WHICEB 2022 Proceedings | Wuhan International Conference on e-Business

Summer 7-26-2022

How Do Shoppers Behave in Extended Realities? A Video-based Comparative Thematic Study

Juan Chen
Faculty of Information Technology and Communication Sciences, Tampere University, Finland; School of Business Administration, Anhui University of Finance and Economics, China

Nannan Xi
Faculty of Information Technology and Communication Sciences, Tampere University, Finland; Faculty of Management and Business, Tampere University, Finland, nannan.xi@tuni.fi

Elpida Bampouni
Faculty of Information Technology and Communication Sciences, Tampere University, Finland, elpida.bampouni@tuni.fi

Juho Hamari
Faculty of Information Technology and Communication Sciences, Tampere University, Finland

Full Research Paper

How Do Shoppers Behave in Extended Realities? A Video-based Comparative Thematic Study

Juan Chen[1,2], *Nannan Xi*[1,3*], *Elpida Bampouni*[1*], *Juho Hamari*[1]

[1] Faculty of Information Technology and Communication Sciences, Tampere University, Finland

[2] School of Business Administration, Anhui University of Finance and Economics, China

[3] Faculty of Management and Business, Tampere University, Finland

Abstract: Currently, extended reality (XR) as one of the most important disruptive technologies has been witnessed to reshape consumer experience in many domains. However, little research has been conducted to explore the new paradigm regarding consumer experience and behaviors in XR-mediated environments. This study aims to explore emerging behaviors as well as new dimensions of consumer experience in different extended realities in the shopping context, by using a video-based comparative thematic analysis approach. Observations on the shopping behaviors of 162 participants across three implementations of extended realities (VR, AR, AV) and a normal brick-and-mortar comparison-point were recorded. Over 67 hours of video recordings were used and interpreted in metaphorical heuristics, before being analyzed by inter-group comparisons, to develop reflective themes. Our results lead to two themes being constructed, illustrating that XR users *connect* their behaviors from physical reality to those in XR (as formed by our sub-themes "synchronizing", "attaching", "habituating", "responding"), but they also appear to *reconstruct* new behavioral schemas (demonstrated by sub-themes "merging", "adjusting", "focusing", "experimenting"). The findings of this study help deepen our understanding of consumers' behavioral similarities and divergences between physical reality and different virtual realities.

Keywords: Virtual reality, Augmented reality, Mixed reality, Metaverse, Shopping

1. INTRODUCTION

Along with the maturing of XR (extended reality) technologies such as VR (virtual reality) and AR (augmented reality), an increasing number of retailers have started exploring the use of different XR in reconstructing and reshaping shopping environments [1, 2, 3] as well as providing augmented digital information [4, 5, 6]. Typical examples of the applications of XR technologies in retail include virtual fitting rooms, AR product catalogs, 360 and 3D product presentations, and VR stores. Practitioners and designers are making effort to explore how to use these technologies to replicate, reshape, and transform the consumer experience from the fully physical reality to a purely virtual world ─ the 'Metaverse'. However, behind the heightened expectations regarding the applications of XR technologies, retailers have shown reduced confidence in designing and creating XR retail environments due to the lack of understanding consumers' shopping experiences in different extended realities [7, 8]. More specifically, it remains unclear whether and how extended reality technologies such as AR and VR, influence consumers' shopping experiences and behaviors.

