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M. Claudia tom Dieck
Timothy Jung *Editors*

Augmented Reality and Virtual Reality

The Power of AR and VR for Business

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Editors

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The Power of AR and VR for Business

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Preface

Immersive technologies such as augmented reality (AR) and virtual reality (VR) are changing the business landscape, providing new opportunities but also concerns for businesses and consumers. Organised by the Creative Augmented and Virtual Reality Hub at Manchester Metropolitan University, the 4th International Augmented and Virtual Reality Conference attracted researchers and industry from around the globe to discuss opportunities, collaborations and future research directions. The conference theme of "The Power of AR and VR for Business" invited academic and industry speakers from various disciplines, to share their knowledge and experiences of immersive technologies.

Papers presented focussed on the areas of retail, tourism, experience design, education and applications and immersive designs. We hope that the conference and this book will serve as a valuable source for future research and discussion on important issues such as privacy, technology adoption and application design. In addition, this book aims to inform businesses about latest developments in the areas of AR and VR.

Manchester, UK

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Dr. Timothy Jung

International Augmented and Virtual Reality Conference 2018

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Part I
AR & VR Retail Experience

Augmented Reality in Real Stores: Empirical Evidence from Consumers' Interaction with AR in a Retail Format

Francesca Bonetti, Eleonora Pantano, Gary Warnaby, Lee Quinn and Patsy Perry

Abstract This exploratory empirical study elucidates the concept of the 'augmented store', namely a physical retail store modified to accommodate AR technology. It extends previous research into immersive environments and technology-enhanced stores from experimental laboratory settings to a real-life scenario with participating consumers. Qualitative data from interviews and observations of consumers using AR technology in-store are analysed to evidence naturalistic understandings of interactions with, and perceptions of, a physical store enhanced with AR technologies. The findings provide evidence to suggest that consumers experience an enhanced, more immersive and enjoyable perception of the store environment as a consequence of the AR experience. They find interaction with the augmented store to be 'realistic', and hedonic motivations for interacting with the immersive store frequently prevail. The AR enhanced store appears to stimulate brand engagement, increasing consumers' desire to shop at the retailer, which provides managerial opportunities to reinforce brand positioning.

Keywords Retailing · Human-computer interaction · Augmented store · Augmented reality · Consumer behaviour · Immersion

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1 Introduction

Atmospherics are acknowledged as critical elements of the retail store environment, which help convey a satisfactory shopping experience and, ultimately, influence consumer behaviour (Kotler, 1973; Puccinelli et al., 2009). Such factors are arguably even more relevant in fashion and apparel retailing, given the multi-sensory experience of both store environment and the products themselves (Foster & McLelland, 2014). In a constantly evolving competitive context, fashion and apparel retailers are increasingly adopting different types of innovative technologies in physical stores to directly enhance the shopping experience, and thereby achieve competitive advantage (Pantano, 2016). Such technologies (see Bonetti & Perry, 2017; McCormick et al., 2014; Pantano, Rese, & Baier, 2017) can be referred to as 'consumer-facing' in-store technology (Bonetti & Perry, 2017).

'Immersive' technologies (e.g. AR and VR) are rapidly evolving and are increasingly adopted in this context (Bonetti, Warnaby, & Quinn, 2017; Javornik, 2016). In particular, AR applications are developing to combine both the real and virtual worlds into the user's view of the physical world in real time (Carmigniani et al., 2011). This can help enhance the user's visualisation of products and perception of the store environment, and thus, the shopping experience, by enabling interaction with virtual items (Huang & Liao, 2015). Whilst VR blocks out real world sensory experiences through a wearable device (typically a headset), immersing the user in virtual and entertaining 3D worlds (Bonetti et al., 2017), AR allows users to experience enhanced and more realistic experiences within the physical place (Papagiannidis, Pantano, See-To, Dennis, & Bourlakis, 2017).

