Three: What first and last-mile initiatives are in place to improve order accuracy and fill rate?

Omni-channel retailing exposes stock accuracy as online orders need to be fulfilled at the SKU level. *Stock inaccuracies are detected at stores during scheduled stock takes whilst fulfilment stores reconcile inventory daily***.** *The online and fulfilment store is set to 100% audit in the DC in contrast to blind receiving for traditional brick-and-mortar to ensure the stock visibility is 100% accurate.* The system at the fulfilment store allows the user to view the code and the picture of the stock and rejects incorrect items that were scanned. The online store performs a pre-scan, followed by a detailed scan where every item received is scanned and the stock on hand is verified every day. *All defective or excess stock is sent to the returns DC to be flushed out to the clear-out store.* If orders cannot be fulfilled by the fulfilment store, the orders are redirected to the online store. Customer service contacts the customer to fulfil the order without the item. Most inaccuracies occur due to the electronic finance technology (EFT) process in comparison to payment via credit card as a result of the delay in using EFT. *More integration is needed for EFT as every step in the process needs to be integrated for successful omni-channel execution.*

Section 1.01 Theme Four: What contribution do integrated information systems make to information sharing and visibility of the first and last mile within the virtual omni-distribution network?

The supply chain uses a single system comprising multiple sub-systems which are linked from point of origin (PO) creation until stock is delivered to the store; however, the subsystems are not integrated in real-time, nor is there visibility of the last mile. An integrated system such as a Distribution Order Management system (DOM) backwards integrates demand and allocates the best place that demand should be fulfilled based on location to customer proximity which is channelled through the system. *The e-commerce system which is also linked to the host system receives historical information concerning each touch point in the order process; however, the data is not in real time. The e-commerce team uses a web order dashboard which provides visibility of the courier, tracking number, and payment method. However, there is no visibility of the last mile between the order being shipped and delivered and as a result, there is no end-to-end visibility of every touch point.* The transport service provider recommended a single customer management process as the retailer and logistics provider are both running call centres to assist with customer queries. Currently, orders cannot be split for fulfilment to occur from different sources. The business still needs to develop the omni-distribution model.

3. DISCUSSION OF RESULTS

The adoption of omni-retail channels has influenced the extension to online buying and the supply chain retail distribution system in terms of increasing sales and ramping up first and last-mile performance. In terms of the propensity to increase sales, the magnitude of customer demand influences 'in full' and 'on time' order fulfilment in the overall distribution system. The branch received notification of the number of customer orders to be received by the store in 1-2 days. The most common medium of parcel tracking by customers is email while SMSs were also highlighted as a critical medium.

Increasing urbanisation is making the last mile of delivery more complex and critical for quick, convenient delivery by e-commerce companies. Companies that can improve their performance with flexible transport networks, automation and data will be better positioned to compete. Localisation (shifting the supply chain to focus more on regional fulfilment to shorten the last mile), and flexible delivery (flexibility built into the networks) have been facilitated by innovative technologies, with increased adoption of virtual reality, artificial intelligence (AI), the IoT, cloud computing and the use of big data analytics to work towards more flexible models. The integration of the channels and information systems improves full and on-time order fulfilment in-store and online. Information sharing and visibility within the virtual distribution network provide an excellent customer experience. However, there is no visibility of the last mile between the order being shipped and delivered, and as a result, there is no end-to-end visibility of every touch point. Virtual reality is applied at the fulfilment store where the user views the code and the picture of the stock and rejects incorrect items that were scanned. Nevertheless, big data analytics and AI can be used on the online store to perform a pre-scan, followed by a detailed scan where every item received is scanned and the stock on hand is verified every day. The last-mile system tracing and tracking with multisensory modes tentatively provides visibility for in-transit trucks and last-mile operations. In contrast to blind receiving in traditional brick-and-mortar, first and last-mile logistic services with the online and fulfilment store set on 100% audit in the DC ensures stock visibility at 100% accuracy with the IoT, big data analytics, driverless vehicles, and AI technologies.

Improved coordination and more accurately matched demand for delivery services builds a last-mile exchange platform that drives delivery decisions and allows retailers and logistics supply chain partners to collaborate to improve responsiveness to delivery demand and to entrench agile, responsive, and continuous adjustment and flexibility in the last mile. The omni-channel distribution system aims to pull supply chain activities from demand-driven orders to reduce system inventory, with cloud-based technology providing visibility of detailed data in real time from various sources across the chain. Store fulfilment is pivotal in achieving on-time delivery to exceed the customer's expectations. The difficulties of managing demand on a given day, which are especially evident during peak times such as Black Friday and holiday periods, are built into the current e-commerce ecosystem. The omni-channel distribution network enhances the speed and dependability of customer services by delivering stock in small frequent loads JIT to improve responsiveness to changes in demand. It supports last-mile order fulfilment through on-time delivery and order fill rate. Last-mile couriers have specific pick-up times for stock delivery to the hub based on the planned sorting time, loading, vehicle type and expected volume to synchronise the omnichannel first and last-mile operations process designs. In the last mile, the in-house logistics management system (LMS) is integrated with many preselected couriers based on cost optimisation using a predefined algorithm to select the cheapest courier that can deliver the order the fastest.

