How the COVID-19 pandemic may accelerate millennials' adoption of augmented reality

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Abstract

Purpose – Augmented reality (AR) technology currently plays a central role in the retail sector, rapidly changing consumers' behaviours and retailers' strategies. The purpose of this paper is to identify the behavioural changes that have occurred due to the coronavirus disease 2019 (COVID-19) pandemic in the retail sector, and how AR technology can be used as a valid and useful response to these new consumer habits.

Design/methodology/approach – Exploratory research was conducted to determine how AR has helped people shop differently than they did before the coronavirus disease 2019 (COVID-19) pandemic by evaluating two retail-sector AR applications (apps). In-depth interviews were conducted and assessed using thematic analysis.

Findings – This paper identifies a new paradigm involving COVID-19 and AR by identifying several factors that are related to the rapid spread of COVID-19 and have modified consumers' shopping habits. Additionally, it shows how interactive technologies, such as AR, are useful tools that can be employed to overcome retailing crises driven by external environmental factors, such as COVID-19, and enhance shopping experiences.

Originality/value – This research reveals the role of AR technologies in transformed economic and social contexts. By investigating the COVID-19 pandemic and its associated consequences, i.e. isolation, quarantines and lockdowns; the fear of contracting the virus and the new needs of people to shop while social distancing, this study enriches AR research with a fourth characteristic, augmented social distance.

Keywords COVID-19 pandemic, Retail, Augmented reality, Online shopping, Consumer behaviours, Millennials

Paper type Research paper

1. Introduction

The rapid spread of coronavirus disease 2019 (COVID-19) has drastically changed people's lives (Laato *et al.*, 2020; Eger *et al.*, 2021) and destabilized the global economy. The consequences of the pandemic have affected different sectors of society in different ways (Donthu and Gustafsson, 2020; Laato *et al.*, 2020). From a retail perspective, lockdowns and social distancing (Wilder-Smith and Freedman, 2020) have limited customers' choices of places to shop via "location constraints and location shortages" (Sheth, 2020, p. 281). Moreover, there have been changes in mobility, working and shopping that have trended towards in–home consumption (Venkatesh, 2020). During the last year, researchers have focused their attention on consumer habits to attempt to understand and predict whether such habits have permanently changed due to these lockdowns and social distancing requirements or if consumers will return to their old habits (Sheth, 2020).

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Although the long-term effects of COVID-19 are not yet known (Roggeveen and Sethuraman, 2020), and it will not likely be the last pandemic of the digital era (Papagiannidis *et al.*, 2020), a significant impact has been observed in the context of retail. Many physical stores have been forced to close, and there are no guarantees regarding the future of in-store experiences (Briedis *et al.*, 2020). Notably, understanding the COVID-19 pandemic's impacts on people's habits appears useful for retail managers and marketers to adapt their strategies to this novel scenario (Verma and Gustafsson, 2020). As stated by Roggeveen and Sethuraman (2020), retailers face a dilemma. On one hand, retailers of essential goods, such as food, groceries and health-care services, have seen their sales grow amid increases in critical issues affecting the management, supply chains and delivery processes of domestic goods (Pantano *et al.*, 2020). On the other hand, nonessential goods retailers face decreases in sales, and they must attract customers with offers that facilitate in–home shopping.

In fact, in addition to addressing the direct consequences of the pandemic, retailers must address consumers' shifting purchase behaviour from offline channels to online channels, a transformation that retailers are still addressing. A study conducted by McKinsey and Company (Briedis *et al.*, 2020) showed that the growth rate of online sales has increased from 14% annually to 25% weekly. However, under pre-COVID conditions, consumers who bought products online generally preferred to visit brick-and-mortar retailers to engage with physical products before buying them. In-person trips to stores thus decreased amid quarantine orders, but retailers were able to partially offset decreases in the foot traffic to their brick-and-mortar stores by increasing their investments in online and digital channels. Indeed, if consumers are unable to visit a store, "the store has to come to the consumer" (Sheth, 2020). Online shopping therefore allows consumers to save time and purchase goods wherever they are, although there is still some prevailing scepticism due to information processing difficulties. Moreover, in the context of online shopping, it is possible to collect information through images and product descriptions; retailers can therefore use technologies to facilitate consumers' decision-making and purchasing processes (Kim, 2020).

With physical stores temporarily closed or open amid significant occupancy restrictions, retailers have found creative methods to use technology to overcome these new sales obstacles. Accordingly, augmented reality (AR) (Azuma, 1997; Azuma *et al.*, 2001) is playing a central role in the retail sector, rapidly changing customers' behaviours (Pantano, 2016; Pantano and Gandini, 2017) and retailers' strategies. Thus, this research aims to understand how AR can be a suitable response to the changing retail landscape and whether this technology can help people shop in a profoundly different way than before the COVID-19 pandemic. Specifically, this paper aims to contribute to the literature on consumers' behavioural changes and technology adoption in retailing showing how COVID-19 has accelerated the adoption of AR among the millennials. The systemic view contributes to underlining the psychological and retail management impacts to profoundly understand millennial consumers in the Italian context as it was one of the countries most affected by lockdown and COVID-19 restriction measures. The research questions that drive the development of this paper are as follows:

RQ1. What behavioural changes have taken place due to the COVID-19 pandemic in the context of retail?

RQ2. How can AR technology be exploited as a valid and useful response to these millennial consumers' novel shopping habits?

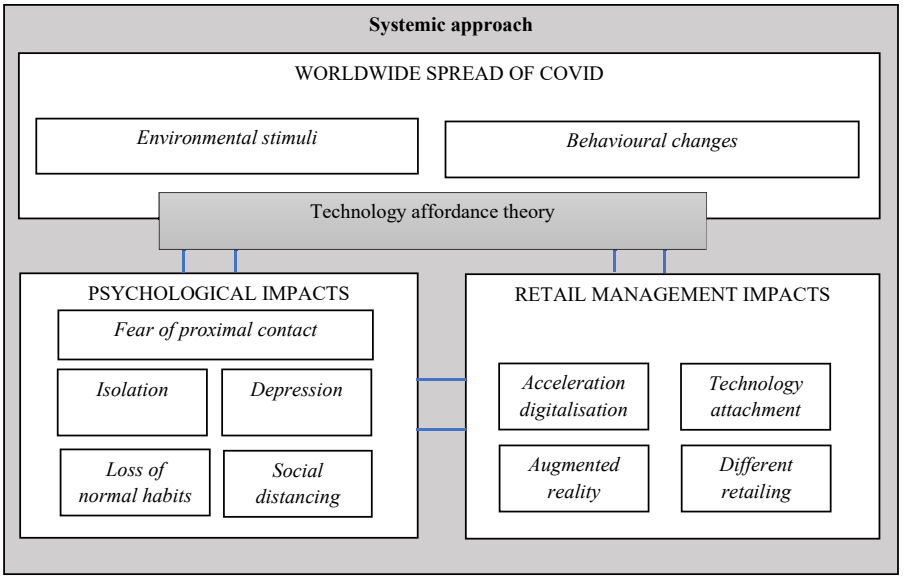
To achieve its research goal and investigate the above research questions, this study's theoretical background is developed by first identifying three main theoretical pillars. Specifically, the first part of the theoretical background section concerns the psychological impacts that derive from behavioural changes and environmental stimuli. The next part