In the majority of XR retail literature, individuals' perceptions, emotions, and behaviors have been analyzed and interpreted quantitatively based on respondents' subjective self-report answers or psychophysiological measures in survey-based and experimental studies (refer to the literature reviews [7, 8]). It is possible that among these studies mainly based on deductive approaches, some important shopping phenomena (especially newly emerging behavioral patterns in XR) might have been ignored and undiscussed, as these confirmatory studies have focused on extant aspects of consumer experience and practice rather than

* Corresponding author. Email: nannan.xi@tuni.fi (Nannan Xi), elpida.bampouni@tuni.fi (Elpida Bampouni)

uncovering novel phenomena. Thus, the interpretation of shopping phenomena in different XR could bring new insights regarding technology-mediated experiences and deepen our knowledge of shopping behaviors in general, which has been rarely explored in previous research. Therefore, this study employs an inductive approach based on video-recorded observations of consumers' behaviors. To be more specific, three different XR-mediated shopping environments (VR, AR, AV) and a normal bricks-and-mortar store were constructed, and observations on the shopping behaviors of 162 participants were recorded and analyzed. This study provides implications to XR-mediated retail practices while addressing the research question of whether and how XR technologies influence the overall shopping experience compared to physical shopping.

2. RESEARCH BACKGROUND

2.1 Extended reality technology

As an umbrella term, XR technology or metaverse covers such concepts as AR, VR, and augmented virtuality (AV) [9]. However, the concept of XR is still relatively complicated to define, with various XR technologies often being discussed separately due to their novelty. This paper argues that AR is the technological application enhancing the physical environment by superimposing virtual stimulus on the physical reality; thus the user's perception consists of the information blender of two layers (the physical and the digital world) [10, 11, 12]. On the other hand, VR, rather than augmenting reality, refers to substituting the perceived reality [8, 13, 14], even if the content as a source of substitution may mimic reality. When users stay in the VR environment, their perception of the physical environment is mediated by computer-generated multi-sensory simulation [15, 7]. Lastly, AV refers to the combination of VR and AR, describing the augmentation of virtual reality, which provides a more hybrid experience [16, 17].

2.2 Extended reality retailing and shopping experience

During recent years XR applications have been increasingly adopted in many domains of humans' daily life such as tourism [18], entertainment [19], education [20], and retail [7]. Early studies on XR retail mainly focused on the feasibility of utilizing XR technology to realize the retail environment (see e.g. [11]) and the acceptance of XR retail consumers (e.g. [21]). It was not until recently that XR retail research began to explore XR shopping experiences (e.g. [3, 22-24]). XR shopping experience is believed to have a profound impact on consumers' purchase decisions, as well as retailers' marketing value and competitive advantage [25, 26].

Shopping experience is a multifaceted phenomenon which involves consumers' subtle perceptions, responses, and activities in physical, emotional, cognitive, and social facets [27, 28]. It might be difficult to derive the nuance of XR consumer behavior based on mainstream quantitative research methods e.g. surveys gauging commonplace shopping interactions and experiences (refer to literature reviews [7, 8]) while neglecting the lived experience and interaction happening in XR-mediated shopping [29]. Therefore, before consumer XR devotes to confirmatory testing on whether known dimensions of consumer experiences exist similarly in XR-mediated shopping, we ought to investigate what novel emergent practice, interaction and experience emerge when people are given free reign to exercise shopping in XR-mediated spaces. Moreover, prior research lacks synthesis and comparison of consumer experiences in multiple and various realities; consequently failing to identify the sets of behavioral similarities and divergence between the physical and its digital replicas or augmentations. As a result, the current study aims to address this research gap in XR-mediated shopping experience through observation of consumers' behaviors based on video recordings.

3. METHODS

3.1 General design

The presented study chose shopping as the research context, one of the most commonly used scenarios in

XR studies (see e.g. [8]). Specifically, participants were given a 10-euro gift card and a time window of 10 minutes to buy products (second-hand LP records) from a shop we set up specially for the research. We constructed altogether 4 shops in different realities (namely a brick-and-mortar shop, an AR shop, a VR shop, and an AV shop) representing the same music store environment (more details about the environments and procedures can be found in [30]). Each participant was randomly assigned to only one shopping condition. Researchers employed cameras and an XR programming system to record the users' actions. We used data from video recordings because they offer materials of dynamic vision, bearing more comprehensive and subtle analysis (such as developing metaphorical heuristics) compared to static images (e.g., snapshots, or photos) [31]. In addition, video recordings enabled a steady and less-intrusive observation (e.g., compared to direct observation) for all individuals' behaviors [31]. We then performed a comparative thematic analysis (illustrated in Section 3.5) based on the collected video recordings, until the hierarchy of themes and sub-themes were constructed. Details of the methodology are provided in the following sections.

