




## THE TRANSFORMATION OF DIGITAL INNOVATIVE SERVICES IN RETAIL TRADE DUE TO THE COVID-19 PANDEMIC: A SYSTEMATIC REVIEW

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### Abstract

Retailers should prioritise technological innovations, adapt their business models, manage their distribution channels effectively, and strengthen their customer-centric strategies. Additionally, it is crucial to note that while smart retail is gaining prominence in the sector, challenges such as the lack of digital culture, training, and digital leadership persist. The importance of digitalisation was significantly highlighted during the crisis period, which proved to be a key opportunity and solution for retailers.

Before the pandemic, there was already a steady growth in retail innovations through the use of artificial intelligence (AI), the Internet of Things (IoT), and Robotics to manage data and ensure efficiencies. However, the crisis not only negatively affected retail trade (restrictions, etc.), but opened new opportunities to react faster and make good decisions when opening or improving electronic stores and implementing digital innovative solutions. Retailers' investments in digital innovation benefit their business models and improve the shopping experience for consumers.

**Keywords:** digital innovative services, digital technologies, artificial intelligence, COVID-19 pandemic, retailing process, digital innovations in retailing, retail trade

**JEL Classification:** O33, L81, L86, M31

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## Introduction

Crises constantly affect the economy and adjust the business. However, crises often show the policies of companies and whether they can survive or even thrive in difficult conditions. Such crises as health (COVID-19), economic (COVID-19, war in Ukraine), energy (because of the war in Ukraine), and others affect business and especially in retail trade. One of the most prominent and unprecedented crises, COVID-19, which is also called the double crisis (Kuckertz et al., 2020). Because of this crisis, retailers have shifted their activities from physical to virtual commerce. The COVID-19 pandemic had social and economic effects on all industries, and retail was no exception. In turn, the digital technologies already used by companies began to contribute to retailers being able to respond more quickly to customer needs, having been fundamental in fighting the COVID-19 pandemic (Lopes et al., 2022).

The retail sector has had many ups and downs between different retail formats and product categories (restrictions such as us closing physical stores, later on distance between shoppers, etc. which instant affect the retailers' economy). The fear of this pandemic has affected different perceptions of consumers, and the shopping mentality has changed so much that retailers can develop new innovative ideas so that they can offer customers maximum satisfaction. (Khaled et al., 2021). The authors Nanda and Zhang (2021) argue that the pandemic has forced retailers to rapidly adopt digital technologies, and this shift is expected to continue.

Digital technologies are the basis of digital innovative solutions. Digital technologies such as IoT, blockchain, big data, and artificial intelligence have been adopted (Bazel et al., 2021). Other technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), chatbots are being developed by artificial intelligence (Hoyer et al., 2020).

The purpose of this article is to expose the fastest growing digital technologies in online retail due to the COVID-19 pandemic period.

## 1. Review of the scientific literature

During the unprecedented COVID-19 crisis, restrictions such as stay-at-home “lockdowns”, closing schools and workplaces, and cancellation of events and public gatherings were implemented. These restrictions not only have economic consequences; they also affected the entire society, leading to dramatic changes in the way businesses and consumers behave (Donthu and Gustafsson, 2020). Electronic commerce platforms, especially new ones, have faced many challenges such as creating a quality platform, including all necessary tools, and attracting consumers due to the COVID-19 pandemic worldwide. COVID-19 has impacted customer shopping trends on many digital platforms (Galhotra and Dewan, 2020).

Nanda et al. (2021) said, especially due to the COVID-19 pandemic, the retail platforms powered by digital technology had to be adapted quickly, and it is expected to continue to support this change as consumers and retailers adjust to new normalities. Digital technology served as an important economic stabiliser during COVID-19 (Huang et al., 2021). COVID-19 has highlighted the prominence of e-commerce and new business models while disrupting conventional business activities (Chen et al., 2022; Chen, 2022; Tudor, 2022). Consequently, closing substantial segments of the physical economy has promoted digitisation by enhancing the use of digital channels, particularly e-commerce (Fletcher and Griffiths, 2020).