analyses the impacts of the COVID-19 pandemic on retail management and then, the impact of AR on retailing in the COVID-19 era is discussed. The methodology section is then presented, including the adoption of multiple case study analyses (Bianchi and Ostale, 2006; Hutchinson *et al.*, 2006; Doherty, 2009) and in-depth interviews (Moore, 1998; Palmer and Quinn, 2005; Evans *et al.*, 2008), and analysed through a thematic analysis. Finally, sections containing the discussion of the results, implications and limitations are presented.

2. Theoretical background

2.1 Systemic approach to the worldwide spread of COVID-19

To more deeply understand how the COVID-19 pandemic could accelerate the adoption of AR technology, two theoretical underpinnings are useful for adopting a new lens capable of integrating them into a systemic perspective (Bertalanffy, 1956, 1972, 2010; Gioia *et al.*, 2013). Specifically, this paper is based on the systemic approach, driven by affordance theory of technology (Gaver, 1991), to analyse several elements that have characterised the pandemic era. According to Gaver (1991), the affordance theory of technology contemplates the possibilities of using technology under specific environmental circumstances to achieve specific aims. For example, given the worldwide spread of COVID-19, multiple environmental stimuli have influenced behavioural changes with psychological impacts on and managerial implications for the retail market. Hence, the holistic approach adopted seems fundamental to reading these impacts in an integrated and systemic manner (Gioia *et al.*, 2013). Specifically, the research contributes to integrating into a systemic view (Figure 1) the environmental stimuli and behavioural changes that have occurred due to COVID-19, emphasizing the attachment to technology, based on the affordance technology concept (Gibson, 2014; Gaver, 1991). Based on this approach the salient acceleration of retail digitalization and the associated impact of AR are highlighted. The affordance theory of technology refers to the possibility of obtaining value (Gibson, 2014) from specific technology, such as AR. This paper, therefore, extends previous



Source(s): Authors' data elaboration

Figure 1.
Systemic approach to the worldwide spread of COVID-19

research by applying the affordance theory to crisis situations and showing how the environmental stimuli and behavioural changes driven by the COVID-19 pandemic have exerted psychological and retail management impacts. Consequently, the technology affordance concept fosters an exploration of novel technology attachment amid the increasing acceleration of digitalization (Amankwah-Amoah *et al.*, 2021).

2.2 Behavioural changes and environmental stimuli: psychological impacts

During the first phase of the spread of the COVID-19 virus in China (Cowling *et al.*, 2020; Pantano *et al.*, 2020), caused by the coronavirus SARS-CoV-2 (Xu *et al.*, 2020), people did not understand what the virus would mean in the future by affecting retail and consumers in several ways (Laato *et al.*, 2020). However, the rapid spread of this virus and its ability to infect people led to a global outbreak in early 2020 (Laato *et al.*, 2020). Then, the World Health Organization (WHO) declared COVID-19 a global pandemic on March 11, 2020. This pandemic immediately changed everyday lives and habits and induced the implementation of restrictions (Laato *et al.*, 2020) at a level that had not been seen since the Second World War (Pantano *et al.*, 2020). Nevertheless, given other epidemics that have occurred in recent years, such as SARS, Ebola and MERS (Balinska and Rizzo, 2009), two central elements have been identified that relate to associated behavioural changes: consumer and health risk mitigation behaviours (Miri *et al.*, 2020; La Torre *et al.*, 2019).

Several environmental stimuli (Mehrabian and Russell, 1974), connected with the worldwide spread of COVID-19, impelled the adoption of individual prevention measures (e.g. isolation, wearing facemasks, using hand sanitizer, etc.) that have produced behavioural changes (Gamma *et al.*, 2017, 2020) and forced not only retailers but also their entire supply chains to adapt their strategies. Some environmental stimuli include store closures; several forms of lockdown that have varied in terms of their restriction levels in different economic sectors; quarantines, which have forced people to stay inside their homes, making it impossible for them to travel, community containment (Laato *et al.*, 2020; Wilder-Smith and Freedman, 2020), closure of public services (e.g. schools) and banning public gatherings (Anderson *et al.*, 2020; Farooq *et al.*, 2020). Consequently, behavioural changes have developed (Pantano *et al.*, 2020; Eger *et al.*, 2021) due to individual prevention measures and their psychological impacts (Serafini *et al.*, 2020) on people's lives (Figure 1). First, the fear of proximal contact as the main cause of COVID-19 transmission (Laato *et al.*, 2020; Farooq *et al.*, 2020) caused people to be isolated at home and avoid any regular activity. Medical doctors and researchers have identified isolation measures as the most critical preventative measures to limit the spread of COVID-19 (Laato *et al.*, 2020; Farooq *et al.*, 2020). People's first reaction to this behavioural change was to stay home in a safe environment and to conduct unusual bulk purchases of food and essential goods to stock large amounts of them (Laato *et al.*, 2020). Over time, due to the rapid spread of the virus and their increasing fear of social contact, people started to react to the global pandemic and to organize their daily lives in several new ways (Trzebiński *et al.*, 2020). They started working from home (Papagiannidis *et al.*, 2020), experimenting with novel new forms of interaction, shopping online and with mobile devices, staying active by taking online gym courses and learning to social distance (Pantano *et al.*, 2020; Wilder-Smith and Freedman, 2020). However, isolation also triggered an increasing number of depression cases (Salari *et al.*, 2020) worldwide due to the loss of regular habits and ongoing social distancing (Wilder-Smith and Freedman, 2020). Therefore, in a systemic view, the environmental stimuli generated by the COVID-19 pandemic strongly influenced consumers' behaviours, with psychological impacts (Serafini *et al.*, 2020) that changed the retail world for both retailers and consumers.