The extended supply chain delivery network has complex big data that requires data analytics to yield improved convenience, transparency, efficiency and cost savings. Technological and analytical omni-channel capabilities for efficient last-mile exchange allow for a dynamic pricing model that is open to multiple retailers, targeting a host of customers and bidding by carriers such as 4th PL, 5th PL and integrated logistics service providers. The 3PL developed track and trace software like the Uber model where there is visibility of the parcel and delivery vehicle. Other couriers contracted to it use similar applications to gain visibility and achieve route optimisation. The level of visibility of inventory and orders, and the service level agreement between the retailer and 3PL have implications in the last mile for store replenishment and order fulfilment. Allocation to the online and fulfilment store is based on demand and the cost of transportation, to reduce courier costs and lead days of delivery from the store through close-to-source deliveries. More integration is needed for EFT as every step in the process needs to be integrated for successful omni-channel execution. Door-to-door orders are prioritised, followed by store economy and store express. If the courier misses the time to pick up, the order overlaps with the next morning and is delivered to the designated collection store. There are designated click-and-collect express queues for customers to collect orders in-store. Different organisations have different key drivers for click and collect. In some organisations, high availability is a key driver whilst in others it is a higher service level. Changing the availability of the courier company has cost and quality implications. Overnight delivery can be offered at a higher price point than three-day delivery. Deliveries via the post office are cost-effective with longer lead times than deliveries via economy. The fast fashion retailing channels require agile supply chains with a quick response strategy and shorter cycle times.

Customers' expectations of high levels of efficiency and speed need to be met while protecting profit margins. Businesses face competition from firms that are aggressively expanding their operations, or adopting disintermediation, where manufacturers supply customers directly. Digital transformation makes it possible for greater operational flexibility and insight into customers' needs using the IoT, big data and blockchain technologies. Distributors can be online 24/7, offering customers a self-service experience where they can place orders, update quantities and schedule at their convenience. Real-time analytics could be crucial for a wholesale distributor with many moving parts, as it is an essential tool to handle logistics in this all-hours agile scenario. Automated alerts could inform action based on trajectories of demand or other factors. With easy-to-use data in conjunction with analytical capabilities (big data analytics), distributors could better plan and forecast demand (improving customer service and reducing costs) through blockchain, as well as effect changes in workflows, such as combining shipments through ingenious IoT connectivity. In addition, the IoT enables distributors to use connected devices, products and tools equipped with sensors that can talk to each other, and collect and store data from self-service lockers to home delivery and in-store collection. They can partner with manufacturers and retailers to access data in real-time with visibility from the IoT and blockchain. To make the best use of data to drive informed and timely decisions, wholesale distributors must replace legacy siloed systems which could prevent information and insight from being used across the business. A robust business management solution could be the answer. IoT technologies and the ability to integrate in real-time with business management solutions transform how inventory can be tracked and managed and allow for automation. Business management solutions can track items in real-time, usually through RFID (radio frequency identification) tags or barcodes that can be scanned or identified.

Reliability and validity of instruments

Measurement tools are considered to be reliable, and valid when they exhibit precise measurement procedures and are characterised as being fit for purpose (Schindler et al., 2008:289). Reliability can be measured using test-retest, split-half reliability, and Cronbach Alpha for quantitative data (Hair et al., 2007:242). The Cronbach Alpha (0.945 out of 61 items) is used to test reliability, as the level of homogeneity of the questions in the instrument is tested scientifically. Thomas (2010:318) elaborates that quality is reflected by the trustworthiness of the research through credibility, transferability, dependability, and confirmability. The credibility of the research is the extent to which its findings match reality. It establishes if there is a match between the constructed realities of the respondents and those represented by the researcher. Credibility validates whether the findings denote "credible information that has been drawn from the participants' original data and if the interpretation of the participants' original views is correct" (Korstjens and Moser, 2018:121). The strategies used to ensure credibility are triangulation, prolonged engagement, member check and persistent observation. It establishes if there is a match between the respondents' constructed realities and those represented by the researcher (Ghauri, Penz and Sinkovics, 2008:699). Transferability is the extent to which the findings can be generalised. Although this is considered a challenge in qualitative data analysis due to its subjective nature, it can be enhanced by the justification of the methodological approach and a detailed description of critical processes and procedures and associated meanings of phenomena (Thomas, 2010:320). The detailed breakdown of the interview process, transcription of audio-recorded interviews and thematic analysis justify the transferability of the research. The instrument is dependable when the steps followed during a research study can be verified through examination and reduction of data. Transparency and a detailed record of interviews facilitate future corroboration of the results. The reliability of the qualitative instrument is also assessed through the similarity of words and phrases using category reliability or inter-judge reliability (Sekaran, 2010:384). Confirmability involves corroboration of the findings by personnel such as auditors or others doing similar research as well as through triangulation. It is achieved through a methodological account of how the research was conducted and by archiving data for future investigation (Thomas, 2010:322). The use of multi-method research promotes the credibility, dependability and confirmability of the overall research findings, ensuring the data is trustworthy and reliable.