Rozo et al. (2023) state that online mail order and online retailing have grown rapidly worldwide in recent years. For example, online retailing in the UK is growing much faster than in-store sales, increasing from 3.4% of the total retail sales share in 2007 to 27.9% in 2020. COVID-19 has accelerated this growth further, forcing nearly all non-grocery purchases to move online.

Khaled et al. (2021) concluded that retailers must invest more funds in their business if they want to stay on the market. They must rethink their retail perspectives, the management of goods, preparing employees, applying new technologies, artificial intelligence, the services and goods they offer, and, sometimes, defining government requirements. It is time for retailers to continually update a new scenario and establish a spot on the market.

Digitalisation has changed the status quo of the retail industry and shows no sign of slowing down. The availability of cheap data and smartphones has further changed the retail landscape. Nowadays, shopping is not just about buying a product or service, rather it is about the whole customer journey and experience. Retailers are facing challenges with digitalisation. Although they have multiple channels to offer to customers, however, the retailers are struggling to synchronise physical and digital channels. (Lohiya, 2021). Authors Saxena and Kumar (2022) noticed that retail clients now expect to be able to access everything from anywhere, at any time, thanks to the advent of digital and online shopping. The customer wants to buy customised products and services advertised on a mobile phone, tablet, or computer. In today's digital world, customers have a new frontier to explore, and businesses must learn to adapt quickly or risk going extinct.

At first, it was not easy for small retailers. For example, research in Belgium showed that overall respondents indicated a loss in turnover of more than 75%. Of these businesses, only 40% operated an online sales channel (e.g., website, app, social media) before March 2020. The survey, however, notes a significant response to the pandemic by retailers. Fifty percent of those who did not operate an online channel before the pandemic opened a webshop at the beginning of the lockdown. As a result, an estimated 70% of the small entrepreneurs had a working online channel during the first pandemic wave lockdown (Beckers et al., 2021). For example, food and grocery retailers in South Africa initiatives contributed to a record increase in online sales of more than 50% in the country for 2020. (Dakora and Rambe, 2022).

The growth in online retail was fast; for example, researchers collected data from Twitter and found that due to the COVID-19 lockdown and fear of contracting the virus, many people preferred shopping online (20.7%) that including buying essential items (44%) (Anik et al., 2021). To cope with this increase in online sales, retailers had the option of opening or updating online stores. Opening or updating e-shops was a challenge for retailers because they needed to offer quality and comfort for consumers. In this case, innovative digital solutions were adopted by retailers. Digital technologies helped retailers, for example, by enabling enterprises to meet consumer needs through data and provide consumers with precision products and services (Zhan et al., 2020).

Changes in the social paradigm, technological and digital trends, as well as the negative impacts of the macro environment, are also reflected in changes in retail business models, which are becoming a multi-channel means of value creation. The research in Bratislava results suggest five key areas in business model design, namely supply chain; online or digital world; communication and price; geo-marketing, and customer satisfaction. Based on the above factors, three homogeneous groups were identified: online innovators, international

retail chains, regional chains of retail outlets (Kita et al., 2023). Based on research results, the most important aspect in this case is online innovators (Table no. 1), which we will analyse.

**Table no. 1. Online innovators**

<b>Online innovators</b>	
The term “online innovators” refers specifically to their characteristic feature within the activities, which focusses primarily on innovation in the online environment. These outlets are often pioneers in online innovation.	For example, online retailers reduce the time of delivery of products to the customer and, as a consequence, increase customer satisfaction with the work of the retailer, forming loyalty to the store.
Current innovations in retailing range from changes in business models, store formats, and technologies to fundamentally new ideas and concepts for pursuing growth opportunities in global markets.	For example, online retailers use the wordless shopping service to solve the product valuation problem.

Online innovators became trendy during the COVID-19 pandemic online electronic stores helped retailers to make their businesses not only survive but grow as well.

**2. Research methodology**

A systematic literature review (SLR) was selected because it is a rigorous academic approach that thoroughly examines all relevant literature on a topic to draw conclusions about a specific research question. It serves to clarify the current state of research, highlighting gaps and areas for future investigation (Feak and Swales, 2009). This review aims to understand a specific research topic through a critical examination of the literature, highlighting key findings and theoretical trends. In this case, the PRISMA method was chosen.