2.3 Retail management impacts of the COVID-19 pandemic

The retail context has been characterized by incessant environmental stimuli and behavioural changes due to COVID-19. Therefore, when creating management strategies to survive, retailers must consider two increasing forces that have become predominant during the pandemic: the acceleration of digitalization (Amankwah-Amoah *et al.*, 2021) and the new appreciation for online commerce among several categories of consumers (Beckers *et al.*, 2021; Li *et al.*, 2020; Roggeveen and Sethuraman, 2020). Based on technology affordance theory (Gibson, 2014; Gaver, 1991), consumers and retailers can generate value from the exploitation of online commerce in a pandemic. Hence, online shopping has changed the concept of distance, necessitating a revision of retail strategies (Alexander and Doherty, 2010; Hagberg *et al.*, 2017). Digitalization has also brought multiple challenges to the retail context (Grewal *et al.*, 2017; Hagberg *et al.*, 2016) and has changed the retail landscape. As stated by Beckers *et al.* (2021, p. 2), "technology has transformed the world into a showroom without walls, reshaping traditional retail settings that now include consumers' homes". Although a correlation between company size and online retail adoption has been demonstrated, the use of smart devices and broadband Internet has allowed even small retailers to revise their strategies towards an omnichannel approach (Savastano *et al.*, 2019). This change implies an increase in competition among retailers worldwide and the possibility of reaching consumers without any spatial restrictions. Retailers, therefore, need to integrate different channels if they want to meet consumer demand and quickly react to changes in consumer behaviours, providing personalized services (Caboni and Pizzichini, 2021; Herhausen *et al.*, 2015). The adoption of online retail channels also requires certain kinds of infrastructure, but small, local retailers have demonstrated an unwillingness to implement them due to their lack of knowledge regarding website maintenance and the high shipping costs associated with a limited volume of sales. However, the outbreak of the COVID-19 pandemic and the resulting governmental actions have had impacts on both consumers and retailers that might continue when the emergency is over. Changes in retail accessibility due to social distance restrictions, physical store closures and supply chain limitations (Wilder-Smith and Freedman, 2020; Laato *et al.*, 2020) have constrained consumers' ability to travel to purchase goods or services; thus, there has been an increase in online shopping for exceptional goods (Beckers *et al.*, 2021). As discussed above, consumers' habits and behaviours have been affected by social distancing, fear of infection (Eger *et al.*, 2021) and self-isolation (Laato *et al.*, 2020), which have also contributed to their avoidance of physical shopping in favour of online channels (Beckers *et al.*, 2021; Li *et al.*, 2020; Roggeveen and Sethuraman, 2020). Moreover, the pandemic, in combination with the associated reduced accessibility to shopping premises and increased concerns regarding consumer health, has led governments to deem online shopping a fundamental service. Indeed, consumers who previously shopped at local physical stores have switched to making online purchases, having "discover[ed] the safety and benefits of home deliveries, store pick-up and cashless payment" (Pantano *et al.*, 2020, p. 210). This adoption of digital technology is one of the eight immediate effects that the COVID-19 pandemic has had on consumption and consumer behaviours, as identified by Sheth (2020), and thus retailers need to adopt an agile approach (Sjodin *et al.*, 2020) to quickly identify consumers' needs and reduce their own response times (Pantano *et al.*, 2020).

2.4 The impact of AR on retailing in the COVID-19 era

AR has been widely adopted in retailing contexts (Butt *et al.*, 2021), which has significant implications for traditional forms of retail (Hagberg *et al.*, 2017). AR technology changes how consumers engage in the shopping process (Chen *et al.*, 2021; Caboni and Hagberg, 2019; Yadav and Pavlou, 2014) within both online and offline environments (Heller *et al.*, 2019; Kumar, 2021). As an interactive technology, AR (Siregar and Kent, 2019; Pantano, 2016;

Pantano and Gandini, 2017) is able to engage customers during their shopping journeys (Butt *et al.*, 2021), to attract new customers (Heller *et al.*, 2021), to influence customer satisfaction by making shopping easier and, consequently, to boost sales and revenues (Butt *et al.*, 2021). Using AR, people can interact with and visualize a product virtually using a smartphone, a tablet, or another smart device without the physical presence of the item (Serravalle *et al.*, 2020). AR can be used to exploit a networked experience (Pantano and Gandini, 2018) and open up new opportunities for personalized and enhanced shopping experiences in retail contexts (Perannagari and Chakrabarti, 2020; Kim, 2020). Fundamentally, AR is one of the technologies that is rapidly transforming how retailers remain in touch with their customers (Heller *et al.*, 2019, 2021), both offline and online (Kumar, 2021). Moreover, the low costs of AR implementation allow not only large retail chains but also small- and medium-sized enterprises to integrate omnichannel strategies (Savastano *et al.*, 2019). AR also overcomes some of the limitations of online shopping, such as the need for an online fitting room or faster and easier access to product information and feedback (Grewal *et al.*, 2017; Serravalle *et al.*, 2020). AR thus seems valuable for and suitable to these contexts (Azuma, 1997; Azuma *et al.*, 2001; Caboni and Hagberg, 2019), allowing retailers and consumers to experience shopping in an interesting and amazing manner. Accordingly, AR could be considered a technology that could be used to facilitate shopping (Butt *et al.*, 2021) during particularly difficult periods, such as a pandemic when people must respect social distancing rules (Wilder-Smith and Freedman, 2020) or lockdown situations that restrict movement and require isolation (Laato *et al.*, 2020). AR, due to its three main characteristics – (1) the three-dimensional reproduction of (2) virtual objects in a (3) real environment (Azuma, 1997; Azuma *et al.*, 2001) – permits people to experience shopping by using only technological devices, such as computers or smartphones. The main difference between AR and other interactive technologies, such as virtual reality, is the absence of physical, wearable tools (e.g. head-mounted or virtual glasses); indeed, it transforms shopping into a "*real augmented experience*" (Caboni and Hagberg, 2019). Given the COVID-19 pandemic and its impacts, i.e. isolation, quarantines, lockdowns, fear of getting the virus and people's novel need to shop while social distancing, AR can be enriched by a fourth characteristic. In accordance with technology affordance theory, it is possible to generate broad value (Gibson, 2014) via the retail implementation of AR during a pandemic. Specifically, by considering the three main AR characteristics identified by Azuma (1997) and the various environmental stimuli and behavioural changes caused by the COVID-19 pandemic, in this work, a fourth AR characteristic is introduced, *augmented social distance* (Table 1), which can increase the understanding of the great acceleration of the adoption of AR in a pandemic scenario.