3.2 Setting up of different reality shops

This study developed four versions of the same shop with almost identical elements (products, layouts, displays, and atmospheres) except for their different technology solutions. A simplified *brick-and-mortar shop* selling second-hand LP records (physically located in a university office room) was set up first as the prototype. The XR shops were then built based on this prototype, as follows:

The AR shop. The AR shop changed the printout product information sheet placed beside the corresponding LP record (in the brick-and-mortar shop) to a paper-like digital page suspending on that record. Microsoft HoloLens AR headsets were used to display the digital information while participants looked at a physical product.

The VR shop. The VR shop was constructed as a 1-to-1 scale digital replica of the brick-and-mortar shop. Participants used the Valve Index VR headset which exclusively afforded the virtual environment of the shop and its contents. Its controllers were presented as gloved hands, enabling a natural interaction with the virtual products and objects.

The AV shop. The AV shop was built based on the VR solution, with one main difference. The product information page in VR was on the same digital layer as the products. However, in the AV shop, the virtual information page was displayed on a suspending layer onto the virtual products, and was triggered by the corresponding LP records appearing in the participant's field of view, similarly to our AR shop mechanism.

3.3 Participants

The current study recruited 165 students from the same university where the shops were built. Each participant provided informed consent before being randomly assigned to one of the four conditions. Participants were then provided the necessary instructions and tutoring regarding the shopping rules and the use of the XR devices (if applicable). Among all recruited, 162 participants (47% females; 56.8% undergraduate students) completed their 10-minute shopping experience.

3.4 Recording apparatus

Two cameras (Mi Home Security 360° Camera) were installed on the ceiling, at the top-left and top-right vortexes (near the entrance) of the room, to procure recordings of participants' in-shop actions in stereoscopic view. Screens of the VR and AV programs were also recorded as supplementary video materials. Thus, this study collected a total of 67 hours of video recordings (including both camera and screen recordings, as shown in Figure 1). Each participant was allocated an exclusive ID number and their faces were mosaicked in all video recordings during any presentations to ensure privacy and anonymity.

Snapshot of videos recorded by the camera: participant shopping in AV

Screenshot of the AV program (a first-person perspective)

Figure 1. Examples of camera recordings and program screen recordings

3.5 Comparative thematic approach

A comparative thematic analysis was deployed to identify the XR users' action themes appearing in the video recordings. We chose the thematic analysis method for subtracting thematic information (meanings reappearing) in our videos recording unstructured action materials [32]. Moreover, a comparative analysis was employed between the different groups in order to identify the behavioral schemas that are similar and divert between different realities [33]. Additionally, metaphorical heuristics were frequently used to interpret bodily actions into behavioral schemas [34]. The analysis consists of the following four stages.

Stage 1: Identifying bodily action codes. Videos of 20 participants (5 in each shop) were first extensively checked for developing bodily action codes (as recommended by [31]). Then, two researchers independently transcribed those video recordings and reached a consensus on the codes (shown in Table 1) through discussion.

Stage 2: Thorough examination of video recordings. Two researchers shared the total amount of participants and independently examined their video recordings. One researcher examined all participants with ID numbers 1-90, while a second researcher examined all participants with ID 81-162. Both researchers went through and coded participants with ID 81-90, in order to test their analysis correlation. The researchers first checked the existence of the above codes, and then took notes for case-specific characterizations of those codes.

Stage 3: Comparison through metaphorical heuristics. Next, XR cases were compared to physical reality cases. All prominent divergence between extended reality and physical reality was identified and analyzed through metaphorical heuristics. During this process, themes of participants' behavioral schema emerged accumulatively.