AR is defined as a combination of 'real and computer-generated digital information into the user's view of the physical world in such a way they appear as one environment' (Olsson, Lagerstam, Kärkkäinen, & Väänänen, 2013, p. 288). By integrating and aligning real and virtual objects (through a virtual layer that can add computer-generated digital elements such as images, videos, textual information, etc.), this technology results in an enhanced (augmented) physical world (Carmigniani et al., 2011; Pantano et al., 2017). Although existing studies have investigated immersive environments and technology-enhanced stores, this research has tended to have been conducted in experimental settings (Huang & Liao, 2015; Kjeldskov & Graham, 2003; Papagiannidis et al., 2017). Therefore, the integration of immersive AR tools within the traditional point-of-sale store environment (i.e. stores that already exist, which are modified to accommodate AR technology, rather than having AR features built into the initial store concept) to investigate users' interaction with—and perception of—stores enhanced with immersive AR technologies in a *real* store environment is still under-investigated. This leads to our research questions:

RQ1. To what extent can traditional stores integrate immersive technologies such as AR, to develop new store forms/concepts?
RQ2. How do consumers perceive the store environment of a more traditional, physical store which has been enhanced by AR technologies?

RQ3. How do consumers interact with a traditional store enhanced with AR technologies?

Using an apparel store enhanced with immersive technologies as a research context, the central aim of this study is to investigate the extent to which immersive AR technologies influence the way consumers interact with, perceive and respond to retail settings and store environments.

2 Theoretical Background

2.1 Augmented Reality in Retailing

A major theme in the existing literature relates to the way(s) in which users adopt, interact with, and experience technology devices and systems (see Dix, 2009; Kjeldskov & Graham, 2003; Rogers, 2004). Of the various forms of innovative technologies used in retail environments, immersive technologies have drawn particular attention (Bonetti et al., 2017; Javornik, 2016; Pantano et al., 2017), particularly AR, which is based on a camera able to capture real-world data and combine information from real and virtual sources into one perception (Oleksy & Wnuk, 2016). Consequently, product simulation, sound, GPS data and media richness contribute to experiential value, with AR enabling consumers to interact with virtual products (McCormick et al., 2014). AR applications have become more popular due to widely distributed personal mobile technology, allowing users to shop using AR, thereby enhancing satisfaction and experience (Dacko, 2016; Javornik, 2016). Early AR retail applications include virtual try-on, and interactive displays providing information on promotion, products and locations (Bonetti et al., 2017). Thus, AR has the potential to improve consumers' visualisation of products, increase engagement and enhance perceptions of the shopping experience, thereby hopefully affecting retailer and brand perception positively which, in turn, can influence consumer behaviour (Huang & Liao, 2015; McCormick et al., 2014).

2.2 Augmented Places

The development of new immersive technologies contributes to the creation of immersive (augmented) places/environments, increasing users' levels of engagement, enjoyment and satisfaction, leading to the enhancement of the user experience (Papagiannidis et al., 2017). Augmented places consist of real, physical places, enhanced by AR technologies to augment users' overall current perception of reality, their experience, and the possibilities offered by the real world (Carmigniani et al., 2011; Oleksy & Wnuk, 2016; Pantano et al., 2017). This can lead to a deeper level of engagement, enjoyment and satisfaction (Dacko, 2016; Papagiannidis et al., 2017).

Existing literature on immersive places arising from the use of AR technology mainly focuses on the entertainment and educational sectors, and museums/other places of historic cultural heritage (Chang, Hou, Pan, Sung, & Chang, 2015). AR technologies potentially enable a deeper *place-based* participation by allowing users to virtually, yet naturally, experience an enhanced version of the physical space in real-time via realistic interfaces. This increases feelings of immersion and engagement (Oleksy & Wnuk, 2016; Pantano et al., 2017), and can result in improved perceptions of the experience and the real environment, by offering new possibilities to see objects not physically available in the real-world context, enriching content and information at users' disposal. This creates an immersive environment and interesting, fun experiences (Oleksy & Wnuk, 2016; Papagiannidis et al., 2017). Oleksy and Wnuk (2016) posited the concept of 'augmented places' as physical places enhanced with AR with the aim to recreate and enhance the experience of the place in question, by overlapping virtual reconstructions of past heritage and actual place, supporting users' understanding of its historical value, and resulting in users' higher emotional attitude towards the place and greater understanding of meaning of multicultural places (Oleksy & Wnuk, 2016). These elements of immersive environments and augmented places could potentially be extended to the retail context.

2.3 Human-Computer Interaction (HCI) in Retail Settings

In order to facilitate technology acceptance, developers need to provide interactional modality that is as realistic and natural as possible (Carmigniani et al., 2011). Consumers' acceptance of, and interaction with, technological innovations in retail settings has received greater attention, due to the growing adoption of technologies at the point of sale to enhance customer experience and increase competitiveness (Bonetti & Perry, 2017; Pantano & Gandini, 2017).