3. Methodology

3.1 Research process

Several studies have shown the increasing use of qualitative methods (Eisenhardt, 1989; Yin, 2003, 2009, 2011) to analyse retailing, e.g. multiple case study analyses (Bianchi and Ostale, 2006;

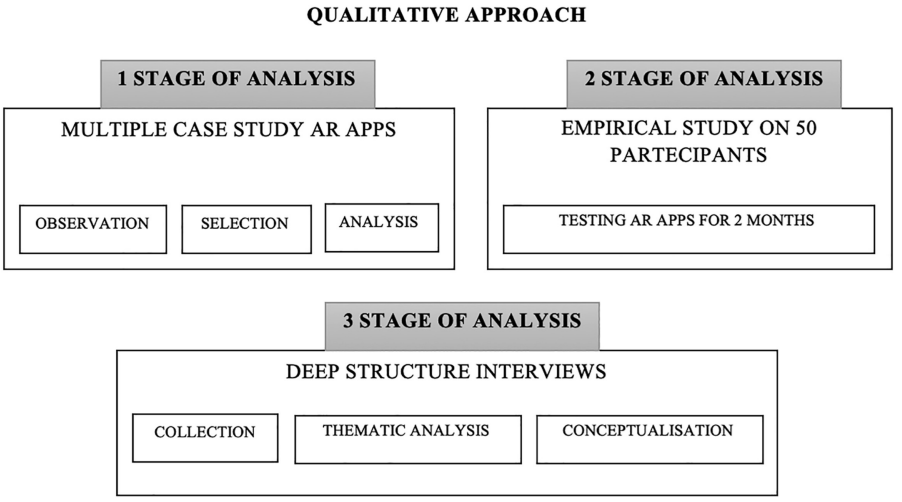
Table 1. The four AR characteristics matched with COVID-19 consequences

Main AR characteristics		Main COVID-19 consequences
Real environment	→	Fear of social contact
Virtual objects	→	Lockdown and isolation
Three-dimensional representation	→	Quarantine
	Augmented social distance	

Source(s): Author's data elaboration

Hutchinson *et al.*, 2006; Doherty, 2009) and in-depth interviews (Moore, 1998; Palmer and Quinn, 2005; Evans *et al.*, 2008). The research process was conducted in three different stages (Figure 2). First, two different AR applications (apps) were selected, observed and analysed. Second, an empirical study was conducted using a convenience sample of interviews with consumers who were asked to use these AR apps for two months. Third, thematic analysis (Gioia *et al.*, 2013) of these interviews was conducted by aggregating and highlighting themes connected with COVID-19 and AR. In the first stage of research, two AR applications, *YouCam Makeup* and *WAnna Kicks,* were selected for four main reasons. First, it was necessary to select apps that were available to the market being analysed (the Italian context) so that the participants could download and use these apps on their devices. Second, both AR apps were free of charge for use with iOS and Android systems. Third, these apps were highly rated. *YouCam Makeup* was rated 4.5/5 for iOS and 4.7/5 for Android, while *WAnna Kicks* was rated 4.5/5 for iOS and 4.9/5 for Android. These data ratings were collected using two bank data apps (IOS https://fnd.io and Android http://andriodapk.com). Fourth, these apps permitted their users to select several products from different brands at different price ranges. Hence, the participants had the opportunity to experience different kinds of products by choosing their preferred brands and considering their monthly spending power for apparel and beauty goods.

3.1.1 Sample analysed. To investigate the research questions, an empirical study was conducted using theoretical sampling as it allows to develop properties and concepts emerging from the data collected, coded and analysed (Chopra, 2019). The theoretical saturation was reach with a sample of 50 consumers (Glaser and Strauss, 1967; Chopra, 2019). The participants were recruited using the researchers' personal contacts (Närvänen *et al.*, 2020) via an invitation email that was sent to explain the research project and ascertain the recipients' availability to participate. The sample was selected based on three main criteria, namely, the *nationality*, *generation* and *gender* to which they belonged. Regarding the *nationality* criterion, Italian people were selected due to the severe restrictions applied by their local governments since the beginning of the pandemic (Pantano *et al.*, 2020). Thus, it was possible to intensely study and verify people's desire to continue shopping amid the restrictions placed on their daily lives by applying and exploiting the potentiality of AR.



Source(s): Authors' data elaboration

Figure 2.
Research process

The *generation criterion* was applied based on the study of Eger *et al.* (2021), which suggests that people "born during the same period and growing through the same experiences will share similar values, attitudes and beliefs and expectations, which are constant throughout the generation's lifetime and constitute a generational identity", since this factor influences consumers' shopping behaviours (Eger *et al.*, 2021; Lissitsa and Kol, 2016). Hence, for the generation criterion, millennials (Generation Y) born between 1983 and 2000 were selected (Table 2). Millennial consumers were chosen for three different reasons. The first was related to their attitudes towards using online media such as photos and videos (Lee *et al.*, 2020) and technological tools. The second reason was related to their role as the most influential generation of the current age (Lantos, 2014). Finally, millennials prefer online shopping in different situations, and they are confident with different languages and platforms and with shopping in different ways using various digital platforms (Eger *et al.*, 2021). Regarding the *gender* criterion, the individuals in the selected sample were asked to use one of the cases AR applications for two months (March–April 2021), specifically the female sample (YouCam Makeup) and the male sample (WAnna Kikcs). A total of 60% of the respondents were women, and 40% were men. Afterwards, in-depth, structured interviews (Barriball and While, 1994) were conducted to determine the attitudes of the participants towards using AR apps (Fuentes, 2019). Specifically, the following points were investigated:

(1) Frequency of AR app use

(2) Purchases from AR app

(3) Level of experience (poor-medium-high-very high)

(4) Satisfaction with the use of app (low-medium-strong-very strong)

(5) Willingness to use AR in a post-pandemic world

These elements are presented in Figures 3–5 and analysed through the advanced functionality of Microsoft Excel software with pivot tables. The researchers conducted interviews in person, using the local language of the interviewees (Italian) and then accurately translated the interviews into English. The interviews lasted between 1 and a half and 2 h and were recorded and transcribed by the researchers using a specific code. To protect the privacy of each participant, a number was assigned to each interview in ascending order from 1 to 50. Finally, accurate information about the purpose of the research was given to the participants, and their permission to record their interviews was requested.