Stage 4: Structuring themes and sub-themes. Lastly, the researchers structured themes to develop an analysis framework focusing on XR users' behavioral experiences.

Table 1. XR user's bodily action codes

Categories	Aspects	Codes	Definitions
Self-action	Motion in one spot	*Head-motion*	The participant shifts their head.
		Hand-motion	The participant moves their fingers.
		Whole-body-motion	The participant conducts actions engaging the whole body, e.g., dancing.
	Motion with locations changing	*Vertical motion*	The participant conducts actions such as stand on tipped toe, kneel, squat, and bend down to change their vertical perspectives.
		Horizontal motion	The participant navigates in the shop.
Product interaction	Spatial-location emphasized	*Regular displacement*	The participant takes the product from their original position to their hands, cashier table.
		Irregular displacement	The participant takes the product from their original position to another place aside from their hands and cashier table, e.g., other

Categories	Aspects	Codes	Definitions
			positions on the shelf or the floor.
		Perfect return	When a product is displaced, the participants return it to its original place recovering its original status.
		Imperfect return	When a product is displaced, the participant does not return it to its original place or recovering its original status.
	Force emphasized	*Throwing*	The participant intentionally throws the product.
		Dropping	The participant accidentally fails at holding the product.
		Playing	The participant plays with the product, i.e., interacting with it but not to check its information.
Surrounding interaction	Touch	*Brief touch*	The participant puts their (virtual) hand on environmental elements, e.g., the walls, the cashier, the decoration, with a time duration < 5 seconds.
		Long stay	The participant put their (virtual) hand on environmental elements of the shop, similarly to "brief touch" but lasts > 5 seconds.

4. RESULTS

4.1 Theme: Behavior connection

Some of the participants' behavioral patterns appeared to be connecting physical reality actions to XR shop experiences. This can be seen by the emerged sub-themes "synchronizing", "attaching", "habituating", and "responding."

Synchronizing

It was not rare for the participants in the VR-mediated conditions (VR and AV) to notice their hands could be partly represented in the virtual world. Quite a few of the participants moved their fingers or rotated their palms, to see if the hands and fingers shown in the virtual world resembled their actual movements (e.g. VR participants with ID 117, 118, 121, and in AV-ID 134, 136, Figure 2). This behavior was usually exhibited at the very beginning of the shopping (during the first 2 minutes) or at the very end (during the last 1 minute, when participants had almost finished their shopping and purchase decisions). Most of the participants who were conscious of their "new" virtual body parts stopped examining them after 5-10 seconds.

Figure 2. VR-ID 117 examining the synchronicity of their virtual hands

Attaching

Participants in VR-mediated shops were observed to have more interactions related to their environment, such as knocking on the cashier table (VR-ID 94), touching decorative LP records or posters on the walls (AR-ID 56; VR-ID 91, 101, 116, 119; AV-ID 129, 131, 136, 142). Their body would construct an external connection with the surface of objects, or “attachment” metaphorically denoted as an intimate feeling of something.

Habituating

Participants were observed to press and hold the information page (located in front of the LP records, shown in Figure 2) while reading the text on it, in both the brick-and-mortar and the VR shop. A virtual “touch” is merely an overlap of their hand position to the position of virtual objects. However, participants still appeared to conduct such actions multiple times. This behavior shows everyday physical reality habits were transferred into XR environments.

Responding

When encountered with unwanted information popping into their field of view (the product information page), participants in AR-mediated shops (AR and AV) instantly responded by shaking their heads or swinging their hands. In these digitized scenarios, “shaking away” and “swinging off” had no actual effect in manipulating the presented information. However, it demonstrates an intuitive behavior and intentionality of avoidance similar to our reactions in physical reality.