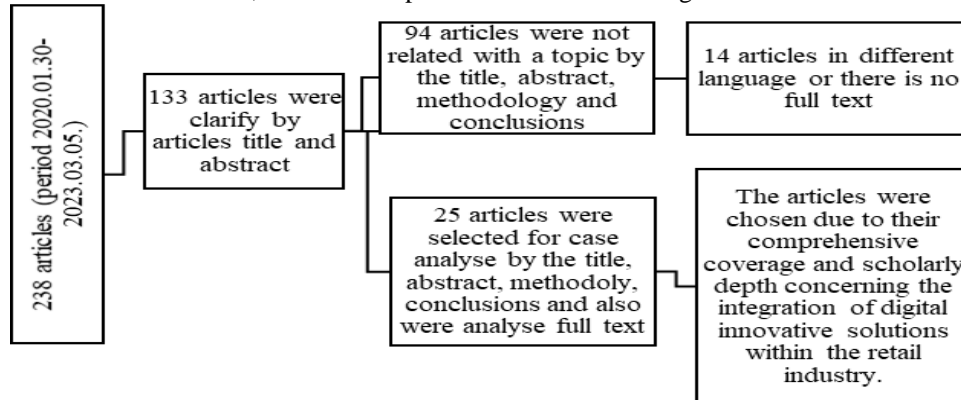
We chose to conduct a systematic review because it enables us to draw clear and reliable conclusions, convey extensive information, and minimise bias (Sohrabi et al., 2021). The use of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) ensures standardised, transparent reporting in systematic reviews. Its detailed guidelines and structured format (Mishra and Mishra, 2023) promote credibility, facilitate replication, and support critical appraisal, making it widely recognised and trusted in research. Liberati et al. (2009) noted that the PRISMA method involves several stages: study search, selection, data analysis, and synthesis of results.

For data analysis, the Web of Science database was selected. Using the keywords “digital innovation” for the period from 2020 to 2023, 36.000 articles were found. The period was selected according to the official dates of the COVID-19 pandemic. The World Health Organisation (WHO) declared the outbreak a public health emergency of international concern (PHEIC) on 30 January 2020. The WHO ended its PHEIC declaration on 5 May 2023. This crisis had a clear start and end, it was unprecedented and affected all sectors. To clear the results, keywords were changed to “digital innovation retail”, and 238 results were found (Table no. 2) which were analysed (Figure no. 1).

**Table no. 2. Results of articles by keywords “digital innovation retail” publications per year**

Years	Publications
2023	34
2022	79
2021	88
2020	37
Total	238

The selection of articles was based on criteria such as title, abstract, methodology, conclusions, and the implementation of digital innovation solutions in retail was analysed. Based on these criteria, the selection processes are shown in Figure no. 1.



**Figure no. 1. Data collection and selection process**

An article selection process was conducted based on the implementation of innovative solutions in retail trade. Only articles mentioning specific digital solutions were analysed. A total of 105 articles were rejected immediately after reading the abstracts. Additionally, many articles (94) were rejected after reading the abstracts, methodologies, and conclusions because they mentioned “digital technologies” without providing concrete details. Our task was to find specific digital innovative solutions implemented due to the crisis period, and for that reason, only 25 articles were selected for a deeper analysis.

### 3. Results and discussion

During the crisis period, retailers responded to restrictions by making their businesses available to consumers through the implementation of digital technologies.

Digital technologies such as artificial intelligence, the Internet of Things, blockchain, big data, smartphones, 5G, cloud, robotics, machine learning, etc. help to create a better experience not only for technology users but also to make business management easier.