Indeed, research into human-computer interaction (HCI) in retail settings enriched with enhanced and immersive AR and VR technologies has expanded in recent years. Conducted in a laboratory environment, Pantano et al.'s (2017) study investigated the effect of customer interaction with AR technologies when trying on glasses to simulate virtual fit and appearance. Their results showed aesthetic quality and interactivity to be antecedents of perceived ease of use; response time and quality of information influenced consumers' positive attitude; and when combined with the perceived enjoyment in interacting with the technology, improved the online buying decision process. Olsson et al.'s (2013) assessment of potential end users' expectations and requirements of future mobile AR services characteristics and user experience in a shopping centre context revealed that participants expect the technology to be proactive and context-aware, suggesting products and activities based on the user's location, as well as providing relevant and personalised content, with interaction intuitive, natural and easy to learn, flexible and controlled by the user. Dacko's (2016) examination of mobile AR apps and the extent to which they contribute to smart retail settings found user satisfaction to be relatively

high, and that technology use provides experiential shopping benefits, including more efficient or better value shopping, more entertaining and more visually appealing shopping.

Research on AR in a retail context mainly concerns online stores, conducted in controlled laboratory environments (Huang & Liao, 2015; Pantano & Laria, 2012; Papagiannidis et al., 2017). However, as physical stores have adopted these technologies, there is an increasing need and opportunity to conduct research in this particular real-world context. In their review of research methods applied within HCI for mobile devices, Kjeldskov and Graham (2003) noted the tendency towards building systems and evaluating consumers' usage and interaction within artificially controlled environments and isolated laboratory-based settings, at the expense of understanding and learning from the actual use of technologies in 'messy' real-world contexts (Dix, 2009), characterised by distractions, noise and interruptions (Rogers, 2004).

3 Methodology

Qualitative research inquiry was used to evaluate users' reaction to immersion in an AR-enhanced store. While it is noted that the majority of studies on technology adoption and usage in retail settings adopt a broadly positivistic perspective (Ha & Stoel, 2009; Huang & Liao, 2015; Pantano et al., 2017)—often applying the Technology Acceptance Model (Davis, 1989), extending and combining it with other frameworks and constructs (Papagiannidis et al., 2017; Venkatesh, Thong, & Xu, 2012)—researchers are increasingly stressing the need for more interpretive research designs in order to gain a richer understanding (Korpelainen, 2011; Rowlands, 2005; Williams, Dwivedi, Lal, & Schwarz, 2009). Indeed, technology adoption is a complex phenomenon (Rowlands, 2005) involving understanding of the unique points of view of the participants involved, human experiences and participant characteristics, the context in which adoption takes place, and the intricate and rapidly changing nature of technology (Pantano & Priporas, 2016). Consistent with this, the intention of this exploratory qualitative study is to gather rich and in-depth data to inform deeper understanding of the phenomenon investigated, rather than generalising more broadly into other contexts.

3.1 Augmented Fashion Store Development

A sportswear fashion and apparel retailer located in central London (UK) was selected as a case study. This retailer sells sportswear and outerwear and an overall lifestyle concept. It occupies a premium market positioning, with an innovative brand image, due to the innovative materials used in products, the sports activities organised by the retailer, and in-store technologies. Moreover, the retailer focuses

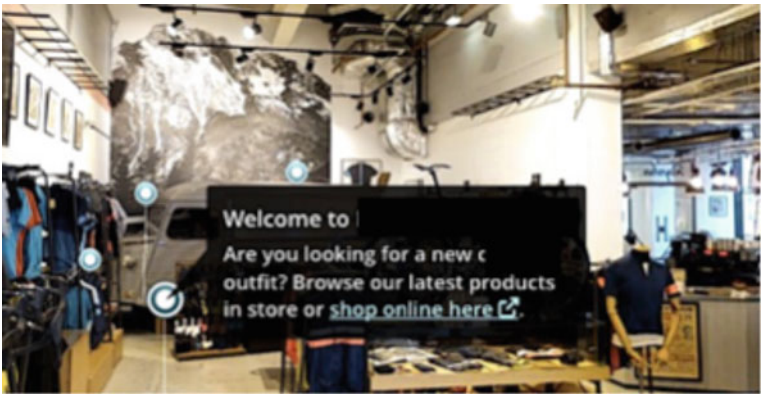

Fig. 1 Example of a point of engagement, as visualised by consumers, welcoming customers, giving information and redirecting users to the retailer's e-store

heavily on providing an overall experience and creating a community among customers, in part by devoting a section of the premises to a café area, thereby providing a place where customers can meet, relax, work, and watch sports events.