4.2 Theme: Behavior reconstruction

Reconstructions of behavioral schemas were also highly represented in XR. Once participants realized that the rules of physical reality do not necessarily apply in XR, and that their XR actions do not inevitably result in consequences identical to the ones in physical reality, their behaviors became more diverse, flexible, and untrammeled. Therefore, our second theme “behavior reconstruction” is represented by the sub-themes “merging”, “adjusting”, “screening”, and “experimenting”.

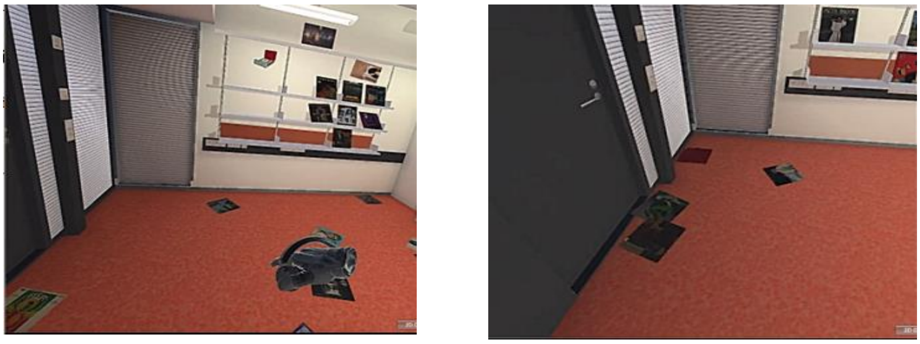
Merging

Participants were observed to “cut” their hands into the virtual objects’ surfaces and stayed in those objects’ inner space while in VR-mediated environments. The status of “merging” was metaphorically developed for blending something with another item to form an assemblage or a unity. In this sense, participants constructed an interior connection with the XR environment.

Adjusting

We observed two kinds of adjusting behaviors primarily employed to enhance physical and mental self-convenience. The first behavior was observed when participants in AR-mediated environments could not easily see the information about products placed on the upper or the lower shelf levels. Instead of physically moving (similarly to the brick-and-mortar behaviors, e.g. standing on tiptoe or kneeling down), several participants opted to change the position of the products, likely when they felt this would result in a lower physical workload. It appears that interacting with virtual products was more labor-saving than interacting with real ones; thus, many participants accumulatively developed a behavioral schema reducing the physical intensity of their workload.

A second adjusting behavior was observed when participants developed strategies on how to employ the virtual space to facilitate decision making. Unlike in the brick-and-mortar shop, where the consumers’ decision-making took place within their mind-space, participants in VR-mediated environments created explicit decision zones outside of their mindset, therefore externalizing some of their mental processes. For instance, some participants threw the LP records they were sure not to buy onto the floor area, thus using the shelves as their active decision zone (AV-ID 153); while on the contrary, other participants threw on the floor only the records they were interested in purchasing, thus transforming the floor into their decision zone (AV-ID 136) (Figure 3).



AV-ID153 moves interesting products in one specific shelf, while throws other products on the floor

AV-ID136 drops all the records they are interested in purchasing on the floor

Figure 3. Participants utilizing different spaces in the virtual environment as decision zones

Screening

We also found that, when participants accidentally knocked products off the shelf in the virtual shops, they would ignore them and continue browsing other products. However, in the brick-and-mortar shop, all the participants returned the records back to their original spots and kept their original state. Similar perfect returns were less frequent in the VR and AV conditions. Some participants simply ignored when they accidentally knocked products off the shelves (data from at least 5 participants in AV shop); others made some effort to return the records back on shelves, but not all the way to their original place, just a convenient shelf nearby (e.g. VR-ID 101, 103, AV-ID 157). We also found that several participants did return the records to their original shelf, but not in their original state (observed in over 17 AV participants, and over 13 in VR including ID 89 shown in Figure 4), e.g., the records were returned upside down or backwards. One explanation for such behaviors relates to the availability of cognitive resources and their allocation [35-37]. It is possible that participants realizing there is no risk on the product's integrity, could afford ignoring accidents for that reason. In such cases, the VR-mediated environments could have facilitated divided attention by enabling participants to screen out irrelevant tasks (or ones perceived as unimportant, e.g. perfect record returns), while allowing them to stay focused on their primary task (making a purchasing decision within the given time).