The role of technology in retailing has taken a dramatic leap following the outbreak of the COVID-19 pandemic. Given the rapid pace of technological change in retailing, researchers and practitioners seek a systematic understanding of the nature and extent of these impacts. While much research has examined how technologies such as point of sale, automated teller machines (ATM), and the Internet have changed retailing (Varadarajan et al., 2010), not

much is known about the impacts of emerging technologies such as micro-cloud computing, new robotics, fifth generation (5G) telecommunication, the Internet of Things (IoT), virtual reality (VR), augmented reality (AR), and mixed reality (MR) on retailing. There were no systematic results, on what kind of digital innovative technologies retailers used and implemented. To clarify digital innovative solutions, 25 articles were selected to clear results and provide a systematic view of digital innovative solutions implemented by retailers during the crisis period (Figure 1).

The diffusion of technologies, such as artificial intelligence, big data, blockchain, machine learning, IoT, etc., has radically changed the way business is conducted, even considering consumer demand for innovative services and products (Dal Mas et al., 2019). Digital technologies helped retailers improve their business, especially during crisis periods.

Accommodating the latest technologies, such as virtual reality, augmented reality, and artificial intelligence, omission levels will decrease, and consumers shopping experience will have more sophisticated customisation (Bae et al., 2022). AI is described by the authors Du-Harpur et al. (2020) as the ability of machines, such as computers, to simulate human intelligence.

By analysing the articles, we identified all digital technologies implemented by retailers (Table no. 3), and many of these technologies are closely related to artificial intelligence. Nowadays, artificial intelligence plays a significant role not only in businesses but in all aspects of human life. During the unprecedented COVID-19 crisis, consumers changed their buying habits, and these changes are still evident today.

Retailers use artificial intelligence to increase in-store and online sales, improve potential cross-selling and up-selling, improve supply chain efficiency, optimise in-store operations, and make payments more efficient (Guha et al., 2021). Artificial intelligence is beneficial in all areas of retailers’ businesses. Shankar (2018) states that AI helps make omnichannel and mobile shopping more profitable, notably by sharpening personalised recommendations, improving payments, customer service, customer relationship management, and optimising logistics and inventory, as well as better managing the in-store experience.

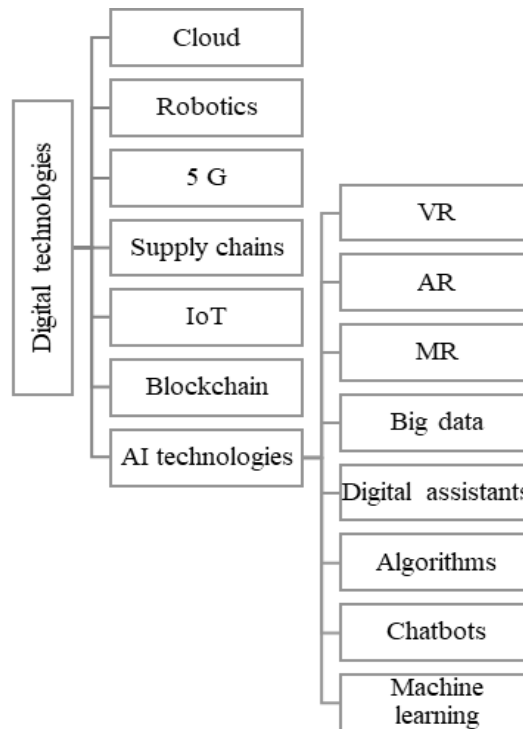
Nowadays, omnichannel strategies are particularly important in retail. Research by Mishra et al. (2022) revealed that customers perceived online–offline channel integration increases their patronage intentions directly and through the mediating role of consumer empowerment and satisfaction. While online retail increased during the pandemic period, both online and offline retail models are now important and these models are often merged.

**Table no. 3. Digital innovative solutions implemented by retailers**

<b>Digital technologies</b>	
Artificial intelligence (AI)	Mixed Reality (MR)
Virtual Reality (VR)	Big Data
Augmented Reality (AR)	Digital assistants
Algorithms	5 G
Chatbots	Supply Chains
Cloud	IoT (Internet of Things)
Robotics	Machine Learning
Blockchain	

Accommodating the latest technologies, such as virtual reality, augmented reality, and artificial intelligence, omission levels will decrease, and consumers shopping experience will have more sophisticated customisation (Bae et al., 2022). AI is described by the authors Du-Harpur et al. (2020) as the ability of machines, such as computers, to simulate human intelligence. Also, Artificial Intelligence (AI) offers this same transformative potential for the augmentation and potential replacement of human tasks and activities within a wide range of industrial, intellectual, and social applications.

