Modern Aspects of Digital Technologies
Development in Retail Networks

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Abstract. The paper considers modern aspects of digitalization of the retail network companies. Retail networks are rapidly increasing the volume of digital services provided, introducing digital technologies into many business processes in order to increase their own competitiveness, speed up decision-making and develop new markets. Continuous development of digital technologies and consumer expectations regarding these technologies are the main prerequisites for digitalization of the retail. The article discusses the practice of using digital technologies, such as big data, e-commerce, and implementing omni-channel model for customer service. Big data is considered one of the key leading digital technologies in the retail sector, which includes geolocation analytics, video analytics, analysis and forecasting of demand for products. Not only the advantages of implementing digital technologies in the retail were emphasized in the article, but the problems associated with this process such as cyber attacks, personal data leaks, etc. were also paid special attention. Promising areas for research within the framework of this problem were formulated.

Keywords: Digital technologies · Digitalization · Retailing · Omni-channel retailing · Big data · E-commerce

1 Introduction

In modern companies of various sectors and industries, introduction of digital technologies is aimed at ensuring collection, processing and provision of the information required by the user [1]. Cloud computing, mobile technologies, sensors, Internet of Things (IoT), big data, Artificial Intelligence (AI), augmented reality technologies (AR), robotics, additive manufacturing (3D printing), drones and other technologies implemented in everyday environment allow you to automate many business processes and economic operations (including marketing; production, sales; finances; accounting [2]), they can extract information from physical devices (sensor readings containing information about the state of a physical device), quickly distribute it (using mobile technologies), store it in the cloud, and instantly analyze it (using big data and advanced analytics), thereby integrating products, services and processes [3]. Digital technologies allow delivering information to target consumers, on a global scale in almost real time mode. Specifics of development and implementation of digital technologies in companies depend on characteristics of the industry in which they operate.
Retail networks have become one of the industries rapidly increasing the volume of the provided digital services and implementing digital technologies in many business processes in order to increase their own competitiveness and speed up decision-making.

Implementation and management of digital technologies in retail networks is facilitated by active development of digitalization, which is considered intellectual business and a process of creating value in electronic form using information and communication technologies [4]. Social media, big data and other emerging technologies (e.g., Artificial Intelligence (AI), virtual reality (VR), augmented reality (AR), blockchain, etc.) are transforming the retail business models. At present «increasing portions of the retail trade are shifted from store-based to internet-based formats, including pure plays, manufacturer online operations, and platforms» [5].

On the one hand, diffusion of digital technologies has rapidly increased in physical stores (stationary retailing), due to the continuous development of digital technologies and consumer expectations for these technologies [6]. Although stationary retailing has its roots in the physical retail, and the economic model of such retailers is primarily based on profitability of their offline operations, they nevertheless actively implement omni-channel strategies that synchronize data and information across all physical and digital channels of interaction with consumers. When applying such strategies, it is important to take into account the connection between digital and physical space in retail supply chains for adaptive synchronization of supply and demand, which ultimately leads to a reduction of the period of an order execution, transaction costs reduction, which are key performance indicators in today’s competitive retail markets [7].

On the other hand, there are new players – digital retail platforms, such as Amazon, Alibaba, which “take over” a significant part of the trade and this is due to the fact that an increasing number of customers prefer the convenience of online purchases and door-to-door delivery, bypassing the space of a physical store [8]. Digital retail platforms allow a large number of sellers and buyers to interact effectively.

Digital technologies in the retail networks, implemented at various stages of value creation, are able to create powerful ecosystems of brands that interact with consumers by means of various applications, direct selling, engagement marketing and development of customer experience, as well as personalized communication which create completely new value offers [5]. Consumers want to use modern technologies that will help them interact with the stores at every stage of making a purchase from waiting for the products to be available in stock to being able to choose from several delivery options. Digital technology either enhances or disrupts the value co-creation process, where customers’ needs and desires drive them to interact with service providers in the physical retail space [9].

Despite a number of obvious advantages associated with introduction of digital technologies, the retail sector, however, faces a number of problems and challenges, from adequate training of store employees to difficulties in measuring the return on digital investment. Many retailers do not put into practice the digital initiatives expected by consumers. It is important to understand and evaluate the reaction of retailers themselves to the actual level of digital technology spreading in various business processes and areas of activity. In addition, the introduction of basic digital
technologies depends on the categories of retail trade, sizes and types of network retailers.