The store space was scanned and virtually reconstructed to realise a 3D model of the store, which consumers could access virtually. This allowed the development of immersive technologies, which were installed in the store for the purposes of this research. Three key products and a real model were scanned in detail, to visualise how a product would look when worn, as well as to increase the sense of realism of the experience. Tags or points of engagement were further inserted on specific items such as new products, at the store entrance to welcome customers, and on the in-store images of sports activities organised by the brand. From the highlighted items, tags would pop up by clicking on or walking by them, giving suggestions to the user and providing further information, linking and redirecting the user to the brand's website and e-store, allowing customers to purchase items and view videos of sports events showcased. This served to immerse the user in the enhanced environment and space by interacting with it through the technologies used (Fig. 1). This 3D model can be used with all types of screens and VR headsets to help confer an immersive and enhanced customer experience whilst in the physical store.

3.2 Procedure and Data Collection

A convenience sample of 29 participants was recruited to take part in the research, which consisted of observation of participants trying out the technology and subsequent interviews (lasting approximately 30 min). The selection criteria were: (1) that participants were current loyal customers; and (2) were willing to take part in the research. The sample consisted of 27 male and two female participants, as the

brand's target market is predominantly male-oriented consisting of 30–50-year-old men, successful, affluent, into a certain active lifestyle and loyal to the sport category. Three participants were aged from 20 to 24; seven from 25 to 29, two from 30 to 34, one from 35 to 39, twelve from 40 to 49, and four from 50 to 60. In terms of frequency of shopping at the brand premises, seven participants visited the store once a week, eleven once a month, and twelve once every six months.

Participants were first asked to try out the new technology on three formats—laptop, iPad screens and a VR headset—whilst in the physical store, and use each format to experience and autonomously explore the environment and immersive and augmented store experience. The technology included 3D, VR, headset, phones compatible with the headset, computers and iPads. Subsequently, participants were interviewed regarding their experience. The interview questions and themes for discussion were formulated to investigate perceptions of the degree of enhancement of the customer experience and the physical environment (i.e. shopping experience; level of immersion and engagement; degree of realistic experience; visibility and presentation of products and space), interaction with the technologies used (i.e. degree of realistic interactions; degree of immersion in the store space and environment; time in store; brand engagement; perception of the brand; purchase decisions), and further suggestions and considerations. Each participant was invited to talk openly and express their impressions and feelings in their own words. Notes were taken and typed into an online survey instrument to facilitate data collection. An established inductive process (Corbin & Strauss, 2008; Miles, Huberman, & Saldana, 2014) of applied thematic analysis (Guest, MacQueen, & Namey, 2012) was followed. The data analysis began with preparing and familiarising with the data, followed by an initial open and free analysis, exploring and identifying initial codes and sub-codes. As data analysis proceeded iteratively (Spiggle, 1994), codes were refined and then grouped into initial themes and categories. Further analysis then revealed three core themes: *enhancement; interaction; behaviour*. These themes form the structural and discursive basis of the following presentation and discussion of findings.

4 Research Findings

4.1 Enhancement: The New Store Environment and Shopping Experience

In terms of participants' perception of the store environment enriched with immersive AR technologies, most participants (n = 26) commented that this enhanced their shopping experience. Participants appreciated the new in-store experience, and considered the enriched store to be entertaining, engaging, immersive and enjoyable. Some respondents said the immersive technologies contributed to make the in-store experience highly customised, which helped the retailer create a closer relationship

with the individual customer and further enhanced perceived service quality and experience (Pantano, 2016). Overall, observations and interviews showed that participants were generally optimistic about the 3D models and the augmented store, and the consequent enhanced in-store experience, and also revealed positive disposition to future developments of this form of store and innovative technologies.