The pace of change for this new AI technological age is staggering, with breakthroughs in algorithmic machine learning and autonomous decision making, engendering new opportunities for continued innovation (Dwivedi et al., 2021). AI is changing the business landscape, and its effects are no less in sales than in any other business function (Juniper Research, (2018) cited by Dwivedi et al. (2021). Developing AI, there are other technologies implemented by retailers such as virtual reality, augmented reality, mixed reality, big data, digital assistants, algorithms, and chatbots. To clarify digital technologies, the authors created and classification of digital technologies (Figure no. 2).



**Figure no. 2. Digital technologies classification in COVID-19 crisis period**

Digital technologies such as cloud, robotics, 5 G, supply chains, IoT, blockchain helps retailers to improve their business to another level. In the wake of COVID-19, retailers are embracing online commerce, driving the need for robust cloud infrastructure. Simultaneously, robotics is revolutionising retail operations, while 5G technology enables real-time, immersive shopping experiences both online and in-store. This convergence of

innovations is reshaping the retail landscape, highlighting agility, automation, and connectivity as keys to success in the digital age (Shankar et al., 2021). 5G technology was instrumental during the COVID-19 pandemic due to its superior network capabilities. Organisations, businesses, and people worldwide struggled with slow Internet connections, as many began using computers and apps for information, shopping from home, and working remotely. The best solution to these problems was 5G technology, because 5G provides a high-speed internet facility, anytime, anywhere, for everyone (Dangi et al., 2021), and this technology continues to help us work more efficiently today. The digitalisation process and the implementation of technology help retailers in all fields, for example, in the supply process.

Streamlining the supply chain to improve resource efficiency involves condensing, cutting, and optimising business tasks while fostering collaboration across stages of the process (Casciani et al., 2022). The development of this platform benefits online retailers by providing more reliability in the selling process based on the platform qualifications. Valencia-Payan et al. (2023) noticed that retailers could be qualified using the transactions registered on the Blockchain platform. Also, all the users will be able to track in real-time their products using the platform apps on a mobile device or a computer.

Merging all devices into one helps technology Internet of Things (IoT). The Internet of Things (IoT) is a network of interconnected devices that can be uniquely identified and accessed virtually. This enables remote monitoring, sensing, and control, facilitating real-time data exchange between the devices (Shankar et al., 2021). Retailers can create an ecosystem using IoT technology. Authors de Souza et al. (2020) agreed that IoT technology allows for real-time bidirectional interaction with consumers. In general, this technology merges all information from different devices and creates better using and navigating services for consumers. In the crisis period, one of the most popular technologies was artificial intelligence (AI) because this technology itself has many other technologies. Artificial intelligence implementation growth in the COVID-19 period is rapidly, and many AI technologies have been used and implemented in the retail business.

Technologies such as virtual (VR), augmented (AR), and mixed (MR) realities were implemented by retailers and have a transformative impact (Christ-Brendemühl and Schaarschmidt, 2022). VR simulates the environment, shutting out the real world through a wearable device (typically a headset) to provide an immersive 3D environment (Shankar et al., 2021). New B2B and B2C products and services with more focus on the experience and engagement of users (e.g., digital garments and cyber-fitting services, physical garments augmented with VR filters that provide the opportunity for constant updating, virtual B2B presentation, wholesaling, and design services (Casciani et al., 2022).

Hermes et al. (2022) noticed that retailers could offer innovative technologies (e.g., VR, or AR) to provide them with product information prior to purchase. The fact that some people do not need to touch products prior purchase does not necessarily mean that they do not need, or prefer, information at all. Augmented and virtual reality also help to “blur the boundaries” between traditional and internet retailing and allow retailers “to interact with consumers through multiple touch points and expose them to a rich blend of offline sensory information and online content” (de Souza et al., 2020). AR creates an add-on and interactive experience of a real-world environment through computer-generated displays, creating interactive, vivid, and rich experiences (Yim et al., 2017). Retailers offer a new subscription programme with augmented delivery and in-store options. (Mancuso et al., 2023). Another aspect worth noting



is that retailers have been merging VR and AR together, and offered a technology known as mixed reality (MR).