3.1.2 Data analysis. The data were collected from in-depth, structured interviews and elaborated through thematic analysis in six steps (Gioia *et al.*, 2013). Specifically, in the first step, the researchers familiarized themselves with the data through several readings of the data set (Braun and Clarke, 2006). The second level identified codes capable of handling the

	Sample characteristics	Data
Nationality	Italian	100%
Gender	Women	60%
	Men	40%
Occupation	Fixed contract	60%
	Temporary contract	40%
Age	Between 25 and 30	40%
	Between 30 and 40	60%
Monthly spending power for apparel and beauty	Average	€380

Table 2.
Sample characteristics

Source(s): Author's data elaboration

data set, using an inductive lens to gather the main essential elements extrapolated from the data (Braun and Clarke, 2012). Third, these codes were combined and compared following an interpretative process to underline the principal themes of the inductive analysis (Braun and Clarke, 2006). Subsequently, the identified themes were revised to identify the fit between the codes and the data set and to enable the development of the thematic map (Figure 6). Finally, for each theme identified, a final analysis was carried out, and the main findings were then provided (Braun and Clarke, 2006).

3.2 AR case studies

YouCam Makeup is an AR beauty app that offers the opportunity to try several cosmetic products and filters that are useful for modifying pictures on a smartphone and *Instagram*. The potential of AR for virtually testing products in real environments (Azuma, 1997; Azuma *et al.*, 2001; Butt *et al.*, 2021) is fully expressed in this app, which exploits the webcams of peopl"s smart devices (computers, tablets and smartphones). This application increased in popularity during the worldwide spread of the COVID-19 pandemic because it addressed several problems related to quarantines, people's inability to move and community containment (Wilder-Smith and Freedman, 2020). Given the fear of social contact, the need to re-establish everyday life, the novel demand for socially distanced shopping and the desire to preserve health and prevent viral transmission, this application appeared to be an excellent solution for these problems due to people's strong attachment to interactive technology. Moreover, to support online social interactions, a specific service called the *YouCam community* allows users to establish human connections and online interactions, and it empowers beauty lovers to express themselves. The main elements of this AR app are as follows:

(1) The opportunity to test hundreds of makeups and beauty looks in real-time (one of the main features of its AR technology) via the front-facing camera of an individual's smart device, which functions as a virtual mirror

(2) The opportunity to test real makeup by exploiting real facial features

(3) Useful tips from a beauty advisor help a person identify the best colours for his or her skin tone and find the most flattering makeup style

(4) If consumers like the makeup that they try, they can purchase it directly in the app to recreate the look at home

Other features of *YouCam Makeup* allow people to enhance their AR beauty experience (Butt *et al.*, 2021) by testing several hair colours without visiting a salon and adding accessories to complete their look. From the case study analysis, the attitudes of the participants towards using AR tools to test products and complete purchases in a socially distanced manner while enjoying an interesting shopping experience were identified. First, the participants showed a high level of satisfaction regarding using the AR makeup app with a correlated level of experience. The in-depth interviews and the examination of the results indicated the participants' attitudes towards using AR apps during this crisis that required social distancing. Specifically, all the interviewees stated that they could shop and test products while remaining in a safe place, e.g. their own apartments, during the quarantine and lockdown periods using AR. A correlated consequence was related to purchasing behaviour; they had the ability to test several kinds of makeup products while choosing the right colours and matching them with their skin tones. The participants could therefore complete their purchases and receive products directly at home.

WAnna Kicks is an AR application that enables people to virtually try on several pairs of sneakers. An individual can point his or her mobile phone camera at his or her feet, and a

new pair of shoes will immediately appear on the screen. This app started to become popular when shops began closing and lockdowns and quarantines were implemented, making people unlikely to shop in person (Laato *et al.*, 2020; Wilder-Smith and Freedman, 2020); the app thus exploited another way to experience shopping while accounting for fears of social contact. Considering the necessity to maintain social distancing during the rapid spread of COVID-19 and the desire to continue shopping even in a crisis situation, this AR fashion app helped consumers re-establish their everyday life and preserve their health and prevent transmission. Another exciting element of this app is that a user can walk while the AR app tracks his or her footsteps. Additionally, users can save pictures of their new pairs of sneakers and enhance their shopping experience with their friends or communities by uploading these photos on social media. The principal elements of this app are as follows:

(1) Ability to move while wearing virtual shoes

(2) Opportunity to virtually try on several brands of shoes

(3) Opportunity to interact with other people by sharing shoe pictures on social media

(4) Ability to complete one's shopping journey by purchasing a selected pair of shoes

Overall, this AR app's effects have arguably revolutionized the shopping experience, and it is useful for both consumers and retailers. Using this AR app, retailers increase their opportunities to present their sneaker collections to a broad community, whose members can try on all the shoes that they like while staying in a safe place and preventing virus transmission.

Specifically, the participants expressed a high level of satisfaction with WAnna Kicks and a correlated level of experience. The participants stated that through this app, they could test shoes and finalize their shopping experience while remaining in a safe place during the quarantine and lockdown period.

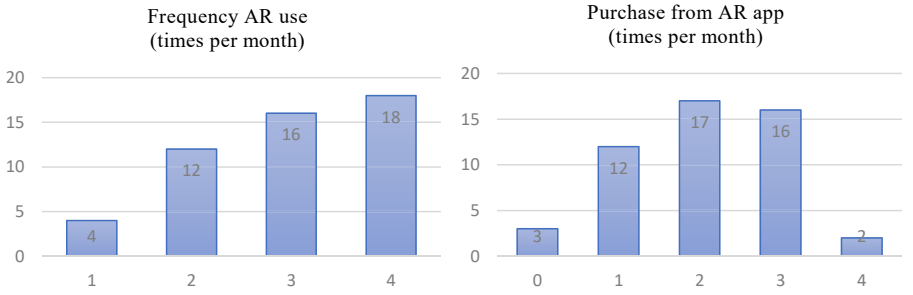
4. Results

The in-depth interview analysis demonstrates the attitudes of the participants towards using AR apps not only to browse products and discover their various features and services but also to finalize their shopping process by purchasing their favourite products. The data relating to app use frequency (Figure 3) (times per month) and purchasing products (Figure 3) in the AR apps (times per month) expressed the participants' increasingly positive attitude towards using AR to search for, test, and ultimately purchase products. Hence, the data analysis showed that the frequency of app use was four times per month for the majority of interviewees. Moreover, interestingly, almost half of the participants purchased a product using the AR app between two and three times per month.