Figure 4. Different placement performed by ID 89 when returning a product in VR

Experimenting

Participants performed more creative behaviors in VR-mediated shops, e.g., they played with the virtual products by doing a throw-and-catch game, delivering them from one hand to the other, or throwing them to some hidden place (VR-ID 86, 91, 118, 119; AV-ID 124, 131, 136, 145) (Figure 5). Brief talks with those participants indicated they were not concerned with breaking the shop's order or damaging the products since "all of these can be recovered to the original state simply by pressing a button" (quote by participant). Therefore, it is possible that damage-proof XR shops afford users more freedom and opportunities to reconstruct their behavioral schema, thus facilitate exploration of various actions and their outcomes.

Figure 5. AV-ID 124 throwing and catching the product

5. DISCUSSION

5.1 mTheoretical contribution

Theoretically, this study offers insights for further understanding the XR shopping environments, as well as in-depth understanding of XR shoppers' behavioral experience. To begin with, our results showed that some of XR shoppers' behaviors can be seen as transferred from physical reality to XR world. We also found that many behaviors can be reconstructed according to XR's environmental characteristics. A distinguishment between behavioral transfer and behavioral reconstruction could help us reflect on the similarities and divergences between physical reality and XR (not only limited in retail contexts). Especially in the virtual reality, new dimensions of shoppers' behaviors and experiences are emerging. For instance, virtualization of physical reality lacks inevitable real action consequences: it is damage-proofed from users' actions. It is possible that this characteristic is a main factor cradling XR users' experimenting behavior.

Identifying the themes (and sub-themes) of XR shoppers' behavioral practices helps expand our understanding regarding emerging XR retail phenomena. While some findings similar to ours have been explored in other everyday-life scenarios (e.g., creation and play [38-40]), they have seldom been explored in the retail context under the perspective of shoppers' behavioral actions and responses. The current study also identifies XR shoppers' behavioral experiences that prior research has not illustrated, such as attaching, merging, and creative adjusting. Further investigations on these behavioral experiences could provide a better understanding on XR shoppers' psychology, as well as assist in development and design of XR retailing environments.

5.2 Practical implication

The behavioral experiences identified in this study can offer a practical basis for XR applications in retail and various other fields such as therapy, training, entertainment, and education. Understanding how the XR environment shapes users' actions could help to leverage XR applications' benefits and advantages. Retailers knowing that an XR user is influenced by their prior experiences in physical reality, or that a user is creatively adjusting to newly-imposed XR environments, may pay more attention to directly relevant aspects. For example, retailers could opt to enhance the spatial constructiveness so that shoppers may move and change objects with little physical constraints.

6. CONCLUSION AND FUTURE RESEARCH

This study adopted a video-based comparative thematic approach through metaphorical heuristics to subtract from XR shoppers' dynamic, unconscious, and complex behavioral experiences resulting in eight sub-themes, synchronizing, attaching, habituating, responding, merging, adjusting, screening, and experimenting. These sub-themes show that XR shoppers are capable of transferring behavioral schemas from physical reality, as well as reconstructing their behavioral schemas in XR. One limitation of this study is that we only investigated the XR-mediated experience in the shopping context. Future research could look into other settings and environments to verify if our findings regarding behavioral schemas are generalizable. Moreover, while this study analyzed and interpreted XR shoppers' behavioral actions, it did not investigate how other systems related to perception, cognition or emotion, may influence the participants' performance. Finally, it could also be valuable if future studies applied more methodological approaches such as navigation trajectory analysis or heat maps, to help portray a more granular view of how shoppers experience and behave in XR environments.