MR combines AR and VR to produce visual environments in which physical and digital elements interact in real time (Shankar et al., 2021). Jain et al. (2021) outline that MR has a unique capability to bridge the gap between online and offline environments, which fits right into the concept of omnichannel retail where multiple channels are integrated into a single seamless customer journey.

Artificial intelligence encompasses various subcategories; which retailers have implemented in their businesses. For example, during the crisis period, there was a surge in purchases, leading retailers to grapple with large volumes of data. In addressing this challenge, big data technology proved to be immensely helpful. According to Juniper Research (2018), cited by Dwivedi et al. (2021), big data analytics are used to develop personalised profiles of customers and predict their purchasing habits. Algorithms played a crucial role in improving consumers' shopping experiences and providing personalised recommendations based on information. AI algorithms that have completely changed the retail selling experiences and this trend is set to continue for the foreseeable future. For example, recommendation algorithms present "suitable" offers to online customers to consider, rather than waiting for the customer to make their selection.

Providing a better shopping experience, other tools such as virtual assistants and chatbots played a crucial role as well. According to Jain et al. (2021), retailers need to deploy innovative retail solutions in their businesses to enhance their consumers' shopping experience. Consequently, the integration of digital assistants is deemed necessary; Maduku et al. (2023) talked about digital voice assistant's implementation in retail. E-service agents are continuously accessible personal helpers that help create vital client relations, allow extra effective use of customer time, and offer greater empathy regarding product performance. A chatbot is a key tool for solving problems via real-time chat with customers in difficult COVID-19 period (Jansom et al., 2022).

Retailers used digital innovative solutions in crisis period to improve their online businesses and survive or even to grow up in crisis period. It was mentioned that there is not much known about the exact technologies retailers used. For this reason, examples of digital innovative services were selected from analysed literature (Table no. 4), and information is still scarce, and more research is needed.

Retailers have implemented concrete digital innovative technologies that help them better manage their businesses. As mentioned above, online shopping by consumers increased rapidly during the pandemic, and retailers needed to find the best ways for consumers to navigate and shop online. To address this, they implemented convenient payment solutions such as WeChatPay, GooglePay, ApplePay, and Alipay. WeChatPay and Alipay enable payments through QR codes or within the apps. Sun et al. (2022) state that adopting the WeChat m-payment-based smart retail system helps firms capture real-time data on their customers and allows retailers to push customised instant messages, such as coupons or promotion information, according to their customers shopping behaviour. ApplePay and GooglePay facilitate payments via Near Field Communication (NFC) technology, in-app purchases, and online transactions. GooglePay facilitates secure and convenient online and in-store payments. Its integration with various Google services, including Google Wallet and Google Assistant, allows users to not only make seamless transactions, but also send money to friends, store

loyalty cards, and use it for online purchases (Hazren et al., 2023). Other technologies help eliminate the need for a wallet; you only need your smartphone with Target Mobile Wallet, or you can gift using a Virtual Shopping Voucher or receive a gift from retailers.

**Table no. 4. Digital innovative services implemented by retailers**

Digital innovative solutions	
QR code payment	Bottles on-demand delivery
Virtual shopping voucher	WumDrop
Click-and collect	Coolomat
Social Media	Uber eats
E-mail shopping	Amazon Alexa
Alipay	Google Assistant
WeChat Pay	Apple Siri
Google Pay	L'Oreal Makeup Genius
Apple Pay	IKEA Place
Target's mobile wallet	McDonald's Track My Maccas
Virtual Wardrobes	Sephora Virtual Artist

Technologies help not only make payments more convenient but also facilitate communication with consumers. For example, Google Assistant, Amazon Alexa, and Apple Siri are technologies that allow users to ask questions and interact with individual virtual assistants (IVAs) as they would with humans (Tulshan and Dhage, 2019). Other technologies enhance the consumer experience even further, such as Virtual Wardrobes, Sephora Virtual Artist, and L'Oreal Makeup Genius.