The need to follow omni-channel models and strategies in the retail leads to the necessity to make “right” decisions both by new market players (who initially build their business models taking into account the digitalization processes) and offline leaders (who have to transform their business models when implementing digital technologies) in order to fit into the new retail environment [10].

In the first part of the study the analysis of directions and prospects of implementation of digital technologies in the sphere of retail chains was performed, the features of implementation of the most important digital technologies for retailers (big data, e-commerce) were examined on the basis of certain individual retail chains, the main benefits and problems of omni-channel strategy were described. In the second part of the study, the main conclusions and results are presented, and areas for further work in this area are identified.

2 Main Directions of the Retail Digitalization: Experience, Prospects and Barriers

Global and national retail chain companies such as IKEA, Metro AG, Carrefour, Walmart, Costco, Home Depot, H&M, Inditex, ASOs, LaModa, X5 Retail Group, Magnit and many others, having done significant financial groundwork and having an objective need for digitalization and digital transformation, use a wide range of modern digital technologies in various business processes, such as e-commerce, Big Data, video analytics, face recognition, contactless payments, etc. Individual representatives of the retail sector, based on global digital platforms, as Google, Amazon, Facebook, Apple, Alibaba, Baidu, Tencent, have grown to the level of “superstars”. Such companies, unlike the traditional ones, have a higher level of productivity, while the efficiency and operation on the global scale make them part of a small but more and more concentrating group of companies that generate value for the shareholders above the cost of the capital on the grounds of actively developing digital technologies in their business processes in the maximum possible range [11]. Figure 1 shows the key changes and expected effects from the introduction of digital technologies both in the business processes of chain retail companies and in their relationships with customers. Retailers – ecommerce and brick and mortar stores – are moving in a common direction to provide seamless consumer experience.

Digital technologies in retail networks allow creating a unique brand vision by ensuring interaction between the key components of a retail store forming the consumer experience and the value for customers:

- consumers (e.g., a mobile app that shows consumers where products are located in the store);
- employees (e.g., digital changing room);
- product (e.g., RFID “smart labels” on price tags);

Physical store space (e.g., robots inside stores to assist with inventory from shelves to carts).
Growth of internet users in number sets the development vector for modern retail: more and more consumers shop online, thus the line between trading in physical stores and purchases using mobile apps, internet sites, marketplaces, social networks, etc. is gradually becoming less visible. The e-commerce segment, unlike traditional offline stores, has low costs connected with the maintenance of retail space and equipment, besides, the probability of illiquid inventory accumulation is reduced, which reduces the price of the product for the consumer. Despite the opinion of the experts that traditional physical stores will soon be displaced from the market by online stores, both categories have been coexisted and changing under the influence of the transformation of consumer preferences [12]. As of January 2020, the average number of internet users in Europe was 87%, in Asia – 61%, in North America – 88%, in Australia and Oceania – 70%, the minimum level of internet coverage is observed on the African continent and in South Asia. The global internet coverage rate is 59%. Mobile internet is used by 92% of all users. Up to 90% of internet users between the ages of 16 and 64, who were reported to perform any online activity in the past month (globally), visited online retail stores on the web, and 74% of them purchased products online using any device [13].

China’s retail sector is a clear example of the digital technologies diffusion in retail sphere and transformation of traditional business models of physical stores. The retail sector is currently valued at $ 3.8 trillion, and is expected to reach $ 6.6 trillion by 2024. China’s retail is characterized by blurring of the line separating the offline and the online retail (this model is called “new retail” in China). For instance, big e-commerce players, such as Alibaba, have established partnership with small local family stores, helping them to modernize by providing no- or low-cost retail management platforms, allowing partnering stores to optimize product procurement and sourcing [14].
Against the backdrop of the COVID-19 coronavirus pandemic, retail is also taking on new challenges and reshaping the structure of its functioning, adapting to changing shopping habits. During the global lockdown, online shopping was the only way to get a range of essential goods while minimizing contact with strangers. Thus, such innovations as, for example, curbside pick-up, robotic delivery, and “Just Walk Out” grocery shopping have been used [15]. Omni-channel communication has become widely used during the pandemic. Retailers who haven’t adapted their activities to new realities are putting their market positions at risk and currently need completely new toolkit. Of course, the pandemic has made significant changes in the consumption process, and its consequences will be felt for the foreseeable future, therefore the introduced innovations will continue to be used.