Such individual behavioural responses were related to people's desire to establish a new everyday life. In particular, changes in people's habits and everyday lifestyles elicited new reactions (Trzebiński *et al.*, 2020) amongst those participants who wanted to reorganize their lives. In general, people have searched for ways to accomplish the tasks that they performed before the outbreak of COVID-19. Attachment to interactive technologies (Pantano, 2016; Pantano and Gandini, 2017) has therefore led people to test something before buying it using AR (Azuma, 1997; Azuma *et al.*, 2001) or other technologies. AR is an interactive technology that can be used to offer an immersive shopping experience (Caboni and Hagberg, 2019), facilitating social distancing while permitting people to test something (virtually) before buying it. Using AR, people can even overlay several augmented elements, such as clothing or objects, using a computer or mobile device in their own physical space. The data gathered

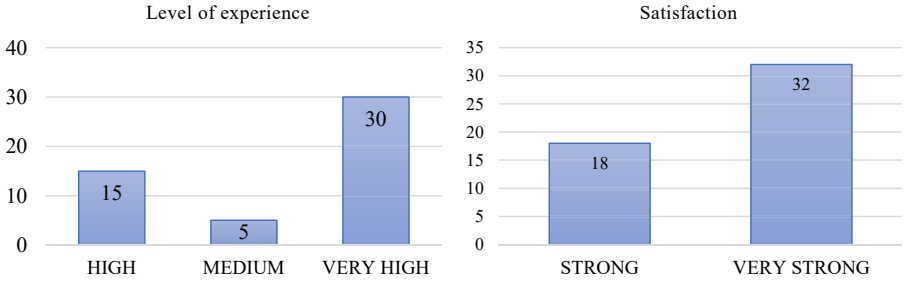
from the interviews, as shown in Figure 4, underscores the high and very high level of experience among the participants using an AR app. No one declared a poor level of experience. Correlated with this high average level of experience is the high level of satisfaction using an AR app for both testing a product and finalizing purchases directly. Hence, the majority (32/50) of the interviewees expressed a powerful level of satisfaction.

Technological skills and new ways to shop could thus be considered the main pillars that are changing people's shopping attitudes in their everyday lives. Moreover, as Figure 5 shows, the willingness to use AR technology after a crisis, e.g. a pandemic, is high.



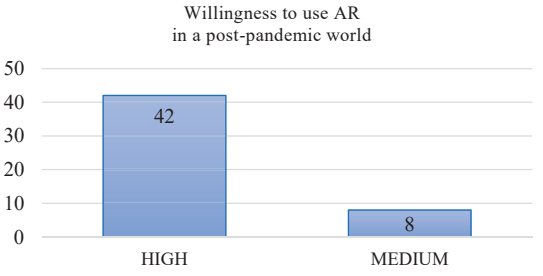
Source(s): Authors' data elaboration

Figure 3.
Frequency AR use and purchase from AR app



Source(s): Authors' data elaboration

Figure 4.
Level of experience and satisfaction



Source(s): Authors' data elaboration

Figure 5.
Willingness to use AR in a post-pandemic world

4.1 Thematic analysis

The thematic analysis confirmed the data gathered from the empirical data. Specifically, as expressed in the thematic map (Figure 6), four different themes were identified that summarize the participants' motivations for the adoption of AR in the COVID-19 era.

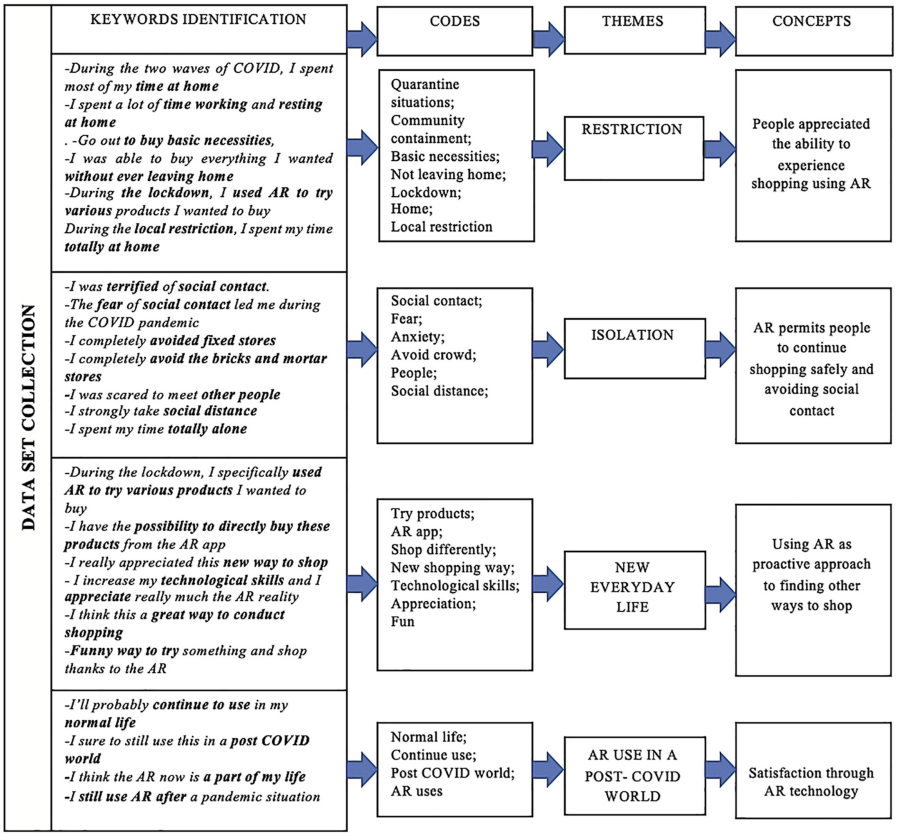


Figure 6.
Thematic analysis

Source(s): Authors' data elaboration

4.1.1 Theme 1: Restriction. This theme refers to all the conditions that have generated modifications during quarantine and lockdown periods (Wilder-Smith and Freedman, 2020), compelling people to follow a new routine. For example, Participant 5 stated, "*During the two waves of COVID, I spent most of my time at home . . . even if I could go out to buy necessities, I was terrified of social contact. Luckily, I love technology, and thanks to the Internet and various apps on my phone, I was able to buy everything I wanted without ever leaving home. I knew about augmented reality, but during the lockdown, I specifically used it to try various products I wanted to buy*". The development of a new routine generates an appreciation of technology – AR – for finding and buying products from home, while AR helps retailers exploit connected customer services, such as home delivery and cashless payment.