Technology, such as virtual wardrobes, can suggest options and may reduce consumption (Shin and Chen, 2017). A virtual wardrobe is a web-based service that allows users to create and organise wardrobes by digitising their personal clothing collections and adding items from their physical closets (Al-Omar et al., 2013). Other technologies help with makeup, such as Sephora Virtual Artist (SVA), an AR feature that scans users' faces and allows them to try different types of makeup (Carman, 2017). Retailers also offer services such as WumDrop, McDonald's Track My Maccas, and UberEats for delivering goods or food to consumers. This type of delivery grew during the pandemic due to the safety of contactless delivery options. Today, consumers use these types of delivery services because they are convenient. Consumers have become comfortable ordering online and having their items delivered to a post machine. For this reason, you can even order groceries online using Coolomat technology; when ordering goods, the customer selects the delivery method, location, and preferred time. After confirmation, the buyer receives an SMS with the pickup location and the exact collection date from a Coolomat (Suliga, 2018). Similar technologies, such as click-and-collect, have become popular in retail businesses. Wang et al. (2024) explain that click-and-collect solutions enable customers to purchase items online and then pick them up at stores or designated collection points. Consumers can even order alcohol online using an app such as Bottles on-demand delivery. All these innovative delivery methods have become convenient for consumers.

However, there is a lack of information on how consumers evaluate these technologies and how their functionality can be improved to better suit consumer needs. Nowadays, consumers are not only searching for convenient methods to order goods and groceries; they are also seeking a better purchasing experience by ordering items for their homes. For instance, IKEA introduced a virtual reality store called IKEA Place, which uses augmented reality to allow users to visualise how furniture will look in their own homes (Ozturkcan, 2021). All these changes show that consumers have altered their buying habits, causing retailers to react accordingly, and retailers have done so.

There are many digital technology solutions, and the question is how many of them are suitable for retailers and consumers. First, research is needed to identify which digital innovative technologies are used by retailers, and second, consumer evaluation is needed. There is a lot of literature and research done that examines the impact of a single digital technology on consumer behaviour, but there is no research with multiple digital technologies, for example, choosing a single case or analysing several e-stores. The importance of digital technologies is growing every year, especially the growth seen during COVID-19. The changes not only remained, but continue to develop, so the most relevant issue at the moment remains the attitude of users and their assessment.

The COVID-19 pandemic has acted as a catalyst for the transformation of digital innovative services in the retail trade sector. Retailers responded to the crisis by shifting their businesses from offline stores to online platforms. This transformation encouraged the implementation of digital innovations, which emerged as a lifeline for retailers, offering not only survival, but also growth opportunities.

The adoption of digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), blockchain, big data, and robotics has revolutionised retailers' everyday tasks, optimising their operations. Technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) have redefined the shopping experience, blurring the boundaries between offline and online retailing. These innovations have enabled retailers to navigate disruptions caused by the pandemic by facilitating real-time decision making, personalised marketing, and efficient supply chain management.

The changes during the pandemic have had a lasting impact, with retailers increasingly integrating brick-and-mortar stores and e-commerce platforms. Another ongoing process today is convergence, where different business models and technologies are coming together. Restrictions during the pandemic, including lockdowns and social distancing measures, accelerated the adoption of digital platforms and e-commerce solutions. Retailers have quickly deployed digital technologies, leading to unprecedented growth in online retailing and a significant shift toward digital channels for shopping and transactions.

Furthermore, the crisis highlighted the crucial contribution of digital innovation to business resilience and market vitality. In a fast-changing environment, consumer behaviour also evolves, and the implementation of digital technologies has helped retailers respond to consumers' needs. These changes have opened new opportunities for retailers in the post-pandemic period. By growing their businesses during the pandemic, they have developed strong foundations with digital innovations.

In today's rapidly evolving landscape, aspects such as digital culture, training, and leadership still present ongoing challenges. Sustained investments and the development of long-term capabilities are essential. It is important to make consumers feel safe in the digital arena, and

for this reason, retailers must prioritise data privacy, information security, and other measures to ensure a safe online experience for everyone.