However, three participants did not regard this new type of store as contributing to their shopping experience. This can be linked to participants' degree of acceptance and usage of innovative technologies, which depends on several factors, including perceived usefulness (PU), perceived ease-of-use (PEOU), consumers' characteristics (i.e. level of cognitive innovativeness, level of education, age, store channel preferences), attitudes about the technology (i.e. degree of familiarity and understanding of how to use a specific tool, confidence in using it in public) and context constraints (i.e. time availability, sources of information, store crowding, technology location in-store) (Davis, 1989; Huang & Liao, 2015; McCormick et al., 2014). Some participants stressed that, as these technologies were still quite new, they needed to get used to them, as they were not yet familiar with them, especially in a retail context:

> I have not used it [immersive technology] for browsing products before. Up until now the experience of it has been novelty games on the iPhone.

This suggests a need for retailers to introduce this new technology gradually to potential users, educating them and promoting the new tool by providing all relevant information (e.g. trained staff in-store, in-store posters and signs) (Lee, Meyer, & Smith, 2012).

4.2 Interaction: Consumers' Mobility and Interaction with the Enhanced Store

Most participants (n = 25) said they found the experience realistic, facilitated by the ability to walk around the enhanced store. Several were enthusiastic about aspects related to the visibility and presentation of products and spaces, where colours played an important role. Moreover, participants stressed the important role of the immersive technologies in enhancing product visibility (in terms of features and fitting), which they found very realistic. The enhanced store also helped users find what they were looking for, thus making the interaction informative (Antéblian, Filser, & Roederer, 2014; Huang & Liao, 2015; McCormick et al., 2014).

However, four participants felt the enhanced store needed a better and easier way to show and interact with products:

> I would prefer it [enhanced store], but it needs an easier way to look at products.

Hedonic motivations for interacting with the immersive technologies prevailed. In fact, participants stressed the immersive, engaging, interactive and entertaining aspects of the enriched store. In particular, they pointed out the desire to see this

technology being used to tell the 'story' of the brand in more immersive ways, making the in-store experience more informative about to the characteristics and values of the brand, and its associated sporting/brand community activities, instead of merely focusing on selling products. These hedonic drivers—accompanied by utilitarian drivers (i.e. product information, location, availability, being redirected to the retailers' e-store to place an order to speed up service etc.)—underpinned participants' evaluations of the augmented store, leading to perceived enhancement of their experience. This is in line with previous studies showing both hedonic and utilitarian value of immersive AR/VR applications (Huang & Liao, 2015; Olsson et al., 2013), although here results revealed a prevalence of hedonic motivations for interacting with the immersive and enhanced store.

Overall, participants liked the interactive elements of the enhanced store. Being able to move virtually from one part of the store to another and see the space through the immersive technology, and then be re-directed to the brand's website and get extra information or place an order, emerged as important aspects making participants' interactions with the 3D models favourably-perceived and realistic. This allowed users to interact with other retail channels whilst in the physical store, as the adoption of innovative consumer-facing technologies (representing touch points between retailer and consumer) has made the online and offline worlds more interrelated (Bonetti & Perry, 2017; McCormick et al., 2014), and perceived by the customer as integrated and as part of a unique, seamless experience (Verhoef, Kannan, & Inman, 2015).

4.3 Behaviour: The Influence of the Enhanced Store

Many participants found the enhanced store entertaining, and commented that the interaction with the innovative technologies and the enhanced store made them feel engaged with the brand (n = 21), and enhanced their perception of brand value:

> It's engaging and puts you right in the centre of the experience.

This would encourage them to spend more time at the enhanced store interacting with the immersive technologies and store, and nine customers stated that the immersive technologies and enhanced store increased their desire to shop at the retailer.

These reactions are in line with previous environmental psychology studies in a retail context in relation to the influence of consumer-facing technology on consumer behaviour (Dacko, 2016; Pantano, 2016; Papagiannidis et al., 2017), although the present study arguably advances understanding by examining the use of innovative and immersive technologies in the real-world context. Generally, participants found the enhanced store to be different, entertaining, innovative, professional, modern and trendy, whereby the technologies used serve to keep the brand up-to-date. Such innovative in-store technical elements are in line with the retailer's identity, image and positioning, reinforcing how the retailer positions itself and is

perceived by consumers and competitors (Pantano et al., 2017), as the retailer also uses innovative technologies and materials for their products—as one respondent commented:

> It pushes the boundaries, I am not surprised, it's the same idea as what they [the brand] are all about; they are innovative in the textile, high quality.

5 Discussion

Building on these exploratory findings, the following discussion suggests ways to enable the possible development of a new store form, enhanced through immersive AR technologies. Resonating with the notion of 'augmented places' mentioned earlier, a schematic framework for this proposed 'augmented store' is outlined below.