Validity is measured using content validity, construct validity and criterion validity. Content validity requires a sample of experts to be consulted to assess the suitability of the items representing a construct on the instrument (Schindler and Cooper, 2008:290). This study was based on established supply chain concepts; hence content validity was ensured by consulting with supply chain experts and academics for the quantitative and qualitative data collection. Content validity of the survey instrument was also achieved by reviewing the relevant literature. In addition, the correspondence with the respondents, as well as the survey documents, were approved by supply chain experts such as the regional omni-channel manager and the omni-channel director before distribution. The survey was also piloted by sending it to ten stores in the Durban region. The feedback noted that supervisors and store associates would not cope with the level of the questions and that it should rather be administered to store management and area managers. The survey was subsequently distributed to store managers and area managers in Durban. In addition, triangulation can be used to test the validity of different sources in qualitative data. This helps to provide inclusive insight into the phenomenon under study. Triangulation enables the researcher to support the results that relate to the phenomenon. The researcher builds a coherent justification of the themes that emanate from several sources of data from the participants' perspectives. A combination of two research methods, as well as the use of questionnaires and interviews during data collection enhances triangulation.

4. CONCLUSION AND FUTURE RESEARCH

The findings reflect that a multitude of fulfilment centres and channels are being used to fulfil orders in the retail group's omni-distribution model. The current orders fulfilment process aligned with the last mile is effective based on the fill rate, lead time and condition of orders delivered via store economy and store express. However, the door-to-door shipping method and delivery via the postal service should be explored for local orders. Future studies could establish the extent to which orders are being fulfilled via door-to-door and post relative to delivery via store express and store economy in South Africa, as well as the services offered internationally. Logistics network designs are diverse, customised and locally optimised to transform the supply chain into decentralised fulfilment systems to enhance cycle time operations, shorten lead time and shorten the throughput rate on the last mile. A single delay forms a perception of the business which penetrates the market in the form of negative reviews and preference for competitors. E-commerce businesses need to optimise e-commerce delivery applications (apps) to keep customers continuously happy as the online retail market is expected to continue to grow with an increasing number of orders being placed by customers. Modern customers are ready to pay extra for same-day delivery. E-commerce players are investing heavily in new tools and technologies such as the IoT, big data, drones, electrical vehicles, GPS, and more. Smart tracking systems increase visibility in the supply chain and the customers can view the status of their order every step of the way. The connectivity and interactions among the agents in omni-channel systems should ultimately connect multiple channel types and stages of the customer value-adding process. A last-mile delivery exchange that connects consumers, retailers, and transportation companies via a digital platform further challenges the e-commerce ecosystem to produce benefits for consumers, retailers, and package delivery providers, yielding improved convenience, transparency, efficiency, and cost savings. Such an exchange would create a path forward through the disruption caused by increasing consumer expectations, technological advances, the emergence of new entrants in the marketplace, and the rise of the sharing economy (PwC Report, 2016). The managers also highlighted the need to flip thinking back towards the customer and rely on sales forecasts with long lead times and extended supply chains. Omni-channel distribution on the underlying demand-driven model requires management to strategise how best to manage a supply chain that is serving a complex, volatile market while the last mile is traced on long distances and lead times from end-to-end logistical specificity and speed.

5. ACKNOWLEDGEMENT

Please note that a preprint has previously been published (Mbhele and Rambaran 2021) and then a reference to the preprint is included in the reference list. It is entitled: Framing Antecedents of the Last Mile Omni-Channel Distribution for the Retail Apparel Group. Preprints available at: www.preprints.org, NOT PEER-REVIEWED, Posted: 25 March 2021.

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