The key element in the retail digitalization and the defining trend in its development are omni-channel strategies that combine all channels around a user. Consumers can easily switch between channels and still receive personalized service in the frame of such strategies. The current crisis compels both the retailers and consumers to resort to the omni-channel and adopt the online channels equally with the offline ones. One of the “effects of the pandemic” is the accelerated development and implementation of the omni-channel model where it was not used before, and the improvement and expansion of channels for brand interaction with consumers as well. The availability of a well-developed infrastructure for the prompt execution of online orders is one of the crucial growth factors for players on the market. Nowadays, customers use omni-channel interaction more and more actively, for example, an option of ordering products online, but picking them up in an offline store at convenient time (click & collect). Amazon, Sephora, and LVMH already use this model. E-commerce platforms (LaModa, Wildberries), networks X5 Retail Group, «Azbuka Vkusa» started using omni-channel model in Russia.

The customer’s shopping requirements is becoming more and more diversified in retail sales. As part of the omni-channel strategy, brand retailers should follow and leverage the trend of customization and personalization to upgrade the manufacturing system to more digitalized and intelligent stage. Big Data is among the key leading digital technologies in the retail sector, the implementation of which in operational activities is currently a necessary element to ensure competitiveness of the retail. It should be noted that Big Data Analytics (BDA) is currently among the top 3 investment priorities across all IT and communications solutions [16].

Geolocation analytics, which includes both the process of choosing a location for a business and collecting data about the customer’s location, is among promising areas of BDA for retail. There are various algorithms designed to recommend the best location for a business and identify areas lacking a certain type of business; the time spent on customer service at a particular point/territory is analyzed. That allows entrepreneurs to choose the location of a new business with the highest probability of reaching a potential client [17].

A common tool for collecting data (tracking) about consumers in the framework of geomarketing is GPS, which allows tracking the users through the global navigation satellite system and determining the coordinates of their location. Potential consumers can find stores or products on their mobile maps in real time mode. Retail may combine this information with other pieces of demographic information to keep in touch with
users on a specific territory. Despite a number of obvious advantages, the retail does not use all the options of Location Intelligence. Thus, in 2018, companies mainly used geographical data analysis on a state, a region, a city, an index, or a country levels (76%, 72%, 69%, 68%, 64% of the number of the respondents respectively), while only 26% of the respondents used custom geography, 26% – virtual location, and 17% – block groups [18].

In retail networks, the Big Data technologies allow us to effectively analyze and forecast demand for various types of goods using a set of mathematical methods. Such technologies are being applied in H&M, Zara, etc. X5 Retail Group and Magnit retail chain use trade analytics technologies in Russia. Research into the market basket in retail is possible on the basis of associative algorithms, such as the Apriori algorithm. The role of the Apriori algorithm is to identify shopping habit patterns of consumers through shopping basket and transactions data analysis to select potentially needed assortment for the consumer [19]. For example, cash receipts are analyzed to determine which product category is purchased more often, which products are purchased together, and whether consumers supplement one product with another.

Modern video surveillance systems are software and hardware complexes with a set of intelligent tasks, such as detecting events, counting people, recognizing behavior, incidents, images, faces, and objects. In 2019, for instance, retail chains Magnit and X5 Retail Group introduced video analytics to control product availability on shelves and queues at checkout stands in a number of their stores, which reduced queues by 70% [20]. Many stores become aware of the need to implement self-checkout systems – Tesco, Carrefour and Magnit are among them, this reduces staff costs, selling space, and customer service time.

Internet of things technologies allow online retail companies to keep in touch with consumers throughout the entire life cycle of their products. For example, manufacturers of household appliances (Samsung, Miele) sell consumables using this technology, when, for example, washing machines automatically order detergents after a set number of washing cycles [5].

Immersive technologies allow a user to get a most realistic experience from interacting with virtual objects or even people. According to forecasts, about 70% of enterprises will experiment with immersive technologies, and about 25% will implement them in their activities by 2022 [21].

However, despite a number of obvious advantages and benefits from digitalization, modern digital technologies in the retail create new industry problems and risks, such as threats of the user’s data leakage. Thus, scanning of face in the checkout queue should not go beyond its direct purpose and be used for other purposes, on other resources, in other programs without the consent of the consumer. It should be noted that there are problems such as threats of cyber attacks aimed at stealing personal data of companies and customers, the loss of consumer confidence due to misuse of their personal data or their unreliable protection; introduction of the big data technologies in business processes necessitates radical changes in the structure and activities of the company, which entails additional difficulties and problems; deficiency of highly qualified specialists in the field of digital technologies, lack of the development of new software, ensuring trouble-free operation and protection. In addition to these risks and problems, it should be noted that huge volumes of generated big data can lead to
statistical problems, information noise, problems of scalability of information and problems of its interpretation in the retail chain companies [22, 23]. These barriers, in our opinion, can serve as a basis for further research and development in the field of digital technologies in the retail, which will help to neutralize threats and ensure progressive development of the industry.