4.1.2 Theme 2: Isolation. The isolation theme encompasses several kinds of fear and anxiety generated during the first (2020) and second (2021) waves of the COVID-19 pandemic that significantly changed the participants' shopping habits (Laato *et al.*, 2020) as a

consequence of the corresponding increase in depression and isolation. Accordingly, the use of AR apps was helpful in terms of permitting people to continue to shop safely while avoiding social contact. For example, Participant 20 emphasized that "*The fear of social contact drove me during the COVID pandemic and when the situation started to return to normal. But, during the long time spent at home, I increased my technological skills, and I really appreciated the AR that I never used before. So, I think this is a great way to conduct shopping when we are at home and when, for several reasons, we cannot go outside*".

4.1.3 Theme 3: New everyday life. New everyday life refers to the new attitude of people towards finding solutions to overcome the various problems that were generated during critical phases of the COVID waves. A proactive approach refers to the desire of people to use AR with a positive attitude regarding their involvement in a novel scenario and thus many related interactive technologies. Overall, re-establishing an everyday life appeared to be a necessity, almost an imperative, for the participants. For example, Participant 41 stated, "*During the COVID pandemic, I completely avoided brick and mortar stores . . . I discovered a new way to shop . . . more relaxing and without wasting time. I think that I will continue to shop from home also in a post-COVID situation . . . I learned a lot of technological things, and I want to exploit these news skills to save my precious time*".

The exploitation of interactive technologies (Siregar and Kent, 2019; Pantano, 2016; Pantano and Gandini, 2017), such as AR, to maintain social distancing (Wilder-Smith and Freedman, 2020) therefore appeared to be accepted by the participants as a reasonable solution to engage in networked experiences (Pantano and Gandini, 2018) and to personalize their retail shopping journeys (Perannagari and Chakrabarti, 2020; Kim, 2020).

4.1.4 Theme 4: AR use in a post-COVID world. The propensity to use AR in a post-COVID world was demonstrated by the participants' powerful desire to continue engaging with AR technology with great enthusiasm, every day. For example, Participant 12 stated, "*Before COVID, I read something about AR technology, but it was only during this crisis situation that I started to use it . . . and I completely fell in love . . . I think it is amazing to stay at home and have the possibility to try on several products in front of your computer . . . and to directly buy them. I love AR*". Additionally, as Participants 31 and 45 stated, "*During the COVID pandemic I experienced AR more deeply . . . As my first reaction, I was completely shocked about the potentiality of this technology . . . during my home-time, I became more familiar with augmented reality and, of course, I will surely continue to use it in a post-COVID world*"; "*One of the best things I did during the lockdown was discovering the funny way to try something out and shop thanks to the AR technology. I love this . . . I bought several cosmetics by using the AR apps . . . And, of course, I'm sure to keep using this technology in my everyday life . . . I think AR is now a part of my life*".

5. Discussion and theoretical contribution

The empirical results and thematic analysis offer a considerable contribution to the literature by showing how the exploitation of AR apps permitted people to shop safely and avoid social contact during the isolation necessitated by COVID-19 pandemic protocols. Specifically, millennials consumers to coping with consequences derived from the rapid spread of COVID-19, demonstrated proactive reactions on the flow of coping strategies to reacquire an everyday life. Particularly, a proactive approach to finding novel ways to shop was clearly expressed with the participants' positive attitude towards the new COVID-19 scenario. Overall, re-establishing an everyday life appeared to be a necessity and somewhat of an imperative for the participants. Remarkably, this study has thus shown how the use of interactive technology (Siregar and Kent, 2019; Pantano, 2016; Pantano and Gandini, 2017), such as AR, helps people to cope the rules and conditions (Wilder-Smith and Freedman, 2020) that are imposed by external and uncontrollable factors, such as a pandemic. Hence, AR

appeared to be a reasonable solution for engaging in networked experiences (Pantano and Gandini, 2018) and personalizing retail shopping journeys (Perannagari and Chakrabarti, 2020; Kim, 2020). The participants also demonstrated a powerful desire to continue using AR technology in a post-COVID world, expressing their great enthusiasm and the ability to use it in everyday life.

Therefore, by connecting the main results from the thematic analysis and the data from the AR case studies with the theoretical context discussed above, it could be possible to introduce a new paradigm related to AR and COVID-19.

The data collected in the study clearly expressed the willingness of people to continue shopping and buying goods and services even in exceptional conditions, such as those created by the COVID-19 pandemic. Figure 7 highlights how the worldwide spread of COVID-19 created changes in consumer behaviour (Miri *et al.*, 2020; Laato *et al.*, 2020;