ACKNOWLEDGMENT

This work has been funded by Liikesivistysrahasto under Grant No. 210301; Academy of Finland under Grant No. 337653.

REFERENCES

[1] Allman-Farinelli M, Ijaz K, Tran H, et al. 2019. A Virtual Reality Food Court to Study Meal Choices in Youth: Design and Assessment of Usability. JMIR Formative Research, 3(1):e12456. Published 2019 Jan 9. doi:10.2196/12456., 3(1), e12456.

[2] Ketelaar P E, Bernritter S F, van Woudenberg, T J, et al. 2018. "Opening" location-based mobile ads: How openness and location congruency of location-based ads weaken negative effects of intrusiveness on brand choice. Journal of Business Research, 91, 277-285.

[3] Moes A, van Vliet H. 2017. The Online Appeal of the Physical Shop: How a Physical Store Can Benefit from a Virtual Representation. Heliyon, 3(6), e00336.

[4] Dacko S G. 2017. Enabling smart retail settings via mobile augmented reality shopping apps. Technological Forecasting and Social Change, 124, 243-256.

[5] Fan X, Chai Z, Deng N, Dong X. 2020. Adoption of augmented reality in online retailing and consumers' product attitude: A cognitive perspective. Journal of Retailing and Consumer Services, 53, 101986.

[6] Huang T L, Liao S. 2015. A model of acceptance of augmented-reality interactive technology: the moderating role of cognitive innovativeness. Electronic Commerce Research, 15(2), 269-295.

[7] Bonetti F, Warnaby G, Quinn L. 2018. Augmented reality and virtual reality in physical and online retailing: A review, synthesis and research agenda. In: Augmented Reality and Virtual Reality (pp. 119-132).

[8] Xi N, Hamari J. 2021. Shopping in virtual reality: A literature review and future agenda. Journal of Business Research, 134, 37-58.

[9] Milgram P, Kishino Fumio. 1994. A taxonomy of mixed reality visual displays. IEICE Trans. Information Systems. E77(D), 1321-1329.

[10] Voogt J, Fisser P. 2015. Computer-Assisted Instruction. In: International Encyclopedia of the Social & Behavioral Sciences, 493-497.

[11] Olsson T, Lagerstam E, Kärkkäinen T, et al. 2013. Expected user experience of mobile augmented reality services: A user study in the context of shopping centres. Personal and Ubiquitous Computing, 17(2), 287-304.

[12] Pantano E, Rese A, Baier D. 2017. Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets. Journal of Retailing and Consumer Services, 38, 81-95.

[13] Manis K T, Choi D. 2019. The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. Journal of Business Research, 100, 503-513.

[14] Yim M Y, Chu S, Sauer P L. 2017. Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective. Journal of Interactive Marketing, 39, 89-103.

[15] Berg L P, Vance J M. 2016. Industry use of virtual reality in product design and manufacturing: A survey. Virtual Reality, 1-17.

[16] Xi N, Chen J, Gama F, Riar M, Hamari J. 2022. The challenges of entering the metaverse: An experiment on the effect of extended reality on workload. *Information Systems Frontiers*, 1-22.

[17] Riar M, Xi N, Korbel J J, Zarnekow R, Hamari J. 2022. Using augmented reality for shopping: a framework for AR

induced consumer behavior, literature review and future agenda. Internet Research. 1-38Guttentag D A. 2010. Virtual reality: Applications and implications for tourism. Tourism Management, 31(5), 637-651.

[18] Guttentag D A. 2010. Virtual reality: Applications and implications for tourism. Tourism Management, 31(5), 637-651.

[19] Stapleton C, Hughes C, Moshell M, et al. 2002. Applying mixed reality to entertainment. Computer, 35(12), 122-124.