3 Results

In a competitive environment among the offline retail companies actively implementing digital technologies and developing omni-channel strategies together with growing of the online gaming sphere (Amazon, Alibaba, etc.), those companies which were able to transform the consumer experience with the help of new technologies in to the best advantage, digitalize operations and key business processes, quickly adapt to rapidly changing consumer expectations, exert flexibility and vision in both online and offline environments, will be successful. Consumers are now becoming more demanding, therefore the entire process from product selection to its delivery should be as smooth as possible. Those consumers who are considered to be “digital natives” are used to convenience, high speed of products and services ordering and delivery (everything can be done through a mobile phone application). It is them who dictate terms to manufacturers, who have to constantly improve the availability and usability of their products and services, and make personal experience of consumers develop, taking into account their characteristic features and interests. Less than a third of consumers around the world prefer a store to an app, and for the many the two channels are equal. Consumers find mobile apps more useful than stores when looking for the information about products and promotions (55% vs 41%), comparing products (54% vs 46%) and providing feedback (53% vs 46%) [24].

The business model of modern retailers has been transformed towards engaging consumers, building digital communications with them and developing consumer experience to improve sales conversion rate under the influence of digital transformation and increasing digital awareness of consumers. Along with it shopping channel boundaries are getting dissolved, and traditional retailers need to transform traditional sales channel management into a seamless omni-channel service model [25]. Eventually, integration of internal processes, resources, and systems across all channels aimed at supporting omni-channel operations in retail networks is meant to improve consumers’ shopping experience. The omni-channel retail has become common and shoppers can easily switch between different channels for a single purchase.

Implementation and use of big data technologies makes retail more competitive and allows it to adapt to market changes more effectively. However, with all the benefits that corporations receive from geomarketing, videoanalytics, data analysis, personalization, etc., there are challenges and threats, such as, for example, the threat of data theft and a shortage of specialists in this field. Big data is a rather useful tool for tactical planning and realization of operational planning when decisions are regularly made, for example, in the case of fine-tuning of the promotional calendar, shelf-space allocation, or the development of targeted offers to loyalty-card holders. However, strategic planning of a company’s activity and development requires significantly more
information, than it is provided by big data, thus, if «big data thinking» becomes the norm, there is a real danger that tactical thinking will take the fore over more strategic thinking in retail managers’ time allocation [22].

4 Conclusion

Active development of digitalization in economic processes and various types of activities, increasing consumer awareness of digital technologies and their expectations, and the growing number of competitors in the offline and online environment call for the introduction of advanced digital technologies in retail chains. Along with it, diffusion of digital technologies goes rapidly in physical stores, and new players (digital retail platforms) have started to emerge. Those companies who actively use innovative technologies in their operating activities can claim leadership in the market, while belated mastering digital tools leads to a gradual loss of competitiveness and weakening of market standing.

So-called “digital mediation” is increasingly blurring the line between offline and online retailers, between manufacturers and sellers, and between suppliers and consumers. In their turn, consumers have evolved through digital transformation, as they expect more and more personalized purchases with minimal costs. Using the example of big data technology and its various applications, the article examines promising areas and individual problems of digital technology development in the retail sector. It is concluded that, despite all the changes directly or indirectly caused by the big data revolution and accompanying technologies, the basic conditions remain unchanged: a consumer buys the product which satisfies his needs to the fullest extent, using the retail channel that best meets his requirements.

Digital technologies implemented in retail chains form new sources of value creation, improve the accepted by consumers advantages of a particular retail network, and thus create a competitive advantage. However, many opportunities of the digital economy have not yet been realized in retail chains, which is caused by barriers to the new technologies, lag effects, and problems of commercialization.

The conducted research does not claim to fully characterize the promising areas and key problems of the implementation and use of digital technologies in modern retail chains. As areas for further research, we can highlight the following topics: ensuring the safety of data and personal information of consumers, the problem of excess workforce due to the total digital transformation of the retail.

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