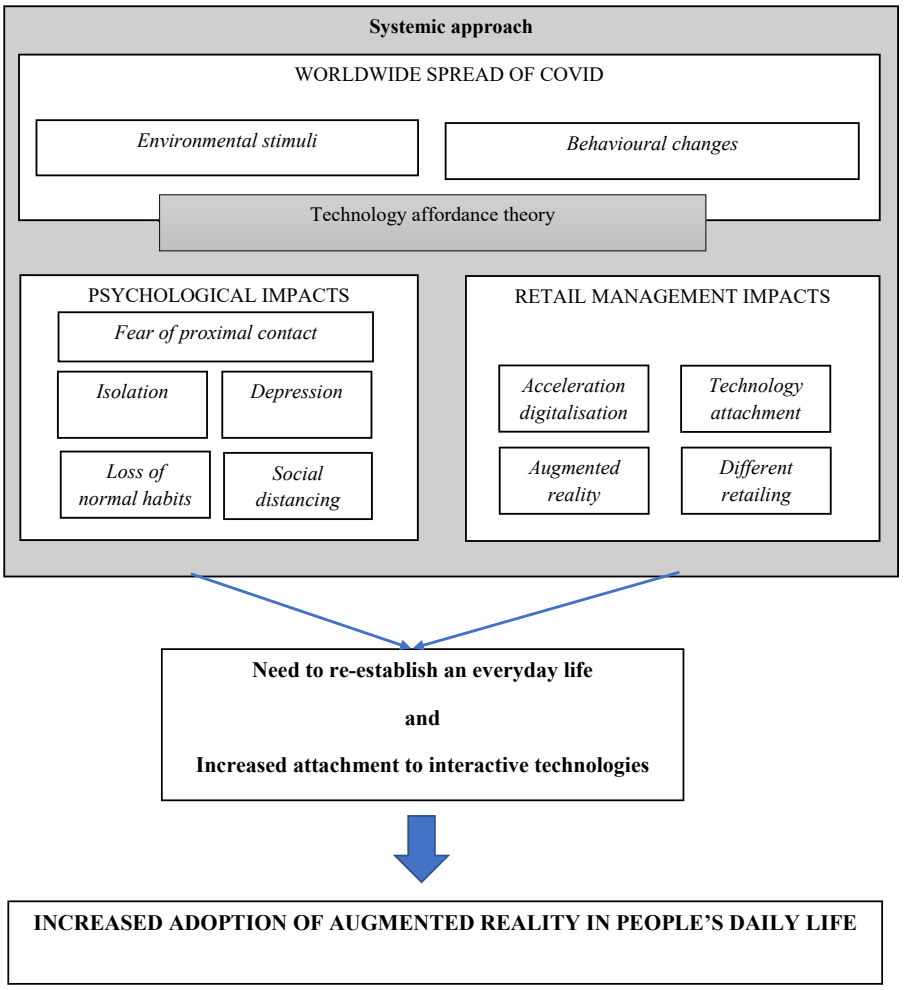


Figure 7.
How the COVID-19 pandemic may accelerate the adoption of augmented reality technology

Source(s): Authors' data elaboration

La Torre *et al.*, 2019). Accordingly, retailing has undergone profound changes due to the vital need to identify new ways to buy and sell (Beckers *et al.*, 2021; Li *et al.*, 2020; Roggeveen and Sethuraman, 2020; Pantano *et al.*, 2020). These issues were impelled by the need to reacquire pre-pandemic conditions (Trzebiński *et al.*, 2020), and the rate of digitalization has strongly accelerated (Amankwah-Amoah *et al.*, 2021). Consequently, as shown in this paper, AR technology can be potentially and significantly adopted both during a pandemic context and in a post-COVID world. Therefore, from the theoretical perspective, this paper bridges environmental stimuli and behavioural changes via a holistic approach, extending the affordance theory of technology to a crisis situation. The research shows how the attachment to technology in a crisis like a pandemic derives from the desire to settle again an everyday life. In that sense, the affordance theory of technology is extended under specific environmental circumstances such as a pandemic to regain a regular life thanks to the AR technology. Indeed, the systematic integration (Bertalanffy, 1956, 1972, 2010; Gioia *et al.*, 2013) of several elements that have characterized the ongoing pandemic era, which combines the attachment to technology with the affordance concept (Gibson, 2014; Gaver, 1991), broadly envisions the impacts of COVID-19. Furthermore, the study contributes to the literature on AR technologies in the retail sector, providing a new definition of AR to delineate the profound value app users derive from it. Following the affordance concept of technology (Gibson, 2014; Gaver, 1991), a fourth additional AR characteristic has been identified in this work *(augmented social distance)*, whereby AR could be redefined as "*an interactive technology that is able to satisfy people's novel desires while facilitating a broad shopping experience, ensuring social distancing and preventing social contact*".

6. Conclusion and practical implications

Due to the rapid worldwide spread of COVID-19, the retail sector has greatly changed. New paradigms are developing, and in the future, people will likely experience a completely changed retail world. This research aims to fill the gap in the literature on technology adoption in the retail sector during the COVID-19 pandemic by analysing how COVID-19 has affected consumers' behaviours; specifically, how AR technologies can overcome the limitations imposed by pandemic protocols. The findings underscore how by exploiting interactive technology (Siregar and Kent, 2019; Pantano, 2016; Pantano and Gandini, 2017), such as AR, it is possible to overcome the retail crisis caused by the COVID-19 pandemic and the responses to it. The interviewees showed a high frequency of AR app use during the study period, confirming that AR represents a new way to have an interesting and socially interactive shopping experience (Caboni and Hagberg, 2019; Yadav and Pavlou, 2014) while preserving health and respecting social distancing rules. The case study and in-depth interview analyses suggest interesting managerial implications for retailers who desire to implement an omnichannel strategy (Berman and Thelen, 2018; Dirsehan, 2020) through AR technologies. A new paradigm is emerging in the retail sector due to the COVID-19 pandemic. On the customer side, the use of digital technologies, such as AR, creates value, increasing the accessibility of information and processes, facilitating sharing and involvement and enriching customer experiences. However, such use can also represent a form of "value destruction", especially in the service sector, where the benefits related to direct contact with staff could be lost; moreover, consumers who are not very skilled with technological devices might experience an increase in perceived sacrifices, privacy problems and technological alienation. As consumers modify their shopping habits, retailers need to implement an omnichannel strategy (Berman and Thelen, 2018; Dirsehan, 2020) to offer a rich shopping experience with the help of interactive technologies. Omnichannel strategies offer retailers competitive advantages over purely online firms (Beckers *et al.*, 2021). AR technologies are

thus a potential source of value generation, but they can also quickly render the core competencies and business models on which a company has based its competitive advantage obsolete, effectively leading to a destruction of value if the company is unable to adapt. Therefore, to manage the large amount of data generated by digital technologies, retailers need to combine digital skills with traditional skills to create an appropriate marketing strategy and contribute to the value creation process (Verhoef *et al.*, 2021).

7. Limitations and future research

This qualitative study is a first attempt to understand the role of AR in the retail response to new shopping habits due to the COVID-19 pandemic and its consequences. The first limitation is related to the limited number of case studies analysed. The study is based on two AR apps related to the fashion and beauty sectors; therefore, this research needs to extend to other retail sectors, e.g. food and beverage, or furniture retailers, to clarify additional profound changes in consumers' behaviours that have occurred amid the COVID-19 pandemic and provide more generalizable results.

Additionally, the participants in this study all resided within the specific geographical boundaries of Italy. They were selected because this country adopted extremely restrictive regulations and implemented a total lockdown for several months during the first and second waves of the pandemic in Europe. Although the selection of a single cultural background allowed to identify some profound effects of AR adoption on consumers' habits, it was also a limitation. Therefore, further research could develop this analysis in other countries, particularly those that have not applied severe pandemic restrictions, such as Sweden, to investigate how their consumer behaviours and habits were affected and to identify specific dimensions that could be included in the model. Moreover, the study could be extended to members of Generation X (1965–1982) to determine whether there are different, generational correlations. Finally, as suggested by a previous study (Venkatesh, 2020), it would be interesting to replicate this study in a post-COVID period by collecting data from the same samples using the specific theories and models to determine if modifications are needed. Such a comparison could increase contextual understanding and create critical new knowledge.

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