[20] Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. Eurasia Journal of Mathematics, Science and Technology Education, 13(2), 469-486.

[21] Pantano E, Servidio R. 2012. Modeling innovative points of sales through virtual and immersive technologies. Journal of Retailing and Consumer Services, 19(3), 279-286.

[22] Ketoma V K, Schäfer P, Meixner G. 2018. Development and Evaluation of a Virtual Reality Grocery Shopping Application Using a Multi-kinect Walking-in-Place Approach. Proceedings of the 1st International Conference on Intelligent Human Systems Integration (IHSI 2018): Integrating People and Intelligent Systems, Springer, Cham:368-374.

[23] Poushneh A, Vasquez-Parraga A Z. 2017. Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. Journal of Retailing and Consumer Services, 34:229-234.

[24] Sikström E, Høeg E R, Mangano L, Nilsson N C, De Götzen A, Serafin S. 2016. Shop'til you hear it drop: influence of interactive auditory feedback in a virtual reality supermarket. In: Proceedings of the 22nd ACM Conference on Virtual Reality Software and Technology (pp. 355-356).

[25] Parise S, Guinan P J, Kafka R. 2016. Solving the crisis of immediacy: How digital technology can transform the customer experience. Business Horizons, 59(4), 411-420.

[26] Roy S K, Balaji M S, Sadeque S, et al. 2017. Constituents and consequences of smart customer experience in retailing. Technological Forecasting and Social Change, 124, 257-270.

[27] Meyer C, Schwager A. 2007. Understanding customer experience. Harvard business review, 85(2), 116.

[28] Verhoef P C, Lemon K N, Parasuraman A, et al. 2009. Customer experience creation: Determinants, dynamics and management strategies. Journal of retailing, 85(1), 31-41.

[29] Lee K C, Chung N. 2008. Empirical analysis of consumer reaction to the virtual reality shopping mall. Computers in Human Behavior, 24(1), 88-104.

[30] Xi N, Bampouni E, Hamari J. 2022. How Does Extended Reality Influence Consumer Decision Making? The Empirical Evidence from A Laboratory Experiment. In Hawaii International Conference on System Sciences 2022 (pp. 1791-1799)

[31] Heath C, Hindmarsh J, Luff P. 2010. Video in Qualitative Research. SAGE, 2010.

[32] Clarke V, Braun V. 2014. Thematic analysis. In Encyclopedia of critical psychology (pp. 1947-1952). Springer, New York, NY.

[33] Guest G, MacQueen K M, Namey E E. 2011. Applied Thematic Analysis, SAGE, 2011.

[34] Zaltman G, Zaltman L H. 2008. Marketing metaphoria: What deep metaphors reveal about the minds of consumers. Harvard Business Press.

[35] Knudsen E I. 2007. Fundamental components of attention. Annual Reviews of Neuroscience, 30, 57-78.

[36] Monsell S. 2003. Task switching. Trends in Cognitive Sciences, 7(3), 134-140.

[37] Shah J Y, Friedman R, Kruglanski A W. 2002. Forgetting all else: on the antecedents and consequences of goal shielding. Journal of Personality and Social Psychology, 83(6), 1261.

[38] Yilmaz R M, Goktas Y. 2017. Using augmented reality technology in storytelling activities: Examining elementary students' narrative skill and creativity. Virtual Reality, 21 (2), 2017, pp. 75-89.

[39] Zünd F, Ryffel M, Magnenat S, Marra A, Nitti M, et al. 2015. "Augmented creativity: Bridging the real and virtual worlds to enhance creative play", SA '15: Proceeings of SIGGRAPH Asia 2015 Mobile Graphics and Interactive Applications, ACM, 2015, pp. 1-7.

[40] Escobedo L, Tentori M, Quintana E, Favela J, Garcia-Rosas D. 2014. Using augmented reality to help children with autism stay focused. IEEE Pervasive Computing, 13 (1), 2014, pp. 38-46.