5.1 Store Augmentation: The Development of a New Store Form

Immersive AR technologies resulted in an enhanced shopping experience within—and environment of—the *traditional* store of the retailer in question, and overall the respondents in this research were satisfied and impressed with this augmented store. The discussion now considers some more practical implications of existing theory which has been generated in more experimental settings in this real-world context.

The augmented store can be defined as a physical retail store augmented/enhanced by innovative and immersive AR technologies. In this store form, the customer's current perception of the real store space, environment and shopping experience are mediated and enhanced by the use of 3D models and virtual scenarios that consumers explore and naturally interact with while in the real store environment. This augmented store is characterised by the combination of AR technologies with the real store environment, thereby integrating real and virtual objects, store space and environment. The augmented store (Fig. 2) thus extends the traditional and real physical retail space boundaries surrounding the customer (such as the physical limits of the store, the items physically present in the store, the information at consumers' disposal and the way it is provided etc.). Here, consumers' natural interactions with the store environment through innovative and realistic interfaces, space mobility and visibility constitute another key feature, offering new possibilities to see and interact with virtual objects not physically available in the real store space, enriching content, and thereby leading to consumers' deeper participation and helping to confer a richer and more immersive perception of the augmented store environment and shopping experience, entertainment and enjoyment in the real physical store.

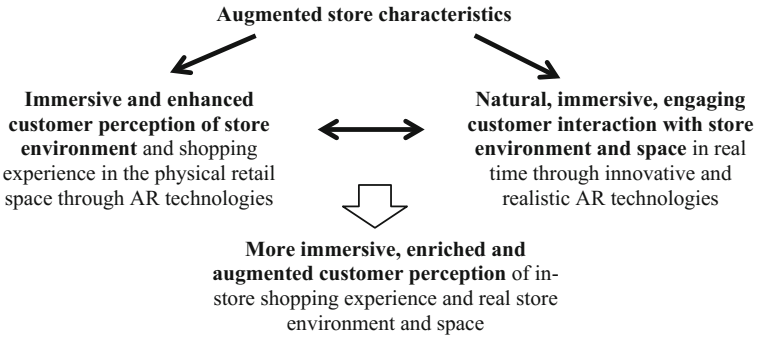

Fig. 2 Key characteristics of the augmented store

6 Conclusions, Contributions and Future Research

This study has explored the integration of AR techniques within a physical store and has suggested ways to develop a new store form, the augmented store, by making the store enriched, enhanced, more accessible, entertaining and efficient for consumers. Results showed that participants perceived the new augmented store to be more immersive, entertaining, engaging and enjoyable. They found the interaction with the store realistic, leading to an enhanced brand perception and further increasing brand engagement.

6.1 Theoretical Contributions and Managerial Implications

This research contributes to the existing literature in multiple ways. First, it extends the existing literature on augmented and immersive places (Carmigniani et al., 2011; Chang et al., 2015; Oleksy & Wnuk, 2016) to a specific real-world context of the retail store, by providing knowledge on the shift towards an augmented store and outlining its key characteristics.

Second, it contributes to the existing literature on HCI (Kjeldskov & Graham, 2003; Rogers, 2004) by focusing on consumers' interaction with the technology (consumer-computer interaction or CCI), thus extending existing research on a generic user's interaction with technology in a generic place. In particular, the study focuses on consumers' interactions with AR technologies in a real-world context of an actual store. This extends previous research conducted in simulated and controlled laboratory environments with simulated consumers (Pantano & Laria, 2012; Pantano et al., 2017; Papagiannidis et al., 2017), by investigating perceptions of current actual consumers of a retailer, their interactions with immersive AR technologies in a real, physical retail store, and their reactions to the new and enhanced store space and environment.

Furthermore, this research has implications for practitioners. It unveils positive consumer reactions to the augmented store form, providing practitioners with a new perspective on a specific new technology to be successfully integrated within traditional points of sale. Retailers willing to further engage with customers by enhancing their in-store experience should therefore consider types of immersive technologies, where these can provide entertaining, informative and engaging experiences.