In conclusion, the COVID-19 pandemic has accelerated the transformation of digital innovative services in the retail trade sector, reshaping business models, customer experiences, and market dynamics. Retailers will need to use digital tools and promote innovation to thrive in a more digitalised competitive environment. By leveraging digital innovation, retailers can not only weather crises, but also unlock new opportunities for growth and differentiation in the digital age.

There is limited information about specific digital innovative solutions implemented by retailers. In the future, we need to clarify how these solutions affect consumer behaviour and their online buying decisions. Retailers have faced difficulties along with opening e-shops; the growth of online retailing has also led to an increase in online piracy and the sale of fake goods, as it is more difficult to inspect products thoroughly online compared to offline shops. Genuine retailers must invest heavily to combat these fake retailers and inform consumers.

Another notable change in retail is the convergence process and shifts in business models spurred by the opportunities offered by advanced digital technologies. Today, retailers can enhance their operations more efficiently, optimise business processes, integrate offline and online channels, and tailor their approach to meet the evolving behaviours and needs of consumers.

Omnichannel experiences are essential, requiring seamless integration of online, in-store, and mobile shopping with solid technology infrastructure and effective inventory management.

To achieve this, forming partnerships with technology companies and start-ups is crucial. These collaborations provide access to the latest innovations and co-create value, accelerating learning and transformation.

Additionally, investing in talent development and digital literacy ensures that employees can effectively use digital tools. Training and upskilling are crucial for maximising the benefits of digital innovations.

## **Conclusions**

The transformation of digital innovative services in the retail trade sector amidst the COVID-19 pandemic underscores the critical role of technology in driving resilience, growth, and competitiveness. The rapid adoption of digital technologies such as artificial intelligence, the Internet of Things, blockchain, and robotics has enabled retailers to adapt to changing consumer behaviours and market dynamics.

Retailers shifted their offline businesses online and experienced unprecedented growth. However, challenges persisted in the online model, and the best tool to enhance their business model was digital innovative solutions. By implementing digital technologies such as AI, cloud computing, IoT, blockchain, 5G, and supply chains, retailers were able to improve their business models and make them more user-friendly for consumers. This shift opened retailers' perspectives to the digital era and demonstrated its practical usefulness.

Online business models worked well during the pandemic, but after the crisis, retailers returned to offline business as well. Many businesses have merged models, incorporating

digital innovative technologies into offline retail operations. However, not much is known about how this convergence process works. Therefore, research is required to reveal how digital innovative solutions function in retail businesses, what benefits they provide, and how these solutions affect consumers. Another important aspect is that the convergence process in retail makes retailers more creative and helps them learn about consumers' needs and how to improve on them.

The online business model became popular during the crisis period, with many innovative delivery, payment, and other solutions were implemented. Consumers used their phones and computers to buy online, making their shopping experience more convenient. Today, consumers still buy online, but there have been many changes. Consumers can access many services merged together, such as ordering online and picking up orders in-store or returning goods in-store even if they were ordered online. For this reason, retailers must figure out how to offer the best online solutions, implement digital innovative technologies, and improve offline business as well. Offline businesses are also adopting digital innovative technologies, which consumers are using. Looking toward the future, we need to clarify how merged online and offline business models work.

Another important aspect of the online business model is privacy and security. Due to the beneficial impact of digital technologies, retailers must prioritise digital innovations to unlock new opportunities for growth and differentiation. Moreover, addressing issues related to data privacy, cybersecurity, and regulatory compliance is essential to maintaining consumer trust and confidence in digital platforms.

In conclusion, the COVID-19 pandemic has accelerated the digital transformation of the retail trade sector, paving the way for a more flexible, customer-focused, and tech-powered industry. By harnessing the power of digital innovation, retailers can navigate crises effectively and drive sustainable growth and success in the digital age. Focussing on consumer needs, fostering partnerships, and investing in talent development are essential for successfully navigating digital transformation. Conducting consumer research will further refine business models and enhance both online and offline shopping experiences.

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