6.2 Limitations and Future Research

The study also has some limitations. The selected retailer's target market focuses on a particular demographic. Thus, the results do not reveal in detail how other consumer types would react to and perceive this new store form. Further research could involve different retailers with varied target customers, to identify and analyse reactions from a more diverse range of consumers, incorporating participants from different demographic profiles, to gain a more comprehensive understanding which would then help obtain the right balance of innovative technologies and traditional services provided in store, to better satisfy a broader range of customers. Although the research takes a qualitative approach, eye-tracking technology or retailers' EPOS data could be used to link consumer perception to purchase behaviour, for example by exploring whether consumers would spend more time in store due to an enhanced experience, or whether it influences purchase intention. Finally, future research could investigate managerial perspectives of consumers' reactions to, and perceptions of, the store enhanced with AR technologies.

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V-Commerce in Retail: Nature and Potential Impact

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Abstract V-commerce is an emerging phenomenon that is gaining traction in marketing and business literature and is becoming specifically more prominent in content related to retail practices. However, interpretations and explanations as to what exactly v-commerce refers to and comprises are inconsistent. This paper addresses the fluid conceptualisation of the v-commerce terminology and advocates the usage of v-commerce terminology exclusively for referring to, and as an abbreviation of, virtual commerce—for which a unified definition will be proposed. Taking a business-to-consumer approach, the current implementations of virtual commerce in the retail sector, as well as the potential and future research implications will be discussed.

Keywords Virtual commerce · V-commerce · Retail · Consumer · Alternate reality

1 Introduction

V-commerce terminology in marketing and business literature is becoming increasingly prevalent. Various authors agree that v-commerce will "reshape the retail landscape" (Ango, 2016; McKone et al., 2017). However, the concept's shared origin between academia, industry and the media combined with ubiquitous implementation, introduced ambiguity to the v-commerce terminology; which currently embodies different, and even contradictory, connotations contingent upon the various stakeholders (i.e., often due to contextual differences). At present, three different usages of v-commerce terminology can be observed: (1) A stream of authors, predominantly practitioner literature, that relates v-commerce to digitally

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native vertical brands and vertically integrated commerce (i.e., vertical commerce; Dunn, 2016). (2) A stream of literature that associates v-commerce with virtual commerce (e.g., Jin & Bolebruch, 2009). (3) A final stream of literature that refers to voice commerce (Beaumont, 2017; Zhang, Liu, & Li, 2009). The following paragraphs will expand on the different interpretations of the v-commerce abbreviation.

1.1 Vertical Commerce

The development of Internet-based commerce and the competitive and fast-paced nature of global markets have revived retailer's interests regarding vertical integration—which can be described as combining two or more stages of production and/or distribution, that are usually separate, under a single ownership (e.g., Buzzell, 1983). Dunn (2016) coined the term Digitally Native Vertical Brands (DNVBs), describing brands that are born on the internet and are maniacally focused on the customer experience (a.k.a., v-commerce brands). DNVBs primarily use e-commerce channels for interaction, transaction, and story-telling and rely heavily on their loyal customer base and user-generated content to spread the word (for examples of DNVBs in different industries see Pixlee, 2017). Adhering to the concept of vertical integration, DNVBs bypass traditional supply chains and distribution channels and implement direct-to-consumer models. This enables these online (niche) retails to offer consumers high-quality products at reduced costs while at the same time enhancing their product gross and contribution margins. Although there are potential downsides to a vertically integrated business model (e.g., supply chain complexities and difficulties in scaling; e.g., Dunn, 2016; Wertz, 2012), rising investment activity and acquisitions (i.e., Unilever bought Dollar Shave Club for US$1 billion; Unilever, 2016) could usher in a new era of cult brand monotheism, e-tailers and vertically integrated commerce.

1.2 Virtual Commerce

A lexical definition of virtual is "not physically existing as such but made by software to appear to do so" (Oxford dictionary, 2018). In line with this definition, Javornik (2016) defined virtuality as a "media's capability of showing virtual elements or virtual worlds, as experienced by the user through immersion or telepresence in the environment created by computer graphics or visual elements"—adopting an experience-based perspective (cf., Steuer, 1992). To facilitate immersive and interactive experiences, alternate reality technologies (Table 1) are utilized; which can be classified along a virtuality continuum (Milgram & Kishino, 1994).

Table 1 Alternate reality technologies

Terminology	Definition
Augmented reality (AR)	Alternate reality technology that provides an enhanced version of the real-world by overlaying our existing reality with an additional layer of digital information, which can be viewed through a (connected) technological device—such as smartphones or Augmented Reality Smart Glasses (ARSGs)
Mixed reality (MR)	Alternate reality technology that facilitates the merger of, and real-time interaction with and between, digitally rendered and real-world data and objects through connected technological devices (e.g., mixed reality headset)
Virtual reality (VR)	Alternate reality technology that is characterized by generating real-time, immersive and interactive multi-sensory experiences situated in, and artificially induced by, a responsive three-dimensional computer-generated virtual environment—usually paired with advanced input and output devices

Virtual commerce encompasses conducting commerce through these medium types. Therefore, this paper defines virtual commerce as: electronically mediated commercial transactions that originate from an alternate reality technological platform and involve either digitally-generated or real-world products and services.

1.3 Voice Commerce

Voice activated commerce pertains to user interaction with commercial platforms and applications that utilize natural language speech recognition to enable self-service transactions over the telephone and other connected devices (e.g., Dennis & Harris, 2003, p. 205)—as such, voice recognition technology substitutes the online point-and-click decision-making process by introducing spoken command methods. This shift towards conversation-based e-commerce is influenced by technological progress, including, but not limited to, improvements in the fields of: artificial intelligence, cloud computing and machine learning. Alongside there is the consumer's rising acceptance and comfort levels towards conversational user interfaces (i.e., smart speakers, such as Amazon's Echo and Google Home, that are often linked and or controlled by virtual voice assistants like Apple's Siri and Microsoft's Cortana). Although voice commerce brings in new challenges for retail (e.g., privacy concerns could fuel increasing restrictions regarding access to walled-garden personal data accumulated from voice interactions, inciting tension among digital ecosystems and potentially raising the cost of platform neutrality; Gartner, 2016), it is likely that consumer demand for voice commerce will continue to rise as industry leaders proceed to innovate.

All of the above-mentioned developments are expected to deeply impact the retail industry. However, to advance marketing research practices and increase

understanding regarding v-commerce within the public discourse, it is imperative that we clearly distinguish these advancements. This research advocates to ascribe the v-commerce terminology exclusively to *virtual* commerce; and use different prefixes for the other concepts, respectively *vi*—for vertical (integrated) commerce and *va*—for voice (activated) commerce. The underlying rationale is that throughout the years, commerce has consistently advanced by moving alongside and making use of technological revolutions (i.e., the internet); and most practitioners and academics agree that the rise of virtual and augmented reality can be considered as the next technological revolution (e.g., Steinicke, 2016, pp. 33–43). In addition, former one-letter commerce prefixes all refer to the medium type and or technology. Examples include: E-commerce, which can be defined as "the use of electronic means to exchange information and to carry out activities and transactions" (i.e., electronic commerce; Wyckoff & Colecchia, 1999); M-commerce "any transaction with a monetary value—either direct or indirect—that is conducted over a wireless telecommunication network" (i.e., mobile commerce; Barnes, 2002) and T-commerce "electronically mediated commerce through interactive digital television" (i.e., television commerce; Arroyo-Cañada & Gil-Lafuente, 2016). Adhering to this pattern, v-commerce should relate to virtual technology. It can be argued that virtual commerce, like m-commerce before (Coursaris & Hassanein, 2002), should be regarded as a subset of e-commerce—although some people have phrased it to be the "next step" (e.g., Alexandru, 2017).

2 V-Commerce and the Impact on Business-to-Consumer Retailing

In 2010, Jones stated that "a host of technological and social forces needs to converge in order for v-commerce to flourish" (p. 56) and it can be reasoned that we are currently at that stage. The maturation of VR and AR technologies heralds a fundamental shift in moving from the internet of information towards the internet of experiences (i.e., in which experiences replace information as the basic unit of currency; Kelly, 2016), and it can be argued that therein lies the biggest premise of virtual commerce; the potential to transform online shopping experiences and provide a (near) real-world equivalent (e.g., Papadopoulou, 2007). This is primarily because a virtual commerce interface, if properly designed, can support natural shopping behaviour by providing a more personalized, immersive and interactive experience (e.g., Chittaro & Ration, 2000). From a societal point of view, the consumer shift towards the v-commerce will be mainly driven by the younger age cohorts, since they are technology savvy, known to associate with brands to express their identity (e.g., Saxton, 2005) and already spend more money on 'experiential purchases' (cf. Van Boven & Gilovich, 2003).